

TECHNICAL MANUAL  
FOR  
SAFETY REQUIREMENTS FOR ATTACHING  
LIFTING CLAMP, BACKUP CLAMP, SAFETY  
CLAMPS, SAFETY STOP, LIFTING DEVICES  
AND SLINGS TO SUBMARINE ANTENNA  
MASTS AND PERISCOPES



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**RECORD OF REVISIONS**

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8	31 JUL 2012	CLARIFY LIFTING DEVICES INSTALLATION PROCEDURES

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## FOREWORD

This technical manual contains safety requirements, general information, equipment definitions, pre-installation requirements, and installation procedures necessary for attaching lifting, backup, safety clamps, safety stops, lifting devices, sled stop assemblies, and slings to submarine antenna mast and periscopes.

This technical manual consists of six chapters as follows:

- Chapter 1 - General Information
- Chapter 2 - Pre-Installation Requirements
- Chapter 3 - Procedures for Installing Safety Devices
- Chapter 4 - Procedures for Installing Lifting Devices
- Chapter 5 - Procedures for Installing Horizontal Lifting Devices
- Chapter 6 - Procedures for Removing Safety and Lifting Devices

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## SAFETY SUMMARY

### GENERAL SAFETY NOTICES

The following general safety notices supplement the specific warnings and cautions appearing elsewhere in this manual. They are recommended precautions that must be understood and applied during operation and maintenance of the equipment covered herein. Should situations arise that are not covered in the general or specific safety precautions, the commanding officer or other authority will issue orders as deemed necessary to cover the situation. No work shall be undertaken on energized equipment or circuits until approval of the commanding officer is obtained, and then only in accordance with Naval Ships' Technical Manual (NSTM) S9086-KC-STM-010/Chapter 300.

### DO NOT REPAIR OR ADJUST ALONE

Under no circumstances shall repair or adjustment of energized equipment be attempted alone. The immediate presence of someone capable of rendering first aid is required. Before making adjustments, be sure to protect against grounding. If possible, adjustments should be made with one hand, with the other hand free and clear of equipment. Even when power has been removed from equipment circuits, dangerous potentials may still exist due to retention of charges by capacitors. Circuits must be grounded and all capacitors discharged prior to attempting repairs. Equipment should be deenergized and properly tagged out according to the ship's Standard Operating Procedures.

### TEST EQUIPMENT

Make certain test equipment is in good condition. If a metal-cased test meter must be held, ground the case of the meter before starting measurement. Do not touch live equipment or personnel working on live equipment while holding a test meter. Do not ground any measuring devices; these devices should not be held when taking measurements.

### INTERLOCKS

Interlocks are provided for safety of personnel and equipment and should be used only for the purpose intended. They should not be battle shorted or otherwise modified except by authorized maintenance personnel. Do not depend solely upon interlocks for protection. Whenever possible, disconnect power at the power distribution source.

### MOVING EQUIPMENT

Personnel shall remain clear of moving equipment. If equipment requires adjustment while in motion, a safety watch shall be posted. The safety watch shall be qualified to administer CPR, have a full view of the operations being performed, and have immediate access to controls capable of stopping equipment motion.

### FIRST AID

An injury, no matter how slight, shall never go unattended. Always obtain first aid or medical attention immediately, and file an injury report in accordance with OPNAVINST 5102.1 series, subj: Mishap Investigation and Reporting.

**SAFETY SUMMARY - Continued****RESUSCITATION**

Personnel working with or near high voltage shall be familiar with approved methods of resuscitation. Should someone be injured and stop breathing, begin resuscitation immediately. A delay could cost the victim's life. Resuscitation procedures shall be posted in all electrically hazardous areas.

**GENERAL PRECAUTIONS**

The following general precautions are to be observed at all times.

1. Install and ground all electrical components associated with this system/equipment in accordance with applicable Navy regulations and approved shipboard practices.
2. Ensure that all maintenance operations comply with Navy Occupational Safety and Health (NAVOSH) Program Manual for Forces Afloat, OPNAVINST 5100.19 series.
3. Observe precautions set forth in NSTM S9086-KC-STM-010/Chapter 300 with respect to electrical equipment and circuits.
4. Ensure that protective guards and shutdown devices are properly installed and maintained around rotating parts of machinery and high voltage sources.
5. Do not wear loose clothing while working around rotating parts of machinery.
6. Ensure that special precautionary measures are employed to prevent applying power to the system/equipment any time maintenance work is in progress.
7. Do not make any unauthorized alterations to equipment or components.
8. Before working on electrical system/equipment, use the correct tag out procedure and check with voltmeter to ensure that system is not energized.
9. Consider all circuits not known to be "dead," "live" and dangerous at all times.
10. When working near electricity, do not use metal rules, flashlights, metallic pencils, or any other objects having exposed conducting material.
11. Deenergize all equipment before connecting or disconnecting meters or test leads.
12. When connecting a meter to terminals for measurement, use range higher than expected voltage.
13. Before operating equipment or performing any tests or measurements, ensure area is dry of water or other liquid conductive material and that frames of all motors and starter panels are securely grounded.
14. Ensure that area is well-ventilated when using cleaning compound or solvent. Avoid prolonged breathing of fumes and compound or solvent contact with skin or eyes.

**SAFETY SUMMARY - Continued****WARNINGS AND CAUTIONS**

Specific warnings and cautions applying to the system/equipment covered by this manual are summarized below. These warnings and cautions appear elsewhere in the manual following paragraph headings and immediately preceding the text to which they apply. They are repeated here for emphasis.



SHUT DOWN and DANGER tag all radio/radar transmitters and DANGER tag all electrical inputs to the mast or antenna being worked. SHUT and DANGER tag all hoist cylinder isolation valves (raise and lower) of all other masts in the sail while personnel are working on or conducting tests and inspections. (Page 1-6)



The nature of the work, tests and inspection to be performed shall dictate the position of the mast or periscope assembly, partly raised, fully raised, fully lowered, faired, or under ice position. At each repositioning of the mast or periscope assembly, personnel working and/or conducting the tests shall first be cleared from the sail. Clear DANGER tags on all hoist cylinder isolation valves on the mast or antennas to be moved. Reposition the mast or periscope and again tag out the hoist cylinder isolation valves. Personnel are then repositioned to continue with work. It is not intended to preclude observation of the moving mast, by properly qualified personnel stationed within the sail, for purposes of the routine inspection or as called for by the procedures. The topside watch shall pass the word over the 1MC every 30 minutes in accordance with CSFINST 5400.39A Series SSORM manual. (Page 1-6)



Use of chemicals will produce a vapor which will displace oxygen. Use with adequate ventilation and avoid prolonged or repeated breathing of vapors. Avoid prolonged or repeated contact with skin, since these solvents dissolve natural oils. While the solvents are nonflammable, they should not be used near open flames since the products of decomposition are toxic and very irritating. Do not take internally. Refer to [References \(k\)](#) and [\(l\)](#) for general personnel protective requirements. Consult individual manufacturer's Material Safety Data Sheet (MSDS) for specific hazards and precautions. (Page 2-1, page 2-2, page 2-2, page 2-3)



Ensure that the mandatory requirements of [Chapter 2](#) have been accomplished and that all pertinent safety precautions of [Chapter 1](#) are in effect. (Page 3-1, page 3-3, page 3-9, page 3-13, page 3-16, page 3-21, page 3-25, page 3-27, page 4-11, page 4-25, page 4-27, page 4-30, page 4-32, page 4-37)



Ensure that the shored system has positive hydraulic support. (Page 3-13, page 3-16)



Do not use the safety stop on the AN/BRD-7, AN/BLD-1 mast for the following hulls: SSN719-750, 751-773, and SSN21-23. Do not use the safety stop on the AN/BRD-7 mast with MMM closure doors (S/A 4412) installed. Due to the configuration of the closure door opening, the sail top does not provide an interference point for the safety stop, instead of installing the safety stop, install safety clamps or shoring in accordance with the [paragraphs 3.1](#) and [3.2](#), respectively. (Page 3-21)



Do not use the safety stop on the mast bearing being worked on when the lifting stop fastener spins during installation. Refer to [paragraphs 3.1](#) or [3.2](#) to install the safety clamp or shoring. Report the damaged insert to local Maintenance Activity. (Page 3-22)



In addition to a lifting clamp, a backup clamp ([Figure 4-1](#)) or a safety stop pin ([Figure 4-2](#)) is a mandatory requirement for personnel safety when lifting masts. Ensure that the mandatory requirements of [Chapter 2](#) have been accomplished and that all other pertinent safety precautions of [Chapter 1](#) are in effect. (Page 4-1, page 4-7)



Do not use the lifting devices on the mast being worked on when the lifting device fastener spins during installation. Refer to para 4.1 to install the lifting clamp and backup clamp or safety stop pin. Report the damaged insert to local Maintenance Activity. (Page 4-12)



In addition to a lifting clamp, a backup clamp (Figure 4-12) is a mandatory requirement for personnel safety when lifting snorkel inner induction pipe. Ensure that the mandatory requirements of Chapter 2 have been accomplished and that all other pertinent safety precautions of Chapter 1 are in effect. (Page 4-34)



To prevent the system swinging during transportation, keep the mast assembly level. (Page 5-2, page 5-3)



Never remove the clamps without checking that a positive means of supporting the weight of mast or periscope exists. (Page 6-1)



Never remove the safety stop without checking that a positive means of supporting the weight of mast or periscope exists. (Page 6-2)



Never remove shoring without checking that a positive means of supporting the weight of the mast or periscope exists. (Page 6-2)



Never remove the lifting blocks without ensuring that there is a positive means of supporting the weight of the mast. (Page 6-5)



Ensure removal of the sled stop assembly prior to cycling the system. (Page 1-7)



Never allow the support bars to rest on the periscope traveling slide assembly. (Page 1-7)



It is mandatory that the SUB HDR and ACM lifting assembly components are kept as a matched set by serial number. Failure to do so negates the weight test. Replacement items can be incorporated as long as the requirements contained in [Reference \(x\)](#) are followed. (Page 2-7)



Snorkel mast clamps extend over the AN/BRD-7, BLD-1, MMM or AN/BRD-7 with MMM (S/A 4412) closure doors. Close and DANGER tag AN/BRD-7, AN/BLD-1 or AN/BRD-7 hoist cylinder isolation valves when the clamps are installed on the snorkel mast. (See [Table 2-2](#)) (Page 3-1)



Periscope faired mast clamps, safety stop, or lifting devices extend over the AN/BRD-7, BLD-1, MMM or AN/BRD-7 with MMM (S/A 4412) closure doors. Close and DANGER tag AN/BRD-7, AN/BLD-1, MMM or AN/BRD-7 hoist cylinder isolation valves when the clamps, safety stop, or lifting devices are installed on the periscope faired mast. (See [Table 2-2](#)) (Page 3-1, page 3-4, page 3-21, page 4-2, page 4-7, page 4-11, page 4-16)

**CAUTION**

AN/BRD-7, AN/BLD-1, MMM mast clamps and mast clamps for AN/BRD-7 with MMM closure doors (S/A 4412) installed, extend over the snorkel mast. Close and DANGER TAG snorkel hoist cylinder isolation valves when the clamps are installed on the AN/BRD-7, AN/BLD-1, and MMM or AN/BRD-7 mast. (See [Table 2-2](#)) (Page 3-2, page 3-9, page 4-7, page 4-24)

**CAUTION**

Never install the clamps onto the fairing access covers or openings. The clamp adjacent to the fairing access should be installed 1 inch minimum away from the access opening edge. (Page 3-2, page 4-2)

**CAUTION**

Use of thread antiseize compound on the clamp bolts is prohibited. (Page 3-3, page 3-6, page 4-2, page 4-8, page 4-17, page 4-27, page 4-34)

**CAUTION**

Tightening one side of the clamp first may cause damage to the fiberglass mast. (Page 3-3, page 4-3, page 4-8)

**CAUTION**

Fully lower and tag out periscope fairing prior to clamping the periscope. Do not install clamps on periscope bearings. (Page 3-4)

**CAUTION**

The shoring chamfer end should be installed under the outer induction pipe bottom flange with 1" clearance and the chamfer is installed away from the faired mast. (Page 3-16)

**CAUTION**

The shoring should be installed flush with the top of the Inner Mast Shipping & Installation Clamp. (Page 3-19)

**CAUTION**

In the event that a mast has been inadvertently powered down while the safety stop was installed, the safety stop shall be thoroughly inspected with particular attention paid to the area around the lower mounting screw. Discard the safety stop if any deformation is noted. (Page 3-22)

**CAUTION**

Ensure removal of the sled stop assembly from the antenna lower bearing prior to the cycling of the system. (Page 3-25)

**CAUTION**

Ensure lifting blocks are installed on the appropriate side of the mast as stamped on the lifting block, to prevent damage to the bearing retainer plate when the mast is lowered. (Page 3-27)

**CAUTION**

To prevent damage to the periscope, the periscope must be removed prior to removing the periscope fairing and installed after the periscope fairing is installed. (Page 4-1, page 4-7, page 4-12, page 4-16)

**CAUTION**

Snorkel mast clamps extend over the AN/BRD-7, BLD-1, MMM or AN/BRD-7 with MMM (S/A 4412) closure doors. Close and DANGER tag AN/BRD-7, AN/BLD-1 or AN/BRD-7 or MMM hoist cylinder isolation valves when the clamps are installed on the snorkel mast. (See [Table 2-2](#)) (Page 4-2)

**CAUTION**

Prior to attempting system removal, ensure that all necessary components are removed in accordance with the applicable system technical manuals and/or drawings. (Page 4-6, page 4-9, page 4-13, page 4-35)

**CAUTION**

The faired mast lifting devices are labeled FWD and AFT. Ensure the devices are installed in the proper locations to avoid the faired mast damage. (Page 4-11)

**CAUTION**

Damage to the fairing and/or threaded insert can occur if not installed correctly. Each lifting device must be installed only on the conformed surface which the device is marked (AFT/FWD) (Page 4-12)

**CAUTION**

**Step d** is very important on faired mast systems which are fully raised/extended, like SUB HDR and ACM, to provide enough cylinder length to mate and bolt to the cylinder base and to verify positive hydraulic pressure underneath the hydraulic cylinder piston (venting air from hydraulic cylinder), before removing the FWD & AFT lifting devices. (Page 4-13)

**CAUTION**

Remove the sled safety stops if they were installed. (Page 4-15)

**CAUTION**

Do not attach clamps within 52 inches of the top of the periscope antenna assembly. Do not use setscrews which set against the outer periscope barrel. (Page 4-17)

**CAUTION**

Cease lifting immediately if binding occurs when the periscope is being rotated. (Page 4-18)

**CAUTION**

Do not lift the radar mast by the radar antenna. (Page 4-22)

**CAUTION**

Use of thread antiseize compound on the bolts is prohibited. (Page 4-30, page 4-32)

**CAUTION**

To prevent interference between the snorkel inner induction pipe and mast bearing assemblies for SSN 688 Class snorkels which do not have the split ring base design, remove the mast bearing assemblies prior to removing the snorkel inner induction pipe out of the sail. (Page 4-34)

**CAUTION**

When using the antenna tail dolly on a SUB HDR and ACM antenna mast assemblies, mast orientation when rotating the mast to or from the vertical position will have the forward end facing down. (Page 4-41)

**CAUTION**

Prior to reinstallation, the horizontal lifting clamp must be removed before attempting to lower the mast assembly or inner mast into the bearing frame or faired mast. (Page 5-2)

**CAUTION**

Lift the system slowly and use the hand line to control and guide the dolly travel. (Page 5-3)

**CAUTION**

The antenna mast assembly should **NEVER** be lifted with the faired mast assembly. (Page 5-8, page 5-14)

**CAUTION**

Ensure that there is sufficient clearance around the faired mast assembly before rotating to the vertical position. (Page 5-8)

**CAUTION**

The SUB HDR and ACM antennas are always lifted or lowered from the horizontal position with the fwd end facing down. Antenna radome chock shall be positioned at the top of the inner mast to provide a stable resting surface with tail dolly installed on the lower end. The chock shall be of a sufficient height to prevent the radome from contacting the dock/pier. If a chock can not be found with sufficient height, then the antenna radome may be laid on a padded foam pallet to protect the radome finish and the tail dolly will support the lower end. (Page 5-15)

**CAUTION**

**Do not lower** the mast assembly to remove the lifting assembly, if the antenna cable is run through the cable guide up to the antenna base, unless the cable is connected to the antenna or the cable is not dropped down more than two inch from its installed state. (Page 5-15)

**CAUTION**

**Do not lower** the mast assembly to install the lifting assembly, if the antenna cable is run through the cable guide up to the antenna base, unless the cable is not dropped down more than two inches from its installed state. (Page 5-18)

**CAUTION**

The antenna is always lifted or lowered from the horizontal position with the fwd end facing down. Antenna radome chock shall be positioned at the top of the inner mast to provide a stable resting surface with tail dolly installed on the lower end. The chock shall be of a sufficient height to prevent the radome from contacting the dock/pier. If a chock can not be found with sufficient height, then the antenna radome may be laid on a padded foam pallet to protect the radome finish and the tail dolly will support the lower end. (Page 5-18)

**CAUTION**

In the event that a mast has been inadvertently powered down while the safety stop was installed, the safety stop shall be thoroughly inspected with particular attention paid to the area around the lower mounting screw. Discard the safety stop if any deformation is noted. (Page 6-2)



## CHAPTER 1

### GENERAL INFORMATION

#### 1.1 INTRODUCTION.

1.1.1 PURPOSE. The purpose of this procedure is to provide instruction in the safe use and installation of clamps, slings, safety stops, lifting devices, and shoring prescribed with submarine antennas, masts, and periscopes.

1.1.2 SCOPE. This procedure defines the requirements for safety of personnel and equipment. It includes the inspection and safety requirements for attaching the slings, lifting clamps, backup clamps, safety clamps, safety stops, lifting devices, and shoring to the antenna assemblies (such as the fiberglass main and inner masts, radomes, Electronic Surveillance Measures (ESM) antenna masts and so forth), periscopes, and snorkels.

1.1.3 APPLICABILITY. Clamps and slings defined in [Reference \(a\)](#), lifting assembly defined in [Reference \(y\)](#), and safety stops/lifting devices defined in [Reference \(v\)](#) are the only devices approved for use on the submarine antenna masts, periscopes, and snorkels by Naval Sea Systems Command (NAVSEA).

1.1.4 TEST REQUIREMENTS FOR WEIGHT HANDLING EQUIPMENT. Testing shall be made and documented as a part of the Periodic Testing of Weight Handling Equipment Program of all cognizant maintenance and repair activities.

- a. Clamps and Sling Assemblies. Weight test and/or holding capacity test for clamps and sling assemblies included in this procedure shall be performed at intervals not to exceed four years. Testing of clamps and sling assemblies shall be conducted in accordance with the requirements of [References \(a\)](#) and [\(ee\)](#).
- b. Safety Stops and Lifting Devices. Safety stops and lifting devices are given an initial weight test and receive periodical inspections at intervals not to exceed two years in accordance with [Reference \(v\)](#).
- c. Submarine SUB High Data Rate (HDR) and Advanced Communication Mast (ACM) Antenna Lifting Assemblies. Inspections and weight testing shall be in accordance with [References \(x\)](#) and [\(ee\)](#), except as modified herein. Initial weight testing of the Antenna Lifting Assembly is conducted at the fabrication facility. The test plate assembly is provided on [Reference \(z\)](#). The lifting assembly maximum load is 2,000 lbs. The Antenna Lifting Assembly shall be static load tested at 150% of the maximum load of 2,000 lbs (3,000 lbs).
- d. UMM Safety Pin and UMM Subassembly Lifting Tools. UMM Safety Pins, Hoist Cylinder Lifting Tools, Internal Bearing Lifting Tools and Fairing Lifting Tools are to be weight tested in accordance with the requirements of [References \(qq\)](#) through [\(tt\)](#).

1.1.5 INSPECTION REQUIREMENTS OF WEIGHT HANDLING EQUIPMENT. Weight handling equipment included in this procedure shall be inspected in accordance with [paragraph 2.3, 2.4, 2.6, 2.7 or 2.8](#) (as applicable) before each installation.

#### 1.2 REFERENCES.

- a. NAVSEA Dwg. SS-904-4398614, Lifting Clamps and Slings for Antenna Masts and Periscopes.

- b. NAVSEA S9086-XG-STM-010/CH-700, Shipboard Ammunition Handling and Stowage.
- c. NAVSEA S9585-AB-MMM-010, Multifunction AN/BRA-34, OE-538 Antenna Mast Assembly; Operation and Maintenance Instructions.
- d. NAVSEA S9425-CS-MMA-010, Radar Camouflage Units on the Type 18 ( ) Periscope; Procedure for Installation and Removal. (Supersedes NAVSEA 0900-LP-016-9050)
- e. NAVSEA Dwg. 5611357, Hinge Carriage for Periscope Handling Assembly.
- f. NAVSEA S9425-AE-PRO-010, Type 18 Submarine Periscope Set with ADF/SUBIS; Installation and Checkout Procedure.
- g. NAVSEA SE110-AE-PRO-010, AN/BRD-7, AN/BLD Antenna Closure Door System (CDS) on SSN-688 Class Submarines, Procedure for Assembly and Installation. (Supersedes NAVSEA 0900-LP-024-3071)
- h. NAVSEA S9585-AC-MMM-010, Direction Finder, Radio, AN/BRD-7, Antenna Mast Assembly; Operation and Maintenance Instructions.
- i. NAVSEA Dwg. 522-2113490, Hydraulic Cylinder, 3-1/2" Bore, 2-7/8" Diameter Rod.
- j. NAVSEA Dwg. 404-1971417, Cable Loop Guards Installation Standard.
- k. OPNAVINST 5100.19B, Navy Safety Precautions for Forces Afloat.
- l. NAVSEA S9086-WK-STM-010/CH-670, Stowage, Handling and Disposal of Hazardous General Use Consumables.
- m. GSA Federal Supply Schedule: FSC Group 79, Part IV, FSC Class 7930, Biodegradable Cleaners/Degreasers.
- n. NAVSEA TE176-B1-PRO-010, AN/BRD-7 and AN/BLD-1 Antenna Systems for SSN-688 Class Submarines; Handling Procedure.
- o. NAVSEA S9425-BJ-MMM-010, Periscope Type 18B, Mechanical Repair Guide, SSN-688 Class.
- p. NAVSEA S9086-CJ-STM-010/CH-075, Fasteners.
- q. NAVSEA 0900-LP-018-0080, Trident Snorkel Induction Mast System; Procedure for Shipboard Installation.
- r. NAVSEA S9342-AA-MMA-010, Snorkel Induction Mast, Mechanical Repair Guide; Maintenance Manual. (Supersedes S9342-AA-MMD-010)
- s. NAVSEA 0900-LP-018-0090, Trident Snorkel Induction Mast System; Procedure for Maintenance and Repair.
- t. NAVSEA SE110-BV-PRO-010, AN/BRD-7 and AN/BLD-1 Antenna Systems for Seawolf Class Submarines; Handling Procedure.
- u. NAVSEA SE217-AY-ETM-010, Radar Set AN/BPS-16 (V)2 and (V)3 Volume 1, Chapter 1-General Information, Chapter 2 Operation, Operation and Maintenance, Shipboard Level.
- v. NAVSEA Dwg. 125-7094237, Faired Mast Rigging Hardware and Safety Stop.
- w. NAVSEA S9170-AA-MMI-010, Mast Maintenance Group High Data Rate (HDR) MFG DWG #585-6931037; Description, Operation and Maintenance Manual.
- x. NAVFAC P-307, Management of Weight Handling Equipment Maintenance and Certification.
- y. NAVSEA Dwg. 7491423, SUB HDR Lifting Assembly.
- z. NAVSEA Dwg. 7491414, Test Plate Assembly, Lifting Ring.

- aa. NAVSEA Dwg. 7491416, HDR Tail Dolly.
- bb. NAVSEA S9SSN-W4-SSM-NK0/(U)688CLV6P3B8, External Hydraulic System Operation.
- cc. NAVSEA Dwg. 7287649, Hydraulic Hoist Cylinder Dolly Assembly.
- dd. NAVSEA S9422-AT-MMA-010, Universal Modular Mast, UMM); (Virginia Class) Interactive Electronic Technical Manual (IETM).
- ee. CINCLANTFLT/CINCPACFLTINST 4790.3 (JFMM), Volume IV, Part 1, Chapter 13.
- ff. NAVSEA S9425-BM-MMM-010, Periscope Type 8B Mod 3 Mechanical Repair Guide; SSN-688 Class Submarines.
- gg. NAVSEA SE217-AT-IEM-010, Radar Set, AN/BPS-16(V)4, with Field Changes 1 and 2; Shipboard Level; Operation and Maintenance; (IETM). (Supersedes SE217-LB-MMO-010)
- hh. NAVSEA N6554000189, Snorkel Mast Induction System on Seawolf Class Submarines.
- ii. NAVSEA S9SSB-X9-SSM-HE0/(U)726VP1C5, External Hydraulic System.
- jj. NAVSEA S9SSN-AW-SSM-QE0/(U)21CLV6P3B5, OI 633-6 External Hydraulic System Operation.
- kk. NAVSEA Dwg 7556877, 688 Class Periscope Fairing Hoist Cylinder Lifting Device.
- ll. NAVSEA SE134-AK-MMA-010, Advanced Communication Mast (ACM) Antenna System Mast Mechanical Group (MMG) for SSN-23 Description, Operation, and Maintenance.
- mm. NAVSEA S9342-AD-MMA-010, Snorkel Induction Mast System for Virginia Class Submarines; Operation and Maintenance Procedures.
- nn. SE134-AE-MMI-010, HDR SATCOM Antenna System Mast Mechanical Group (MMG) for SSN 21 Class; Description, Operation, and Maintenance.
- oo. SE134-AA-MMI-010, SUBHDR SATCOM Antenna System Mast Mechanical Group (MMG) for SSBN-726 Class; Description, Operation, and Maintenance.
- pp. SE110-CH-PRO-010, Procedure for Troubleshooting and Corrective Maintenance of the Multifunction Modular Mast and Closure Door Systems on SSN-688 Class Submarines.
- qq. NAVSEA Dwg. 7377735, Pin, Safety.
- rr. NAVSEA Dwg. 7377880, Internal Bearing Lifting Tool Assembly and Details.
- ss. NAVSEA Dwg. 7377883, Mast Fairing Lifting Tool Assembly and Details.
- tt. NAVSEA Dwg. 7377890, Hoist Cylinder Lifting Tool Assembly and Details.
- uu. S9505-AM-GYD-010 Submarine Fastening Criteria

### 1.3 DEFINITIONS AND EXPLANATION OF TERMS.

Throughout this procedure, there is frequent reference to the lifting clamp, backup clamp, safety clamp, safety stop pin, shoring, positive support of hydraulics, support bar, interference point, holding capacity test, weight test, faired mast safety stop, faired mast lifting device, and sled stop assembly. This section provides the definitions and explanations for these terms.

1.3.1 LIFTING CLAMP. A lifting clamp is utilized to attach a crane or other device for installing or removing an antenna/mast or periscope assembly. The lifting clamp will always be the lower of two installed clamps.

1.3.2 **BACKUP CLAMP.** A backup clamp is installed above and snug against the lifting clamp, and whose purpose is to provide additional clamp holding in the unlikely event that the lifting clamp permits antenna/mast or periscope assembly slippage.

1.3.3 **SAFETY CLAMP.** As stated herein, installation of two clamps is a mandatory requirement whenever personnel are working near or beneath the masts or periscopes. In these instances, the appropriate clamps are referred to as the safety clamps. No shackles or slings are attached to the safety clamps.

1.3.4 **SAFETY STOP PIN.** A safety stop pin is installed in the mast fairing piston rod bracket in place of the piston rod pin to provide a positive stop in the unlikely event that the lifting clamp should slip. The safety stop pin will always be installed above the lifting clamp. No backup clamp is required when the safety stop pin is installed.

1.3.5 **SHORING.** A supportive shoring is placed and secured on or beneath a mast or periscope to immobilize the system. The only authorized hardwood shoring is oak, elm, maple, mahogany or ironwood and must be a minimum of 4" by 4".

1.3.6 **POSITIVE HYDRAULIC SUPPORT.** Positive hydraulic support is when the antenna/mast or periscope is totally supported by the ship's hydraulic system. It is mandatory to ensure that the positive hydraulic support is evident prior to removing the clamps, safety stops, lifting devices, or shoring.

1.3.7 **SUPPORT BARS.** Support bars are attached to the periscope E&E adapter and laid on the raised platform and across the well. These bars position the E&E adapter and support the weight of the periscope system.

1.3.8 **INTERFERENCE POINT.** An interference point is a point where the lifting device, safety device, or shoring contacts an immovable submarine structure such as the sail top or bearing frame.

1.3.9 **HOLDING CAPACITY TEST.** This test is performed to ensure that a clamp will hold the antenna/mast or periscope weight during the lifting or safety function. The test procedure and acceptance criteria are provided in [Reference \(a\)](#).

1.3.10 **WEIGHT TEST.** This test is performed to ensure that a device will withstand the weight of the antenna/mast or periscope during the lifting or safety function. The test procedure and acceptance criteria are provided in [References \(a\), \(v\), and \(y\)](#).

1.3.11 **FAIRED MAST SAFETY STOP.** A faired mast safety stop may be used in place of safety clamps. The faired mast safety stop is installed in the aft edge of the fairing only and provides a positive stop against the top of the sail. Lifting devices can be used as the safety device when the system is being installed/removed.

1.3.12 **FAIRED MAST LIFTING DEVICE.** Faired mast lifting devices may be used in place of a lifting clamp, backup clamp, or safety stop pin. The lifting devices are installed in the aft and forward edges of the fairing.

1.3.13 **SLED STOP ASSEMBLY.** Two sled stop assemblies may be inserted through the faired mast sail access openings for OE-538, OE-207, and OE-592 masts. The sled stop assemblies will prevent the mast from being inadvertently raised when being worked on in the intermediate position. No weight test is required.

1.3.14 SUB HDR AND ACM ANTENNA LIFTING ASSEMBLIES. The antenna lifting assembly is utilized to remove or install the antenna assembly from or to a submarine sail using a single hook crane. See [Reference \(y\)](#).

1.3.15 ANTENNA TAIL DOLLY. The antenna tail dolly can be utilized on a SUB HDR, OE-538, OE-207/BR, OE-592, and ACM antenna baseplate to utilize a single hook crane to swing an antenna assembly from horizontal to vertical or vice-versa dockside. See [Reference \(aa\)](#).

1.3.16 HYDRAULIC HOIST CYLINDER DOLLY ASSEMBLY. The hydraulic hoist cylinder dolly assembly can be used on an HDR, ACM, and OE-538, OE-207, OE-592, NAVSAT and for SSN-688 Class only BRD-7 Faired Mast Assembly. The dolly assembly allows a single hook crane to be utilized to lift a Faired Mast Assembly from horizontal to vertical or vice-versa dockside. The configuration of the dolly assembly allows a controlled flow-rate of air into or out of the hydraulic hoist cylinder, which allows the Faired Mast Assembly (without the antenna mast installed) to be extended and retracted respectively. This feature is important for the HDR and ACM Faired Mast Assemblies, which must be fully extended to load into the sail. With the Faired Mast Assemblies fully extended, high loads are exerted on the piston/gland and its associated software, unless the cylinder is properly supported at the lower end.

1.3.17 SAFETY PIN. A safety pin is used in place of safety clamps on Universal Modular Masts (UMM's). It is installed in the guide trunk of the UMM and provides a positive stop for the Internal Bearing Assembly and mast fairing.

1.3.18 SNORKEL LIFTING BLOCKS. The lifting blocks may be used in place of the safety clamps. The blocks are installed in port and starboard side of the snorkel mast and provide a positive stop against the upper bearing.

1.3.19 INTERNAL BEARING LIFTING TOOL. An internal bearing lifting tool is utilized to attach a crane or chain fall to a UMM Internal Bearing Assembly (IBA) during installation or removal of the IBA. It is only used on Photonics Mast UMM's.

1.3.20 MAST FAIRING LIFTING TOOL. A mast fairing lifting tool is utilized to attach a crane or chain fall to a UMM fairing assembly during installation or removal of the fairing.

1.3.21 HOIST CYLINDER LIFTING TOOL. A hoist cylinder lifting tool is utilized to attach a crane or chain fall to a UMM hoist cylinder assembly during installation or removal of the hoist cylinder.

## **1.4 SPECIAL PRECAUTIONS.**

1.4.1 SAFETY MONITORS AND COMMUNICATIONS. Prior to commencing work, safety monitors shall setup a sound powered telephone circuit and shall be stationed in the following areas:

- a. On top of the sail in the vicinity of the mast being worked on.
- b. Outside the sail in the vicinity at the base of the mast being worked on when the sail access plates are removed.
- c. By the control valves at the Ballast Control Panel (BCP) or Ship's Control Station (SCS).

**NOTE**

Movement of an antenna/mast and periscope shall be under positive control by personnel stationed as specified and in direct phone communication with the control valve operator in the control room. Ensure sail is clear of all personnel.

1.4.2 BEARING LUBRICATION. To eliminate damage of the paint coatings and/or scoring of fiberglass masts (including antenna radomes), all bearings shall be continuously water-lubricated during cycling when air temperature is above freezing.

1.4.3 SAIL SYSTEM PROTECTION. When performing work on a submarine sail system or on an apparatus in or around the sail, extreme care must be used to prevent damage to neighboring sail systems. It is essential that the periscope head windows and bearings be covered to prevent entrance of foreign material, which could damage the head windows or score the periscope barrels.

1.4.4 ELECTRONIC AND MECHANICAL PROTECTIVE MEASURES. At the commencement of work, observe the following:

**⚠ WARNING**

SHUT DOWN and DANGER tag all radio/radar transmitters and DANGER tag all electrical inputs to the mast or antenna being worked. SHUT and DANGER tag all hoist cylinder isolation valves (raise and lower) of all other masts in the sail while personnel are working on or conducting tests and inspections.

**⚠ WARNING**

The nature of the work, tests and inspection to be performed shall dictate the position of the mast or periscope assembly, partly raised, fully raised, fully lowered, faired, or under ice position. At each repositioning of the mast or periscope assembly, personnel working and/or conducting the tests shall first be cleared from the sail. Clear DANGER tags on all hoist cylinder isolation valves on the mast or antennas to be moved. Reposition the mast or periscope and again tag out the hoist cylinder isolation valves. Personnel are then repositioned to continue with work. It is not intended to preclude observation of the moving mast, by properly qualified personnel stationed within the sail, for purposes of the routine inspection or as called for by the procedures. The topside watch shall pass the word over the 1MC every 30 minutes in accordance with CSFINST 5400.39A Series SSORM manual.

## CAUTION

Ensure removal of the sled stop assembly prior to cycling the system.

- a. Always position the mast or periscope assembly by its built-in power source (hydraulic hoist assembly) to the desired position (for working or removal) prior to installing the lifting clamp/device, backup clamp, safety clamps/stops, shoring, support bars, sled stop assembly (OE-538, OE-207, and OE-592 only), or strongback assembly (SSN-688 and SSN-21 Classes).

## CAUTION

Never allow the support bars to rest on the periscope traveling slide assembly.

- b. When attaching the support bars to the periscope E&E adapter, ensure that the bars make contact with the edge of the well or raised platform. This is referred to as the interference point.
- c. When applying torque to fasteners, do not torque bolts beyond proper value stated in [Table 3-1](#) or delamination and/or cracking of the fiberglass mast may occur. Such damage is not always visible.
- d. To avoid the false torque values, ensure that the nut does not bottom out against the end of the bolt thread and that the threads have no nicks, burrs, or galls that would impair the serviceability of the bolt.
- e. When working and/or conducting any tests or inspections under the mast or periscope assembly, ensure that the safety clamps/stops or shoring are installed to prevent slippage.
- f. Never clear DANGER tags on clamps, lifting devices, safety stops, supportive shoring, or support bars from a mast or periscope assembly before first ensuring that a positive means of supporting the mast or periscope exists. When relying on the hydraulic system for positive support, ensure that the mast or periscope with the clamps/safety stops or shoring has a specified clearance and the hoist cylinder isolation valves are closed and DANGER tagged. Observe for any downward drift of the mast or periscope for at least five minutes before clearing DANGER tags from the clamps, safety stops, shoring, or support bars and removing them.
- g. Never install the clamps above or below fairing sigma or channel area.
- h. Do not leave the periscope or mast clamped overnight without being hydraulically supported. In the event that a faired mast or periscope must be clamped for an extended period of time, the bolt torque must be checked weekly to ensure that the torque is a minimum of the value specified in [Table 3-1](#). Periscopes that must be clamped overnight, without hydraulic support, should be placed on bars or strongback (SSN-688 Class and Seawolf Class) in the control room.

## NOTE

The force should be applied to the torque wrench in the direction to tighten the bolt when checking the bolt torque.

- i. Never install the clamps onto the fairing access covers or openings. The clamp adjacent to the fairing access should be installed 1 inch minimum away from the access opening edge.



## CHAPTER 2

### PRE-INSTALLATION REQUIREMENTS

#### 2.1 INTRODUCTION.

2.1.1 GENERAL NOTE. In the interest of ensuring safety for all personnel who are involved in the repair and installation of submarine antenna/mast assemblies, periscopes, E&E adapters and their independent faired masts, compliance with the contents of this procedure is mandatory each time it becomes necessary to work under or to lift these assemblies into or out of a submarine fairwater. Additionally, safe, efficient installation of the lifting clamps/devices, safety clamps/stops, and shoring requires that certain practices provided herein as prerequisites be rigidly observed and used throughout phases of the removal and installation process to which they pertain.

#### 2.2 PREREQUISITES.

Safe, efficient installation of lifting clamps/devices, safety clamps/stops, and shoring requires that certain precautions be observed throughout all phases of installation. This section provides the requirements for effective workmanship.

##### 2.2.1 CLEANING OF INTERFACE SURFACES.

2.2.1.1 Fiberglass Faired Masts. This paragraph provides the procedures for cleaning the fiberglass faired masts prior to installation of clamps. This is not required when installing lifting devices, safety stops, or sled stop assemblies (see [paragraph 2.2.1.4](#)).



Use of chemicals will produce a vapor which will displace oxygen. Use with adequate ventilation and avoid prolonged or repeated breathing of vapors. Avoid prolonged or repeated contact with skin, since these solvents dissolve natural oils. While the solvents are nonflammable, they should not be used near open flames since the products of decomposition are toxic and very irritating. Do not take internally. Refer to [References \(k\)](#) and [\(l\)](#) for general personnel protective requirements. Consult individual manufacturer's Material Safety Data Sheet (MSDS) for specific hazards and precautions.

- a. Clean the faired mast surface area and Snorkel Induction Mast where the clamps are to be secured with an approved solvent/degreaser listed in [Reference \(m\)](#).
- b. Ensure that all dirt, grease, oil, or other contaminants has been completely removed from interfacing surfaces.

2.2.1.2 Periscopes. This paragraph provides the procedures for cleaning the periscopes.

**NOTE**

Type 18 B and Type 18H periscopes must be fully raised to install the clamps.

- a. Prior to attaching the lifting clamps to a periscope for removal, the E&E adapter must be properly supported with the proper support bars for each system.

**WARNING**

Use of chemicals will produce a vapor which will displace oxygen. Use with adequate ventilation and avoid prolonged or repeated breathing of vapors. Avoid prolonged or repeated contact with skin, since these solvents dissolve natural oils. While the solvents are nonflammable, they should not be used near open flames since the products of decomposition are toxic and very irritating. Do not take internally. Refer to [References \(k\)](#) and [\(l\)](#) for general personnel protective requirements. Consult individual manufacturer's Material Safety Data Sheet (MSDS) for specific hazards and precautions.

- b. Degrease the clamping area of the periscope barrel by wiping with rags saturated with an approved solvent/degreaser listed in [Reference \(m\)](#).

2.2.1.3 Snorkel Induction Mast. This paragraph provides the procedures for cleaning the Snorkel Induction Mast.

**WARNING**

Use of chemicals will produce a vapor which will displace oxygen. Use with adequate ventilation and avoid prolonged or repeated breathing of vapors. Avoid prolonged or repeated contact with skin, since these solvents dissolve natural oils. While the solvents are nonflammable, they should not be used near open flames since the products of decomposition are toxic and very irritating. Do not take internally. Refer to [References \(k\)](#) and [\(l\)](#) for general personnel protective requirements. Consult individual manufacturer's Material Safety Data Sheet (MSDS) for specific hazards and precautions.

- a. Clean the Snorkel Induction Mast surface area where the clamps are to be secured with an approved solvent/degreaser listed in [Reference \(m\)](#).
- b. Ensure that all dirt, grease, oil, or other contaminants has been completely removed from interfacing surfaces.

2.2.1.4 Lifting Devices, Safety Stops, and Sled Stop Assemblies. This paragraph provides for cleaning the mounting holes in the faired masts and antenna lower bearing assembly (if applicable) used for attaching lifting devices, safety stops, and sled stop assemblies.

- a. Clean the threaded holes using a wire brush or pick.
- b. Ensure that all dirt, corrosion or other contaminants has been completely removed from interfacing surfaces.

#### 2.2.1.5 BPS-15 Radar Mast.



Use of chemicals will produce a vapor which will displace oxygen. Use with adequate ventilation and avoid prolonged or repeated breathing of vapors. Avoid prolonged or repeated contact with skin, since these solvents dissolve natural oils. While the solvents are nonflammable, they should not be used near open flames since the products of decomposition are toxic and very irritating. Do not take internally. Refer to [References \(k\)](#) and [\(l\)](#) for general personnel protective requirements. Consult individual manufacturer's Material Safety Data Sheet (MSDS) for specific hazards and precautions.

- a. Clean the radar mast surface area where the clamp is to be secured with an approved solvent/degreaser listed in [Reference \(m\)](#).
- b. Ensure that all dirt, grease, oil, or other contaminants has been completely removed from interfacing surfaces.

### 2.3 PRE-INSTALLATION INSPECTION OF THE LIFTING AND SAFETY CLAMPS.

It is mandatory that the clamp halves are kept in a matched set by the serial numbers. Failure to do so, negates the weight test and holding capacity test.

- a. Obtain the required clamps. Use [Table 2-1](#) and [Reference \(a\)](#) for guidance.
- b. Inspect all clamps before each use for handling masts and periscopes. See [Figure 2-1](#). Ensure that:
  - (1) The brake lining material is firmly anchored to the metal part of the lifting clamp and is the proper thickness as specified in [Reference \(a\)](#).
  - (2) The brake lining material is free from oil, paint, grease, dirt, or other contaminants. If the brake lining material becomes contaminated, clean it by washing with one of the solvent specified in [Reference \(m\)](#).
  - (3) The weld joints on the lifting lugs (padeyes) are integral with the body of the clamp. No cracks or linear indications are allowed.
  - (4) Clamp weight and holding capacity tests have been conducted and are current. Test data are stamped on the clamp tags in accordance with [Reference \(a\)](#).

**Table 2-1** Summary of Data, Lifting and Safety Stop Device Assemblies

Lifting and Safety Stop Device Assy No.	Nomenclature or Use Designation	Remarks
(2)**	BRD-7, OE-207/BR, Periscope Fairing, OE-538, HDR Faired Mast, OE-592/BRC, ACM, NAVSAT, AN/BRD-7, AN/BLD-1 and MMM	For details, see <a href="#">Reference (a)</a> . For details, see <a href="#">Reference (a)</a> . Two Assy 2 clamps with 4 lifting lugs, item 297 of <a href="#">Reference (a)</a> , are installed. See <a href="#">Figure 3-3</a> .
(4)	AN/BRD-7	For details, see <a href="#">Reference (a)</a> .
(6)	OE-538, OE-207/BR, OE-592/BRC Antennas	Fwd half (Pc 9, <a href="#">Reference (a)</a> ) is semicircular (4-1/4-inch radius) with the center at station 12. Straight line connects tangent to fwd (4-1/4 inches) and all (1-3/4 inches) radius. See <a href="#">Reference (a)</a> .
(47)	7-1/2-Inch Diameter Periscope	For details, see <a href="#">Reference (a)</a> .
(51)*	3-Inch Diameter Radar Lifting Clamp	See appropriate Assy No. in <a href="#">Reference (a)</a> .
(161)	Buoy Lifting Slings BRR-6, BRR-6B	For details, see <a href="#">Reference (a)</a> .
(201)	Snorkel Lifting Clamp for SSBN-726 Class.	For details, see <a href="#">Reference (a)</a> .
(232)	Sliding Clamp, Type 8 and 18 Periscopes	For details, see <a href="#">Reference (a)</a> .
(280)	Hinge Carriage for Periscope Handling Assembly	For details, see <a href="#">Reference (e)</a> .
(293)	E&E Support Bars for Type 8 and 18 E&E Adapters	For details, see <a href="#">References (a)</a> and <a href="#">(f)</a> .
(298)	2-7/8" Diameter Hoist Cylinder	For details, see <a href="#">Reference (a)</a> .
(325)	Snorkel Mast Induction Pipe Clamp (SSN-688 Class, SSN-21 Class, and SSN-774 Class)	For details, see <a href="#">Reference (a)</a> .
(330)	BPS-16 Radar Lifting Device	For details, see <a href="#">References (a)</a> , <a href="#">(u)</a> , and <a href="#">(gg)</a> .
(334)	Snorkel Mast Lifting Clamp (SSN-21 Class, and SSN-774 Class)	For details, see <a href="#">Reference (a)</a> .
(338)	Snorkel Mast Lifting Clamp (SSN-688 Class)	For details, see <a href="#">Reference (a)</a> .
(348)	Periscope Lifting Device	For details, see <a href="#">Reference (a)</a> .
(370)	BPS-16 Radar Outer Housing Lifting Clamp	For details, see <a href="#">Reference (a)</a> .
(377)	Snorkel Cylinder Lifting Device (SSN-688 Class)	For details, see <a href="#">Reference (a)</a> .
(381)	Snorkel Inner Induction Pipe Clamp (SSN-726 Class)	For details, see <a href="#">Reference (a)</a> .
(382)	Periscope Fairing Cylinder Lifting Device (All Class, except SSN-774 Class)	For details, see <a href="#">Reference (a)</a> .
Safety Pin	Universal Modular Mast (UMM)	For details, see <a href="#">Reference (dd)</a> .
Fairing Lifting Device, AFT (1)*	HDR Faired Mast, OE-538, OE-207/BR, BRD-7, OE-592/BRC, & Periscope Fairings, ACM	For details, see <a href="#">Reference (v)</a> . For use on SSN 21 & SSN 688 Classes. See ***
Fairing Lifting Device, FWD (2)*	HDR Faired Mast, OE-538, OE-207/BR, OE-592/BRC, BRD-7, & Periscope Fairings, ACM and MMM	For details, see <a href="#">Reference (v)</a> . For use on SSN 21 & SSN 688 Classes. See ***
Fairing Lifting Device, AFT (42)*	HDR Faired Mast	For details, see <a href="#">Reference (v)</a> . For use on SSBN 730 - 743. See ***
Fairing Lifting Device FWD (43)*	HDR Faired Mast	For details, see <a href="#">Reference (v)</a> . For use on SSBN 730 - 743. See ***

**Table 2-1** Summary of Data, Lifting and Safety Stop Device Assemblies -

Continued

<b>Lifting and Safety Stop Device Assy No.</b>	<b>Nomenclature or Use Designation</b>	<b>Remarks</b>
SUB HDR and ACM Antenna Lifting Assemblies (1)*	SUB HDR and ACM Antenna Mast Assemblies	For details, see <a href="#">Reference (y)</a> . See ***
Safety Stop Assembly (3)	HDR Faired Mast, OE-538, OE- 207/BR, BRD-7 with closure cap installed & Periscope Fairings, ACM, OE-592/BRC	For use on SSN 21 & SSN 688 Classes. For details, see <a href="#">Reference (v)</a> . See ***
Safety Stop Assembly (50)	HDR Faired Mast	For use on SSBN730 - 743. For details, see <a href="#">Reference (v)</a> See ***
Sled Stop Assembly (19)	OE-538, OE-207/BR, OE-592/BRC	For details, see <a href="#">Reference (v)</a> . See ***
<p>* Use of backup clamp(s) or safety strap is not required.  ** Can be used if the fairing lifting or safety stop devices are not available.  *** MACHALT-ECP 560, HDR S/A 4173K, S/A 4148K or TRID 0541 must be installed for activity to use fairing lifting devices, safety stop devices, or sled stop assemblies.</p>		

c. Inspect the bolts with their complementary nuts and washers (for holding the clamp halves together). Ensure that:

- (1) The fasteners are not bent.
- (2) The bolt threads are not damaged.
- (3) The nut can be run up and down the bolt thread freely by hand.
- (4) The bolt size is as stated in [Reference \(a\)](#) and the bolt head is marked with three or six radial lines to designate, respectively, that the material is grade 5 or 8, high tensile steel.
- (5) Two flat washers are used with each bolt nut (one under the head and another under the nut).
- (6) The bolt threads are free of any lubricants (Not for the safety stop and lifting devices).

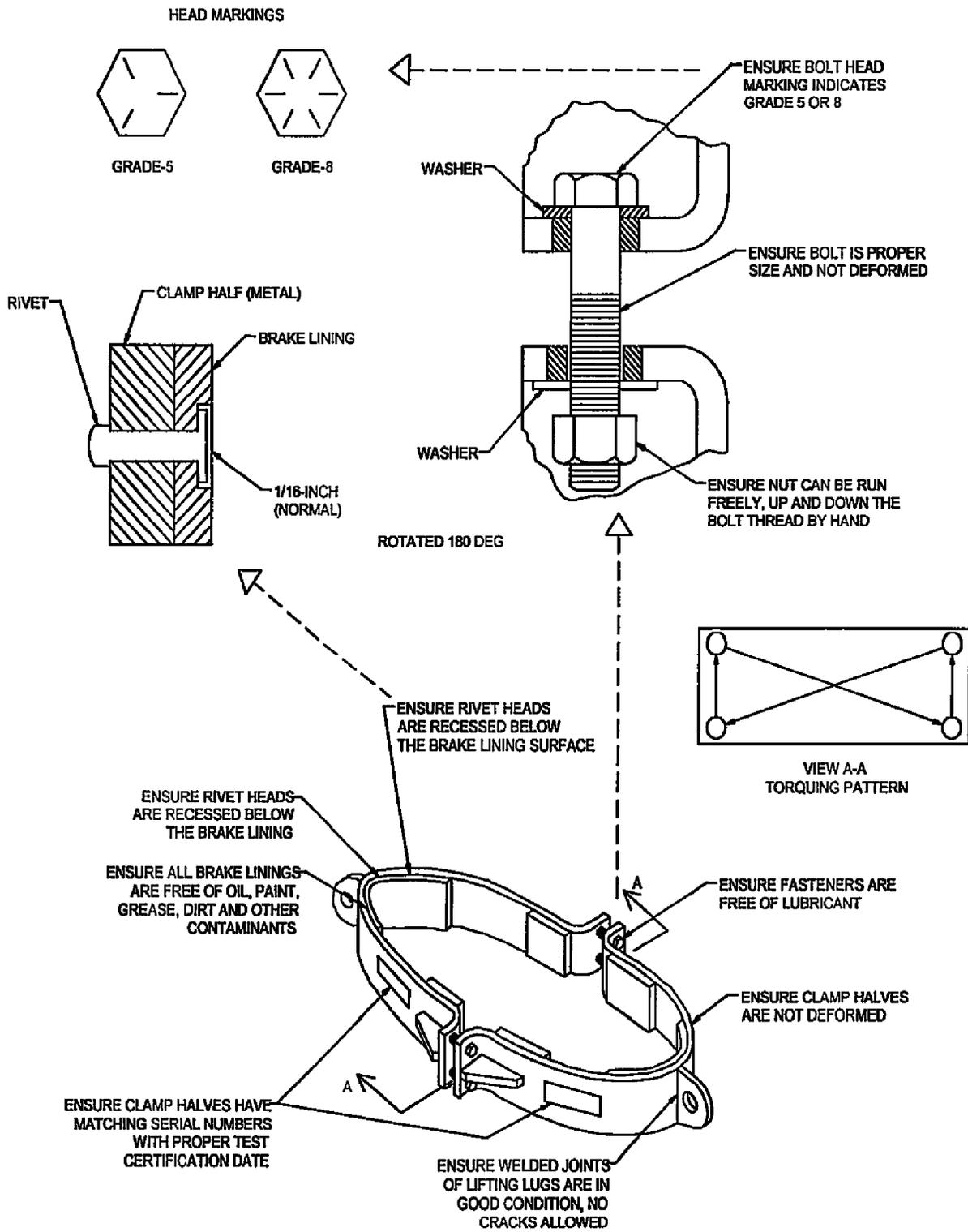


Figure 2-1 Mast Clamp Pre-Installation Inspection

## 2.4 PRE-INSTALLATION INSPECTION OF THE FAIRED MAST LIFTING AND SAFETY STOP DEVICES.

### NOTE

It is mandatory that the lifting devices are kept in a matched set by Serial numbers. Failure to do so negates the weight test.

- a. Obtain the required lifting or safety stop devices. Use [Table 2-1](#) and [Reference \(v\)](#) for guidance.
- b. Inspect all lifting and safety devices before each use for handling masts and periscope fairings. See [Figure 2-2](#). Ensure that:
  - (1) Initial weight tests and subsequent periodic inspections have been conducted and are current. Test data is stamped on the tags in accordance with [Reference \(v\)](#).
- c. Inspect all bolts. Ensure that:
  - (1) The fasteners are not bent.
  - (2) The bolt threads are not damaged.
  - (3) The bolts in the lifting device, safety stop or sled stop assembly (as applicable) can rotate freely by hand.

## 2.5 MAST CLAMP/SAFETY STOP/LIFTING DEVICE OPERATIONAL INTERFERENCES.

When the installed clamps, safety stop, or lifting devices interfere with the adjacent system operation, Close and Danger tag the interfered system hoist cylinder isolation valves, also. Refer to [Table 2-2](#) for a list of these interferences.

## 2.6 PRE-INSTALLATION INSPECTION OF SUB HDR AND ACM LIFTING ASSEMBLIES.

### CAUTION

It is mandatory that the SUB HDR and ACM lifting assembly components are kept as a matched set by serial number. Failure to do so negates the weight test. Replacement items can be incorporated as long as the requirements contained in [Reference \(x\)](#) are followed.

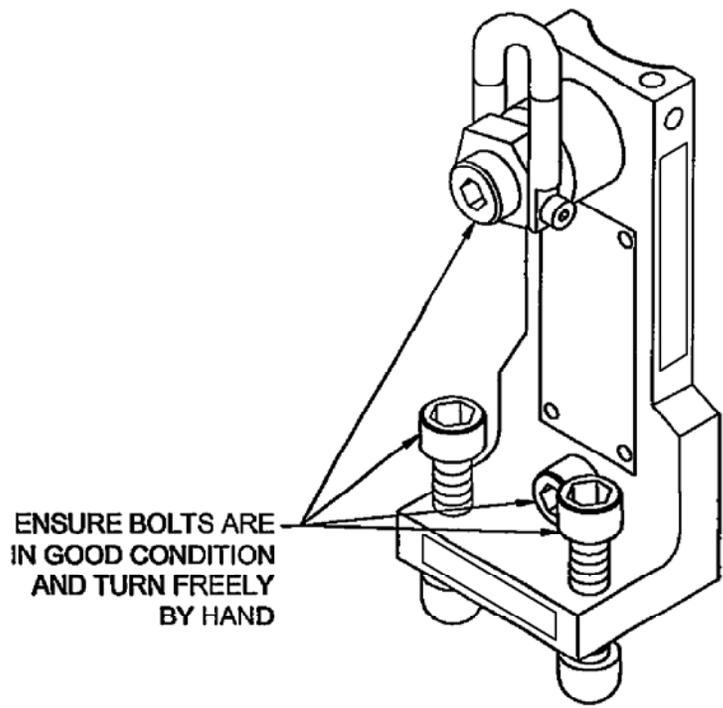
- a. The antenna lifting assembly is tested as an assembly and the lifting ring is serialized. Ensure all antenna lifting assembly components are part of the matched lifting set.
- b. Inspect welds on the four-point lift beam and lifting ring assembly. No weld cracks are allowed.
- c. Inspect weight test certification data tag installed on the four-point lift beam, slings, and lifting ring assembly to ensure the tags are in place and current.
- d. Inspect the fasteners with the associated washers, nuts, and retaining rings on the lift ring assembly and four point lift beam hooks.

Lifting ring assembly 1/4-20UNC x 2 inch bolt is grade 5 or better

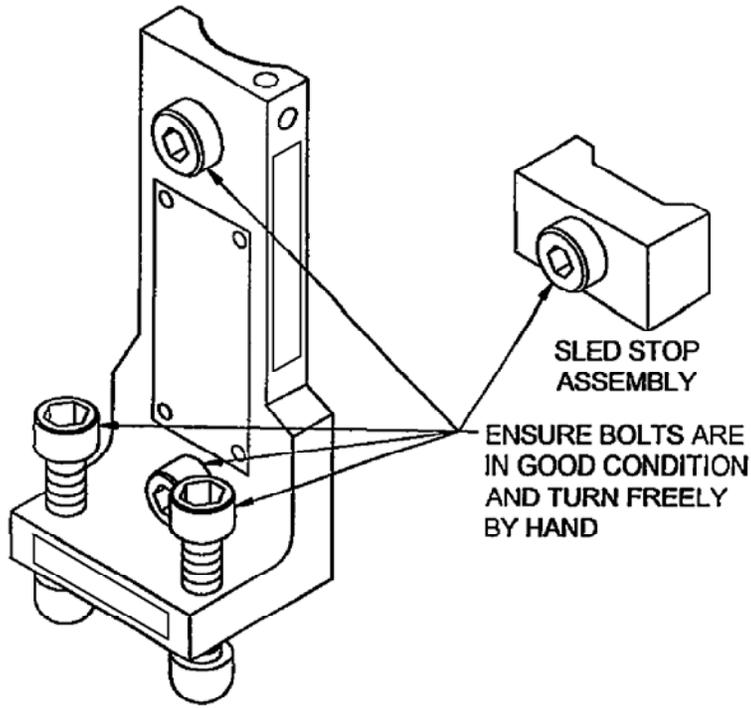
Threaded fasteners are not loose, bent, damaged, or missing

Nuts on the hoist rings and hooks are not loose. The required hoist ring torque is 28 ft-lbs.

Lifting ring assembly 1/4-20UNC x 2 inch bolts shall be lightly lubricated.



LIFTING DEVICE



SAFETY STOP

Figure 2-2 Mast Lifting and Safety Device Pre-Installation Inspection

**Table 2-2 Interference Matrix (For SSN-688 and Seawolf Class only)**

<b>Being worked system with clamps</b>	<b>DANGER Tag Interfered System</b>
Periscope Fairing	AN/BRD-7, AN/BLD-1, and MMM or AN/BRD-7 with MMM closure doors (S/A 4412) installed
AN/BRD-7, AN/BLD-1, and MMM or AN/BRD-7 with MMM closure doors (S/A 4412) installed	Snorkel
Snorkel	AN/BRD-7, AN/BLD-1 and MMM or AN/BRD-7 with MMM closure doors (S/A 4412) installed
<b>Being worked system with safety stop or lifting devices</b>	<b>DANGER Tag Interfered System</b>
Periscope Faired Mast	AN/BRD-7, AN/BLD-1, and MMM or AN/BRD-7 with MMM closure doors (S/A 4412) installed

## 2.7 PRE-INSTALLATION INSPECTION OF UMM SAFETY BLOCK PIN

- a. Verify the safety block pin is serialized.
- b. Inspect weight test certification data tag installed on the head of the safety block pin to ensure the tag is in place and current.
- c. Verify the safety block pin is not bent and the threads are not damaged.

## 2.8 PRE-INSTALLATION INSPECTION OF UMM SUBASSEMBLY LIFTING TOOLS.

- a. Verify the lifting assembly is tested as an assembly (i.e., including captive threaded fasteners) and the lifting assembly is serialized.
- b. Inspect weight test certification data tag installed on the lifting assembly to ensure the tags are in place and current.
- c. Verify captive threaded fasteners and swivel lifting eyes are not loose, bent, damaged, or missing.

## CHAPTER 3

### PROCEDURES FOR INSTALLING SAFETY DEVICES

#### 3.1 INSTALLATION OF SAFETY CLAMPS FOR WORKING AROUND OR UNDER THE MASTS/PERISCOPES.

3.1.1 GENERAL INFORMATION. Safety clamps (2) are used to secure a mast/periscope in a fixed position while working on, around or under the mast/periscope and when there is no intention of lifting the mast/periscope out of the ship. This procedure is applicable to any style of clamp, listed in [Table 2-1](#), and on all classes of submarines. Mast/periscopes that have had MACHALT - ECP-560, SHIPALT 4173K, SHIPALT 4148K OR TRID 0541 installed may use a single safety stop or two lifting devices (and two sled stop assemblies for OE-538, OE-207, and OE-592) listed in [Table 2-1](#) in place of the two safety clamps. Refer to [paragraph 3.3](#) for installation of safety stop and sled stop assemblies.

3.1.2 PROCEDURE FOR INSTALLING SAFETY CLAMPS ON MASTS. Safety clamps (2) are to be installed on a faired mast in accordance with the following steps:



Ensure that the mandatory requirements of [Chapter 2](#) have been accomplished and that all pertinent safety precautions of [Chapter 1](#) are in effect.



Snorkel mast clamps extend over the AN/BRD-7, BLD-1, MMM or AN/BRD-7 with MMM (S/A 4412) closure doors. Close and DANGER tag AN/BRD-7, AN/BLD-1 or AN/BRD-7 hoist cylinder isolation valves when the clamps are installed on the snorkel mast. (See [Table 2-2](#))



Periscope faired mast clamps, safety stop, or lifting devices extend over the AN/BRD-7, BLD-1, MMM or AN/BRD-7 with MMM (S/A 4412) closure doors. Close and DANGER tag AN/BRD-7, AN/BLD-1, MMM or AN/BRD-7 hoist cylinder isolation valves when the clamps, safety stop, or lifting devices are installed on the periscope faired mast. (See [Table 2-2](#))

**CAUTION**

AN/BRD-7, AN/BLD-1, MMM mast clamps and mast clamps for AN/BRD-7 with MMM closure doors (S/A 4412) installed, extend over the snorkel mast. Close and DANGER TAG snorkel hoist cylinder isolation valves when the clamps are installed on the AN/BRD-7, AN/BLD-1, and MMM or AN/BRD-7 mast. (See [Table 2-2](#))

**CAUTION**

Never install the clamps onto the fairing access covers or openings. The clamp adjacent to the fairing access should be installed 1 inch minimum away from the access opening edge.

- a. Refer to [Table 2-1](#) and [Reference \(a\)](#) for proper clamp type.

**NOTE**

See [paragraph 3.1.4](#) for installing safety clamps on AN/BRD-7, AN/BLD-1, and MMM masts or AN/BRD-7 masts with MMM closure doors (S/A 4412) installed.

**NOTE**

Install one safety clamp at a time on the faired mast, such that the upper end of the top clamp is attached at a minimum of 5 inches below the end of the sigma or channel section. See [Figure 3-1](#). If the magnet exists and interferes with the clamps, remove the magnet.

- b. Position the faired mast to the desired height hydraulically. Close and DANGER tag the hoist cylinder isolation valves.

**NOTE**

Fit each half of the clamp to the faired mast surface and ensure that they will properly conform to the shape of the faired mast.

- c. Install the lower clamp on the faired mast so that it is 1/2 to 1 inch above the sail top. (For safety reasons, this gap should be as small as possible.) This allows 1/2 to 1 inch of downward motion to verify the positive hydraulic support prior to removal of the clamps after completion of work.



Use of thread antiseize compound on the clamp bolts is prohibited.



Tightening one side of the clamp first may cause damage to the fiberglass mast.

- d. Torque the four holddown nuts on the clamp sequentially as illustrated in [Figure 2-1](#) and in uniform increments until the proper torque value provided in [Table 3-1](#) has been attained on each bolt.



1. All bolts should be installed and snugged up before torquing.
  2. Torque should be applied slowly and evenly until the specified torque is reached.
  3. The bolts should be cross-tightened as shown in [Figure 2-1](#). It may be necessary to cross-tighten two or three times before an even tightness is reached.
  4. The bolts, when installed and tightened, should protrude a distance of at least one thread beyond the top of the nut.
- e. Check to ensure that all brake linings are contacting the surface of the faired mast.
  - f. Check to ensure that the gaps between the clamp halves are the same on each side (or end) of the faired mast. The clamp flange ends shall never make metal-to-metal contact.
  - g. Wait 10 minutes to allow the clamping force to redistribute, then recheck the holddown nuts for the proper torque value provided in [Table 3-1](#).
  - h. If the proper torque value is not maintained, repeat [steps 3.1.2.d](#) through [3.1.2.g](#).
  - i. Attach the second clamp above and snug against the installed clamp using the procedures given in [steps 3.1.2.d](#) through [3.1.2.h](#).

3.1.3 PROCEDURE FOR INSTALLING SAFETY CLAMPS ON PERISCOPES. The safety clamps are installed on Type 8, 15, and 18 periscopes in accordance with the following steps:



Ensure that the mandatory requirements of [Chapter 2](#) have been accomplished and that all pertinent safety precautions of [Chapter 1](#) are in effect.

**CAUTION**

Periscope faired mast clamps, safety stop, or lifting devices extend over the AN/BRD-7, BLD-1, MMM or AN/BRD-7 with MMM (S/A 4412) closure doors. Close and DANGER tag AN/BRD-7, AN/BLD-1, MMM or AN/BRD-7 hoist cylinder isolation valves when the clamps, safety stop, or lifting devices are installed on the periscope faired mast. (See [Table 2-2](#))

**CAUTION**

Fully lower and tag out periscope fairing prior to clamping the periscope. Do not install clamps on periscope bearings.

**NOTE**

This procedure is applicable to all periscopes and class submarines.

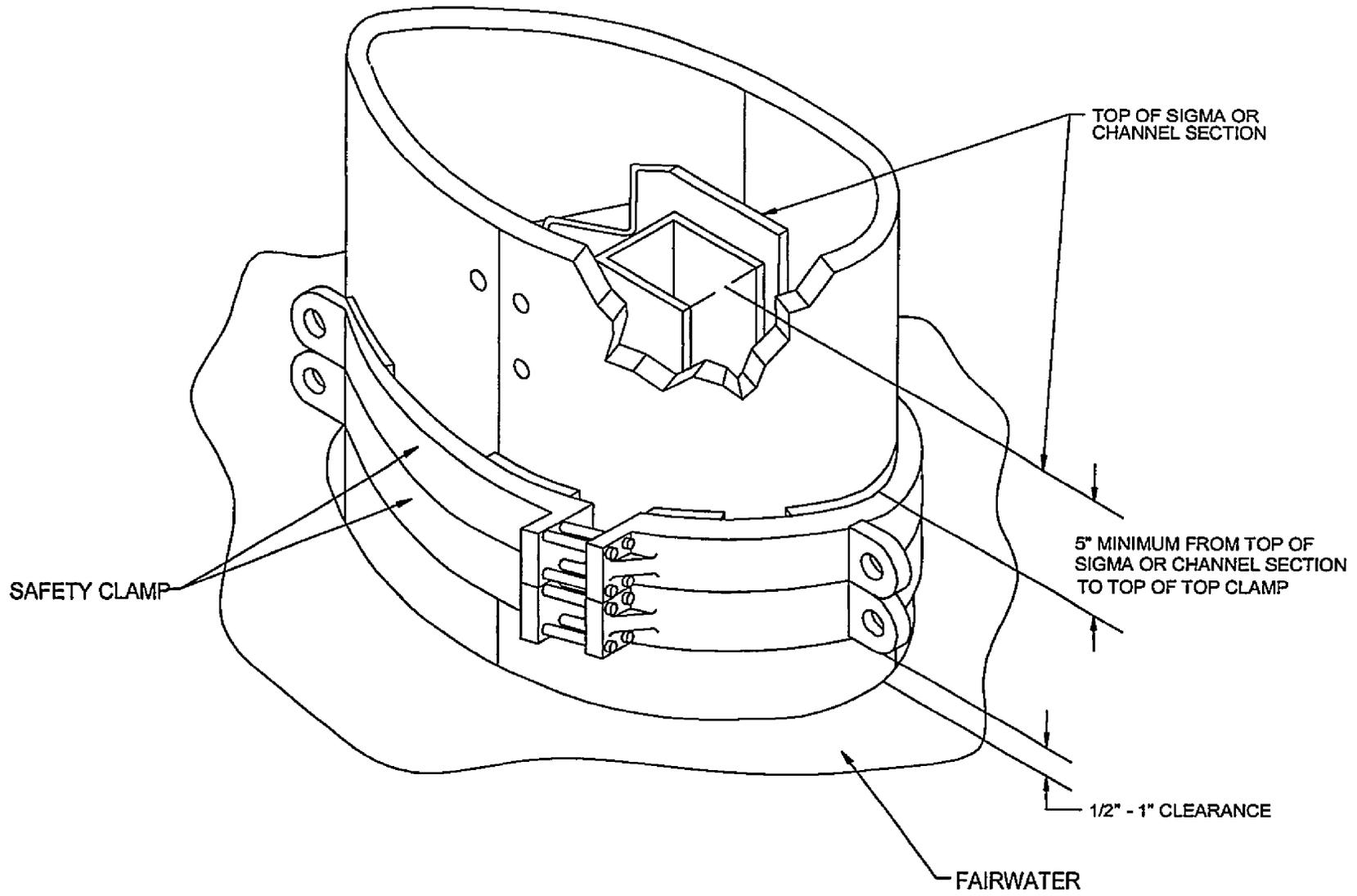


Figure 3-1 Installation of Mast Safety Clamps

**Table 3-1** Clamp Assembly Torque Values

CLAMP ASSEMBLY	TORQUE VALUES
Assy No. 201	110 ft-lbs
Assy No. 298, 377	20 ft-lbs
Assy No. 334	80 ft-lbs
Assy No. 382	5 ft-lbs
Assy No. 309	See <a href="#">Reference (a)</a> , NOTE 33
Lifting Device Assy (7094237-1, 2, 42, 43)	36 ft-lbs
Safety Stop Assy (7094237-3, 50)	36 ft-lbs
Sled Stop Assy (7094237-19)	25 ft-lbs
All Other Clamps	60 ft-lbs

- a. Refer to [Table 2-1](#) and [Reference \(a\)](#) for proper clamp type, assembly 47.
- b. Position the periscope to the desired height. Close and DANGER tag the hoist cylinder isolation valves.

**NOTE**

Install one safety clamp at a time on the periscope.

**NOTE**

Fit each half of the clamp to the periscope surface and ensure that they will properly conform to the shape of the periscope.

- c. Install the lower safety clamp on the periscope so that it is 1/2 to 1 inch above the sail top. See [Figure 3-2](#).

**CAUTION**

Use of thread antiseize compound on the clamp bolts is prohibited.

- d. Torque the four holddown nuts on the clamp sequentially as illustrated in [Figure 2-1](#) and in uniform increments until the proper torque, 60 ft-lbs, has been attained on each bolt.

**NOTE**

1. All bolts should be installed and snugged up before torquing.
2. Torque should be applied slowly and evenly until the specified torque is reached.
3. The bolts should be cross-tightened as shown in [Figure 2-1](#). It may be necessary to cross-tighten two or three times before an even tightness is reached.
4. The bolts, when installed and tightened, should protrude a distance of at least one thread beyond the top of the nut.

- e. Check to ensure that all brake linings are contacting the surface of the periscope.

- f. Visually check to ensure that the gaps between the clamp halves are even. The clamp flange ends should never make metal-to-metal contact.
- g. Wait 10 minutes to allow the clamping force to redistribute, then recheck the holddown nuts for the proper torque value provided , 60 ft-lbs.
- h. If the proper torque value is not maintained, repeat [steps 3.1.3.d](#) through [3.1.3.g](#).
- i. Orient the second clamp lifting lugs 90 degrees from the first safety clamp and install it above and snug against the installed clamp using the procedures given in [step 3.1.3.d](#) through [3.1.3.h](#). See [Figure 3-2](#).

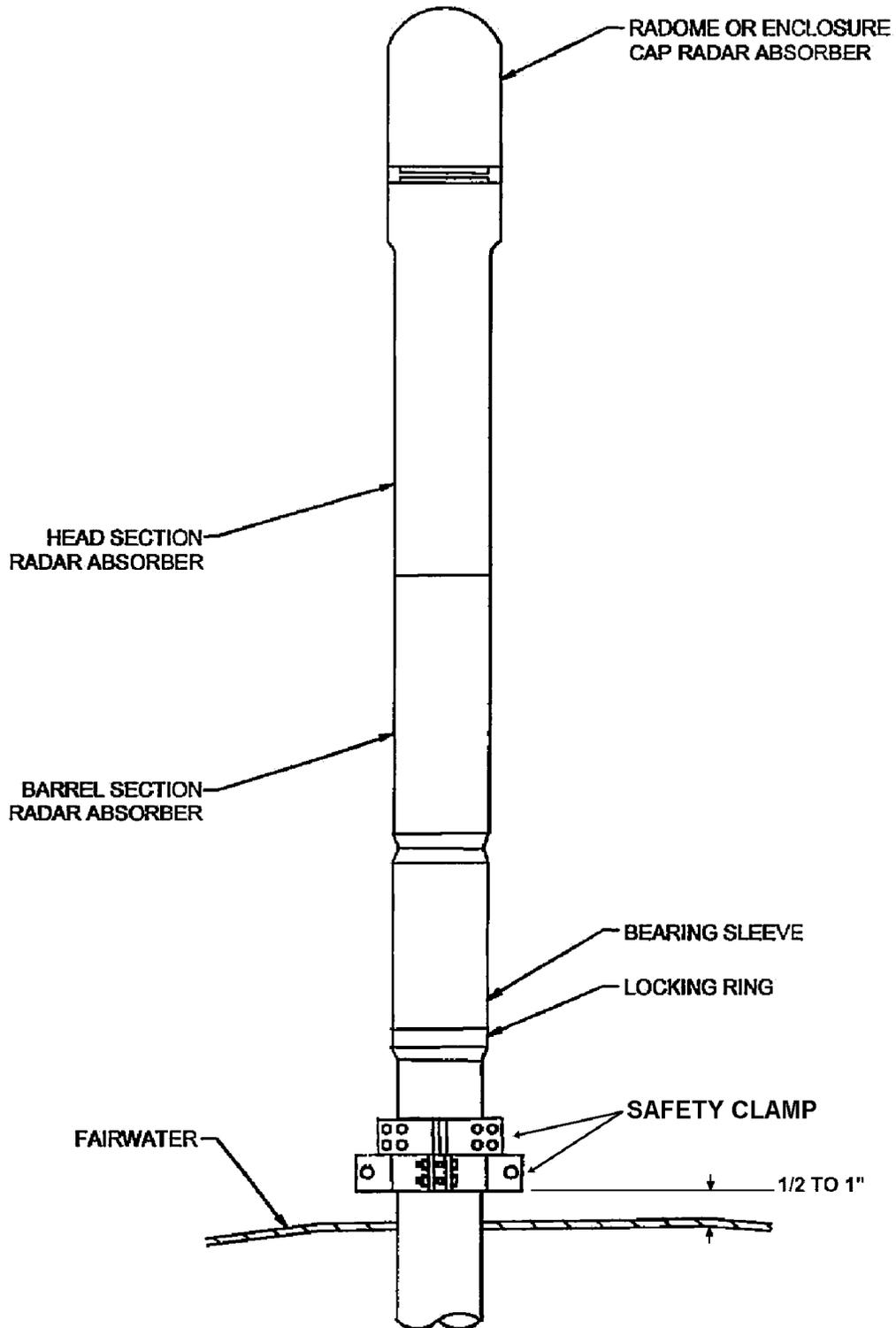


Figure 3-2 Installation of Periscope Safety Clamps

### 3.1.4 PROCEDURE FOR INSTALLING SAFETY CLAMPS ON AN/BRD-7, AN/BLD-1, AND MMM MAST OR AN/BRD-7 MAST WITH MMM CLOSURE DOORS (S/A 4412) INSTALLED.

#### CAUTION

AN/BRD-7, AN/BLD-1, MMM mast clamps and mast clamps for AN/BRD-7 with MMM closure doors (S/A 4412) installed, extend over the snorkel mast. Close and DANGER TAG snorkel hoist cylinder isolation valves when the clamps are installed on the AN/BRD-7, AN/BLD-1, and MMM or AN/BRD-7 mast. (See [Table 2-2](#))

- a. Install two safety clamps on the mast fairing in accordance with [paragraph 3.1.2](#). See [Figure 3-3B](#).
- b. Install four lifting lugs to the safety clamps and torque all bolts to 60 ft-lbs. Ensure that the lifting lugs are 1/2" to 1" above the sail opening. [Figure 3-3A](#).

3.1.5 PROCEDURE FOR INSTALLING SAFETY CLAMPS FOR BPS-15 RADAR MAST. This procedure is applicable to all class submarines with a 3-inch radar mast. Safety clamps are to be installed in accordance with the following steps:

#### WARNING

Ensure that the mandatory requirements of [Chapter 2](#) have been accomplished and that all pertinent safety precautions of [Chapter 1](#) are in effect.

- a. Position the radar mast to the desired height. Close and DANGER tag the hoist cylinder isolation valves.
- b. Refer to [Table 2-1](#) and [Reference \(a\)](#) for proper clamp type. Reinspect for any possible grit or dirt on the clamp lining and install the lower and upper safety clamps snug against the mast.

#### NOTE

Ensure safety clamps do not interfere with the mast key.

#### NOTE

Lower safety clamp is to be installed with lifting lugs aligned in the fore-aft position of the submarine. Upper safety clamp is to be installed with lifting lugs aligned in the port-starboard position of the submarine.

- c. Torque each of the four holddown nuts on each clamp sequentially, as illustrated in [Figure 2-1](#), and in uniform increments to 60 ft-lbs.

#### NOTE

1. All bolts should be installed and snugged up before torquing.

2. Torque should be applied slowly and evenly until the specified torque is reached.
  3. The bolts should be cross-tightened as shown in [Figure 2-1](#). It may be necessary to cross-tighten two or three times before an even tightness is reached.
  4. The bolts, when installed and tightened, should protrude a distance of at least one thread beyond the top of the nut.
- d. Check to ensure that all brake linings are contacting the surface of the radar mast.
- e. Check to ensure that the gaps between the ends of the clamp halves are the same on each side. The clamp halves must never make metal-to-metal contact.

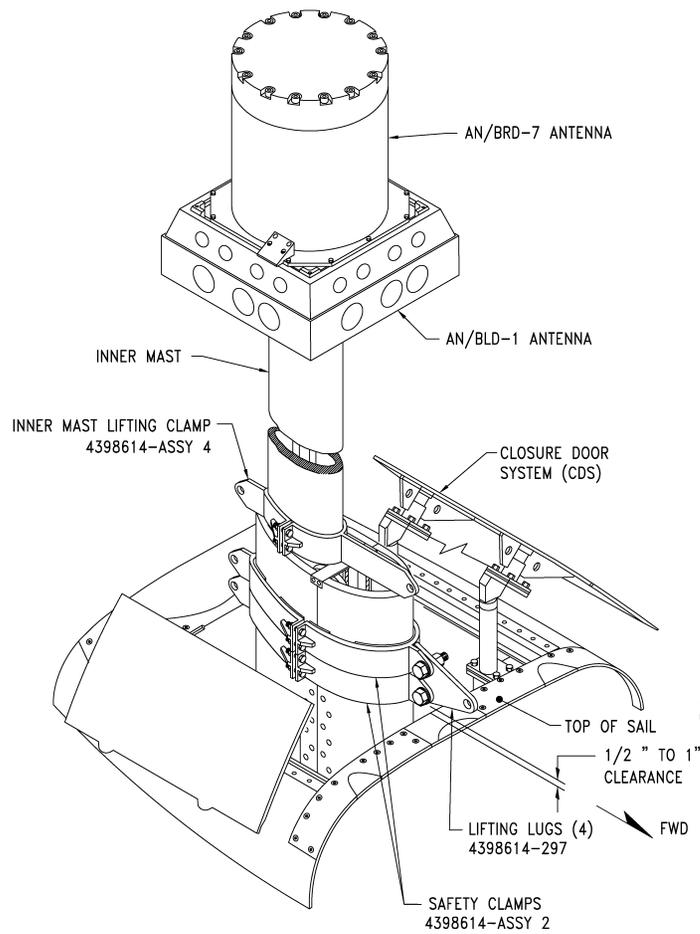


Figure 3-3A1  
 Safety Clamp Configuration for SSN 719-725 & 750-773  
 Hulls With AN/BRD-7, AN/BLD-1 Antennas Installed.

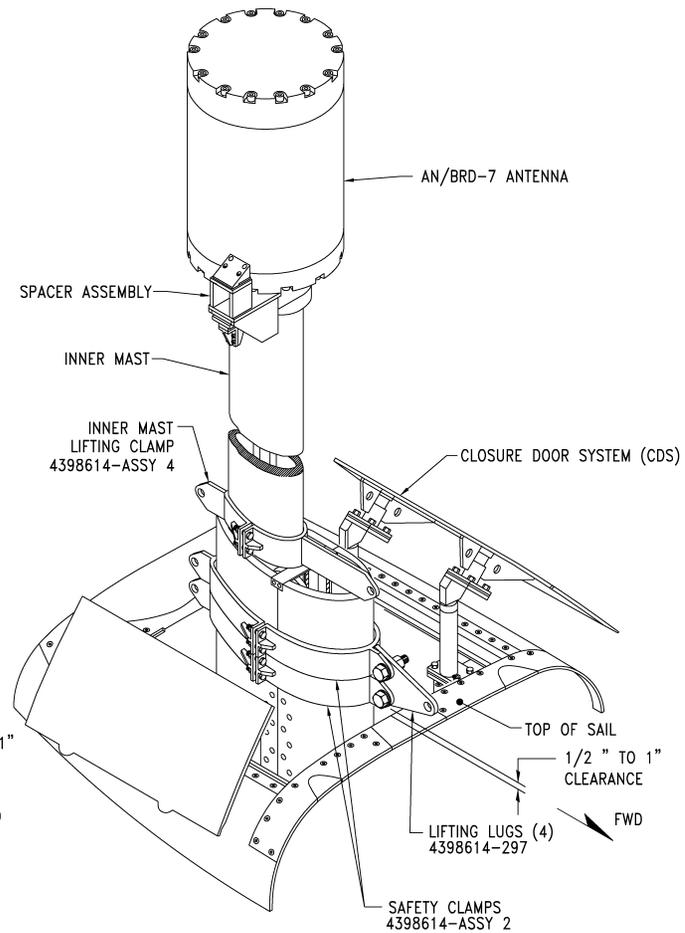


Figure 3-3A2  
 Safety Clamp Configuration for SSN 719-725 & 750-773  
 Hulls With AN/BRD-7 Antenna and Spacer Assembly Installed.

Figure 3-3A Installation of AN/BRD-7, AN/BLD-1 Safety Clamps (SSN-719-725, 750-773, and SSN 21-23)

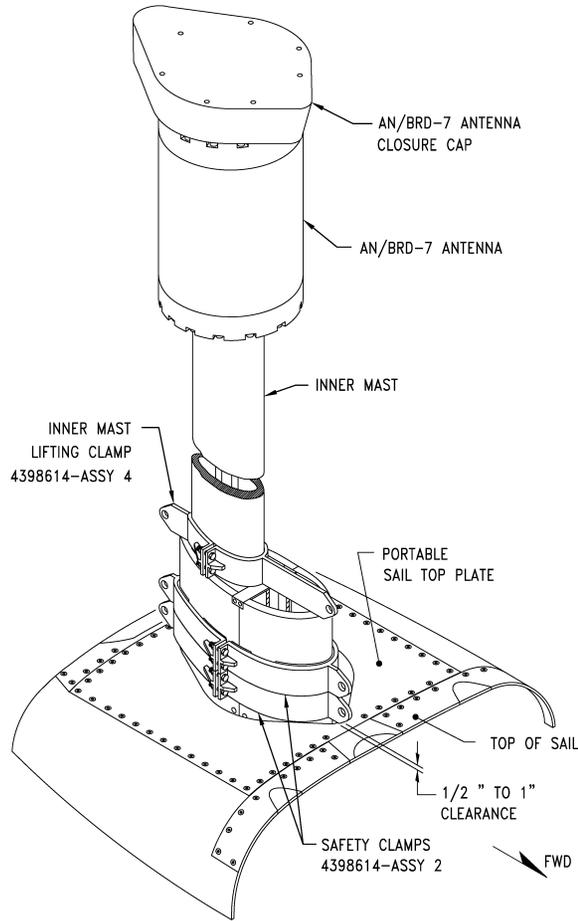


Figure 3-3B1  
 Safety Clamp Configuration for SSN 866-718  
 Hulls With AN/BRD-7 Antenna Only

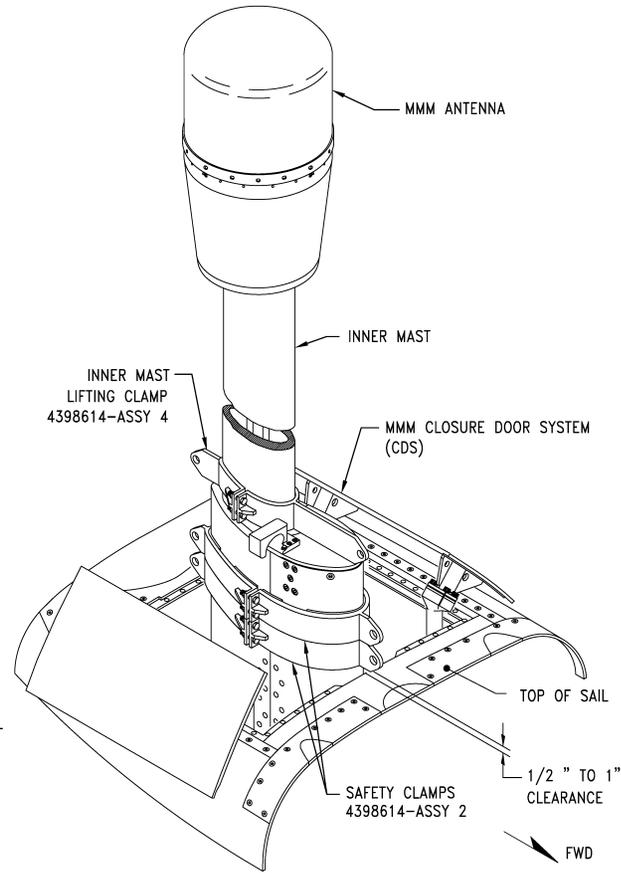


Figure 3-3B2  
 Safety Clamp Configuration for SSN 751-773  
 Hulls With Multifunction Modular Mast (MMM) Antenna Installed.

Figure 3-3B Installation of AN/BRD-7, MMM Safety Clamps (SSN 688-718 and SSN 751-773) also Applicable to those Ships with MMM or AN/BRD-7 with MMM Closure Doors (S/A 4412) Installed

- f. Wait 10 minutes to allow the clamping force to redistribute, then recheck the holddown nuts for the proper torque value provided in [Table 3-1](#).
- g. If the proper torque value is not maintained, repeat [steps 3.1.5.c](#) through [3.1.5.f](#).
- h. Attach the second clamp above and snug against the installed clamp using the procedures given in [steps 3.1.5.c](#) through [3.1.5.g](#).
- i. The radar mast is safely secured at this point in the procedure.

3.1.6 PROCEDURE FOR INSTALLING THE SAFETY PIN ON THE UNIVERSAL MODULAR MAST (UMM). Use [Reference \(dd\)](#) for installation of safety pin(s) on UMM's.

## 3.2 INSTALLATION OF SHORING.

3.2.1 GENERAL INFORMATION. Supportive shoring is placed and secured on or beneath the mast or the snorkel outer induction pipe flange and is used as an alternate method to the safety clamps. This procedure is provided for general guidance and is applicable to all antenna/mast and periscope systems. Local deviations, to suit conditions, are authorized as long as the following mandatory criteria are met:

- a. Hardwood is required (oak, elm, maple, mahogany, or ironwood).
- b. Shoring is a minimum of 4" x 4".
- c. Shoring is secured to the mast or the hoist cylinder as shown in [Figure 3-4](#) or [3-5](#).

3.2.2 PROCEDURE FOR INSTALLING SHORING BENEATH MAST. Shoring is to be installed in accordance with the following steps:



Ensure that the mandatory requirements of [Chapter 2](#) have been accomplished and that all pertinent safety precautions of [Chapter 1](#) are in effect.



Ensure that the shored system has positive hydraulic support.



In cases where the snorkel clamps cannot be installed, use of shoring is permissible.

- a. Position the mast to the desired height hydraulically.
- b. Close and DANGER tag the hoist cylinder isolation valves.

- c. Install safety clamps in accordance with [paragraph 3.1](#).
- d. Measure the distance from the bottom of the mast to the hoist cylinder column. See [Figure 3-4](#).

**NOTE**

Ensure that the shoring is straight and has no cracks, water, or insect damage.

- e. Cut one piece of 4" by 4" (minimum) hardwood shoring (oak, elm, maple, mahogany, or ironwood) to 1 inch shorter than the measurement taken in [step 3.2.2.d](#).

**NOTE**

Shoring should be installed parallel to the hoist cylinder and seated on the column of the hoist cylinder.

- f. Secure the shoring to the hoist cylinder with steel banding. Ensure there is a 1-inch gap between the shoring top and mast bottom. This allows 1 inch of downward motion to ensure the positive hydraulic support prior to removal of the shoring after completion of work.
- g. Ensure that the system is supported hydraulically prior to removing the safety clamps as required.

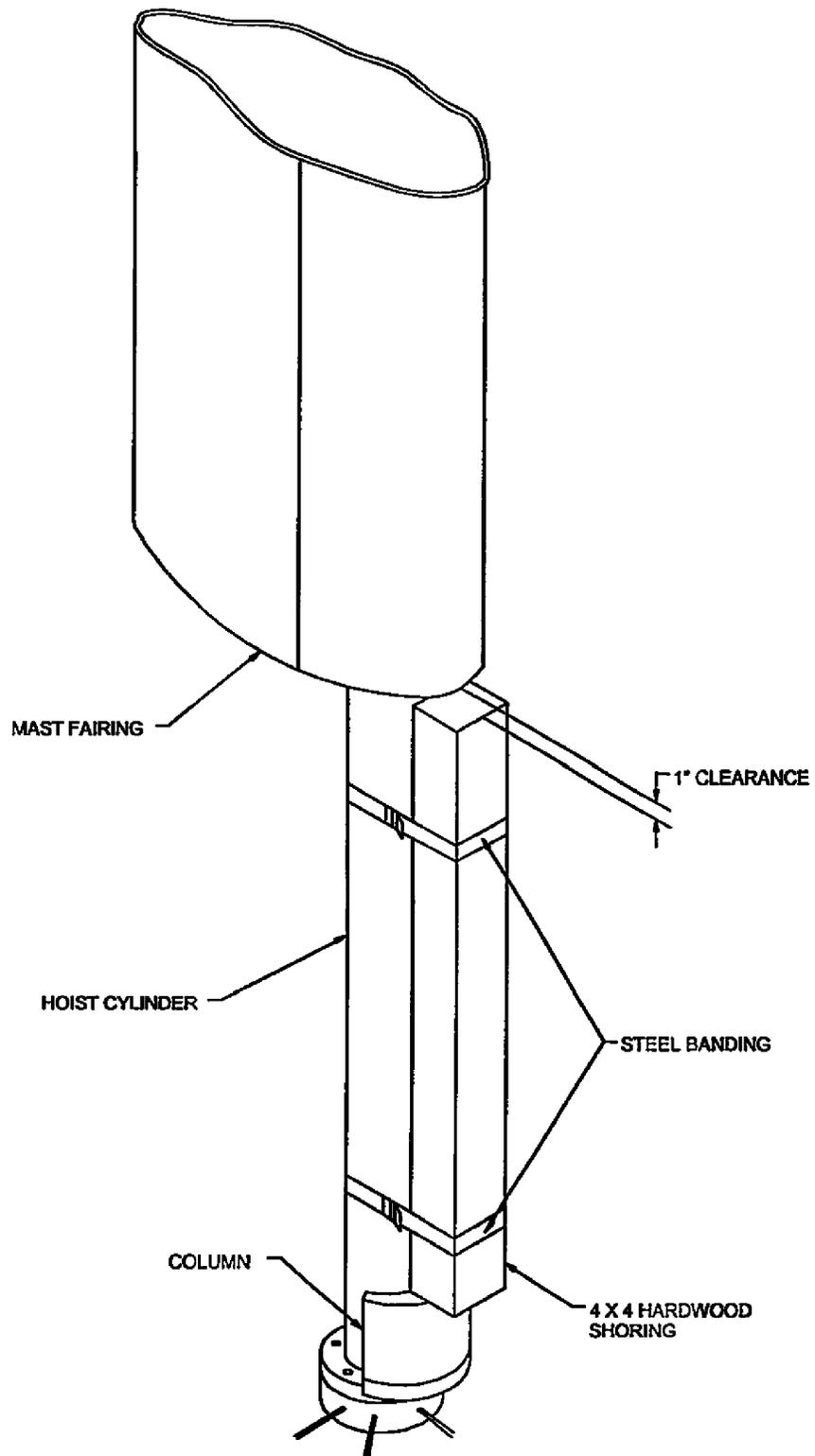


Figure 3-4 Installation of Shoring

3.2.3 PROCEDURE FOR INSTALLING SHORING BENEATH SNORKEL OUTER INDUCTION PIPE. This is an alternative method in cases where the clamps cannot be installed to shore the snorkel assembly. The shoring is to be installed in accordance with the following steps:



Ensure that the mandatory requirements of [Chapter 2](#) have been accomplished and that all pertinent safety precautions of [Chapter 1](#) are in effect.



Ensure that the shored system has positive hydraulic support.

- a. Position the snorkel mast to the desired height hydraulically.
- b. Close and DANGER tag the hoist cylinder isolation valves.
- c. Measure from the port and starboard of the snorkel outer induction pipe flange (bottom) to the sail top. If the sail plates are removed, measure to the snorkel upper bearing frame.



Ensure that the shoring is straight and has no cracks, water, or insect damages.

- d. Cut two pieces of 4" by 4" (minimum) hardwood shoring (oak, elm, maple, mahogany or ironwood) to 1 inch shorter than the measurements taken in [step 3.2.3.c](#).



The shoring chamfer end should be installed under the outer induction pipe bottom flange with 1" clearance and the chamfer is installed away from the faired mast.



Shoring should be installed parallel to the snorkel mast and seated on the sail top or the upper bearing frame.



Make a 2" chamfer on the top of the shoring to prevent the contact between the shoring and the closure cap.

- e. Use steel banding to secure the shoring to the port and starboard of the snorkel mast. See [Figure 3-5](#). Ensure

that it has 1-inch gaps between the snorkel outer induction pipe flange and shoring tops. This allows 1 inch of downward motion to ensure the positive hydraulic support prior to removal of the shoring after completion of work.

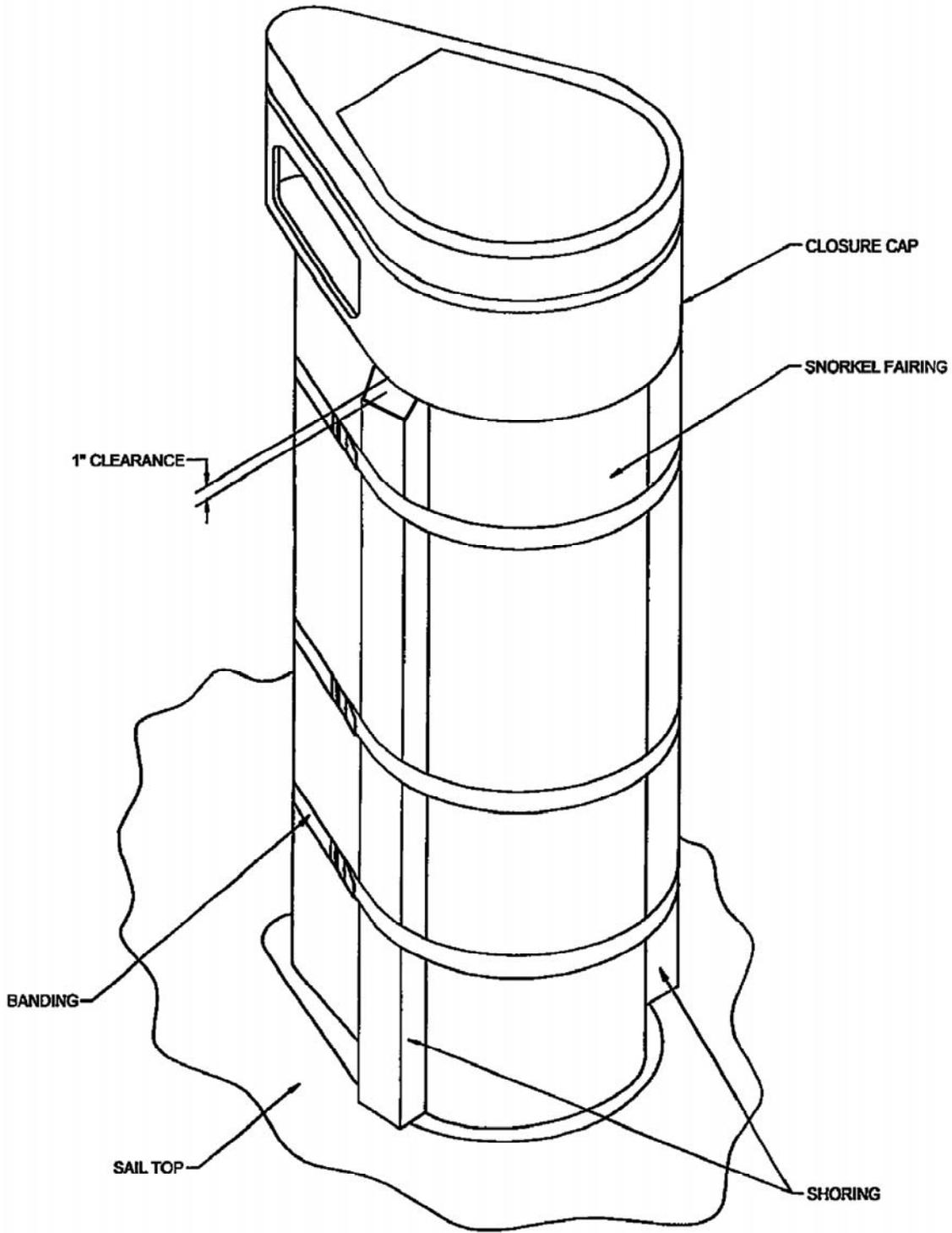


Figure 3-5 Installation of Snorkel Shoring

## 3.2.4 PROCEDURE FOR INSTALLATION SHORING BENEATH BPS-16 RADAR MAST.

**NOTE**

This is a method to secure the radar mast with the Inner Mast Shipping and Installation Clamp.

- a. Position the radar mast to the desired height hydraulically.
- b. Close and DANGER tag ship's service hydraulics to the BPS-16 Radar Mast.
- c. Open the BPS-16 ACU Bypass Valve and tag DO NOT OPERATE.
- d. Clean BPS-16 Inner Mast in accordance with section [paragraph 2.2.1.5](#) at location described in step 3.2.4.e.
- e. See [Figure 3-5.A](#). Install Inner Mast Shipping and Installation Clamp, Item 357 of [Reference \(a\)](#), at the lowest accessible point on the Inner Mast just above the Seal Cartridge Cap and Outer Housing. Torque Screws to 7-8 ft-lbs.
- f. Measure from the top of the Inner Mast Shipping and Installation Clamp to the Inner Mast Antenna Flange of the radar mast.

**NOTE**

Ensure that the shoring is straight and has no cracks, water, or insect damages.

- g. Cut six pieces of 2" by 2" hardwood shoring (oak, elm, maple, mahogany, or ironwood) to 1/4 inch shorter than the measurement taken in step 3.2.4.f.

**CAUTION**

The shoring should be installed flush with the top of the Inner Mast Shipping & Installation Clamp.

- h. Use steel banding to secure the shoring to the inner mast within 6" from each end.

**NOTE**

Shoring should be installed evenly spaced and parallel to the radar mast.

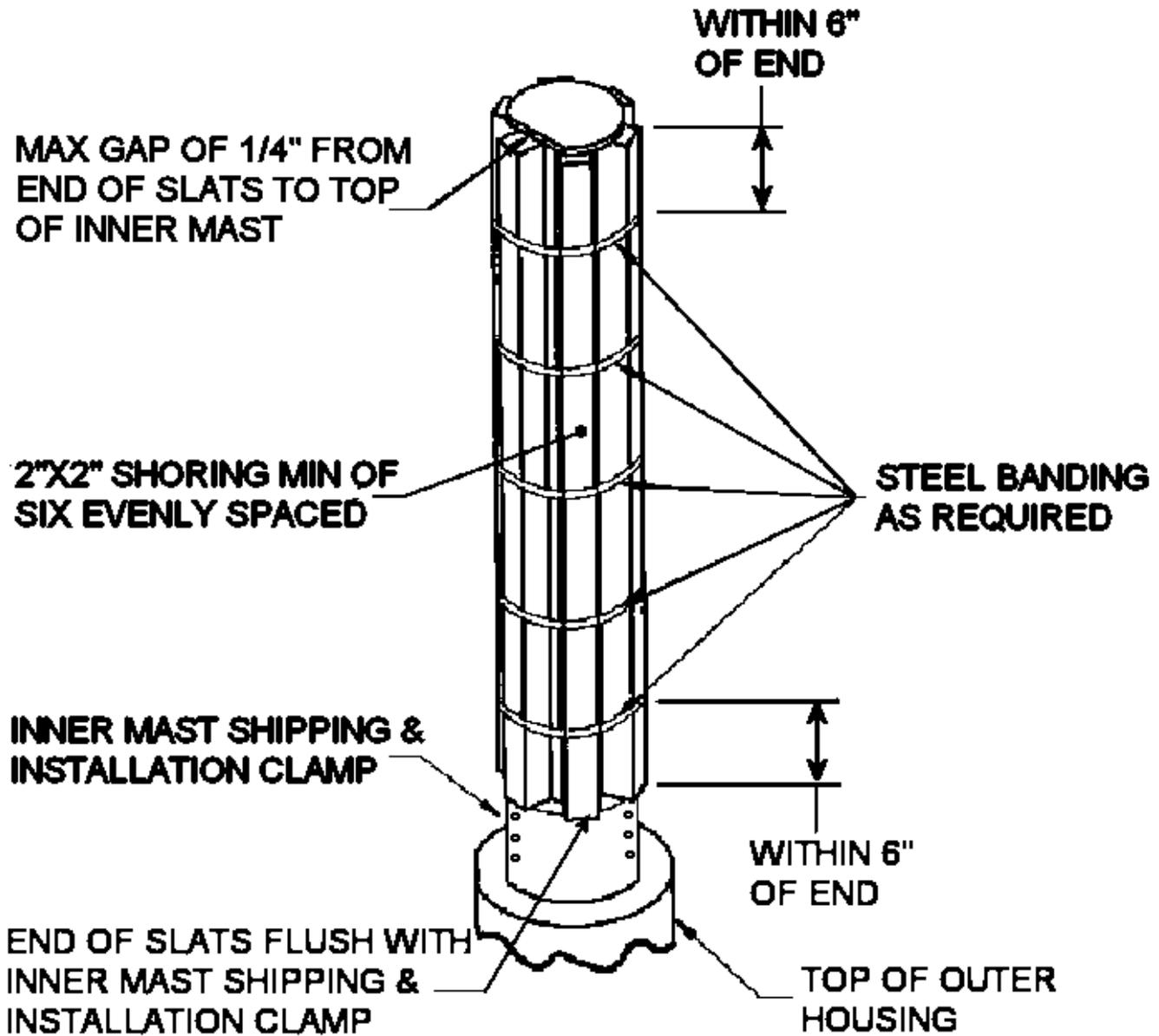


Figure 3-5.A Installation of BPS-16 Radar Shoring

### 3.3 INSTALLATION OF SAFETY STOP AND SLED STOPS FOR WORKING AROUND OR UNDER THE MASTS/PERISCOPES.

3.3.1 GENERAL INFORMATION. Safety stops are used to secure a mast/periscope in a fixed position while working on, around or under the mast/periscope and when there is no intention of lifting the mast/periscope out of the ship. In addition, when working on OE-538, OE-207, and OE-592 systems in the intermediate maintenance position, two sled stop assemblies are also used to prevent inadvertent raising of the mast. This procedure is applicable to any NAVSAT, BRD-7 with closure cap installed, OE-538, periscope, OE-207, or OE-592 mast that has had MACHALT - ECP-560 installed and HDR masts installed by SHIPALT 4173K, SHIPALT 4148K or TRID 0541.

#### NOTE

The Advanced Communications Mast (ACM) system is only installed on the SSN-23. The ACM main components (fairing, antenna, hoist cylinder) are identical to the Sub High Data Rate (HDR) components. All ACM system safety, lifting and handling requirements therefore are exactly the same as Sub HDR. Pertaining to this manual, all Sub HDR safety, lifting, and handling requirements are to be utilized when handling the ACM components.

3.3.2 PROCEDURE FOR INSTALLING A SAFETY STOP ON MASTS. A safety stop is to be installed on a faired mast in accordance with the following steps:

#### ⚠ WARNING

Do not use the safety stop on the AN/BRD-7, AN/BLD-1 mast for the following hulls: SSN719-750, 751-773, and SSN21-23. Do not use the safety stop on the AN/BRD-7 mast with MMM closure doors (S/A 4412) installed. Due to the configuration of the closure door opening, the sail top does not provide an interference point for the safety stop, instead of installing the safety stop, install safety clamps or shoring in accordance with the [paragraphs 3.1](#) and [3.2](#), respectively.

#### ⚠ WARNING

Ensure that the mandatory requirements of [Chapter 2](#) have been accomplished and that all pertinent safety precautions of [Chapter 1](#) are in effect.

#### CAUTION

Periscope faired mast clamps, safety stop, or lifting devices extend over the AN/BRD-7, BLD-1, MMM or AN/BRD-7 with MMM (S/A 4412) closure doors.

**Caution** - precedes

Close and DANGER tag AN/BRD-7, AN/BLD-1, MMM or AN/BRD-7 hoist cylinder isolation valves when the clamps, safety stop, or lifting devices are installed on the periscope faired mast. (See [Table 2-2](#))



In the event that a mast has been inadvertently powered down while the safety stop was installed, the safety stop shall be thoroughly inspected with particular attention paid to the area around the lower mounting screw. Discard the safety stop if any deformation is noted.



Safety stops may be installed at different mast locations where the aft fairing inserts are installed. If the mast is desired at another location where inserts are not provided in the fairing, then safety clamps or shoring must be used.

- a. Position the faired mast to the desired height hydraulically. Close and DANGER tag the hoist cylinder isolation valves.



Refer to [paragraph 2.2.1.4](#), Lifting Devices, Safety Stops, and Sled Stop Assemblies, prior to installing the safety stop.

- b. Install the safety stop on the aft edge only of the faired mast by attaching with two captive 5/8 inch socket head cap screws.



1. Coat the threads of all attaching hardware with anti-seize compound per [Reference \(v\)](#).
2. Both screws should be installed and snugged up before torquing.
3. Torque should be applied slowly and evenly until the specified torque is reached.



Do not use the safety stop on the mast bearing being worked on when the lifting stop fastener spins during installation. Refer to paragraphs [3.1](#) or [3.2](#) to install the safety clamp or shoring . Report the damaged insert to local Maintenance Activity.

- c. Torque the two mounting socket head cap screws in uniform increments until a value of 36 ft-lbs is attained on both screws.
- d. Adjust two contact screws until their contact buttons have a 1/4 to 1/2 inch gap with the top of the sail. See [Figure 3-6](#).

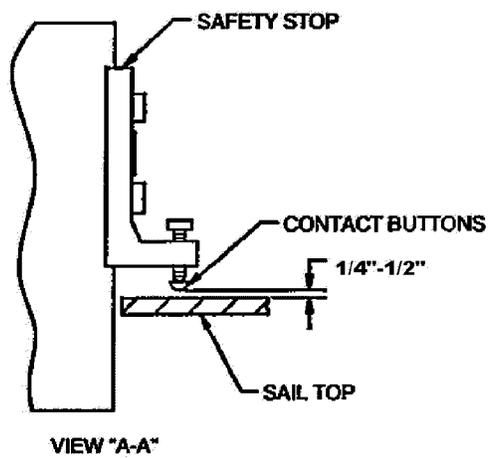
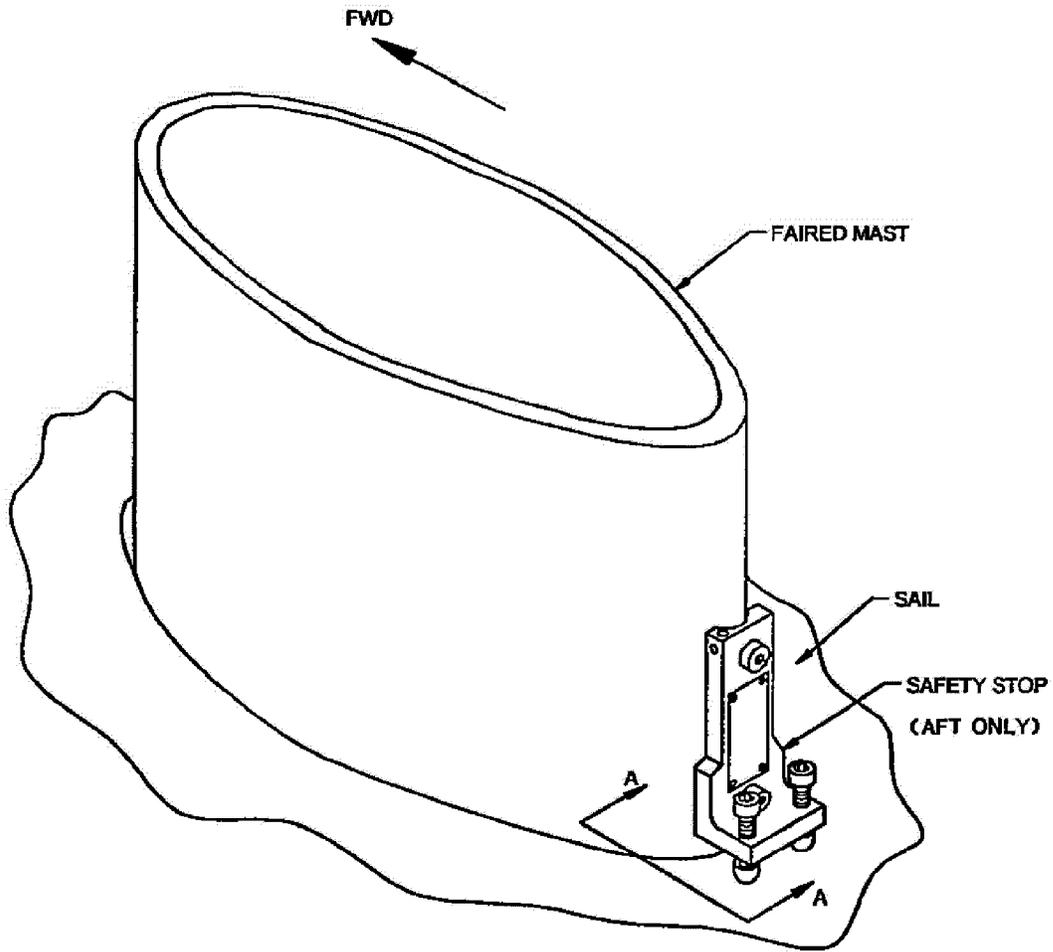


Figure 3-6 Installation of Safety Stop

3.3.3 PROCEDURE FOR INSTALLING SLED STOP ASSEMBLIES (OE-538, OE-207, AND OE-592 ONLY). Sled stop assemblies are to be installed in accordance with the following steps:



Ensure that the mandatory requirements of [Chapter 2](#) have been accomplished and that all pertinent safety precautions of [Chapter 1](#) are in effect.



Ensure removal of the sled stop assembly from the antenna lower bearing prior to the cycling of the system.

- a. Gain access to both sides of the OE-538 antenna lower bearing by removing the aft faired mast access covers.



The sled stop assemblies are to be used in conjunction with the safety stop or clamps when the OE-538, OE-207, or OE-592 is in the intermediate maintenance position. This combination will prevent inadvertent raising or lowering of the mast while it is being worked on.

- b. Position the faired mast at the intermediate maintenance position hydraulically. Close and DANGER tag the hoist cylinder isolation valves.
- c. Install safety clamps or safety stop, in accordance with applicable [paragraphs 3.1.2](#) and [3.3.2](#).



Refer to [paragraph 2.2.1.4](#), Lifting Devices, Safety Stops, and Sled Stop Assemblies, prior to installing sled stops.

- d. Attach one sled stop assembly on each side of the antenna lower bearing using captive 1/2-inch socket head cap screws. See [Figure 3-7](#). Torque the socket head cap screws to a value of 25 ft-lbs.

3.3.4 PROCEDURE FOR INSTALLING SAFETY PIN (UMM). Use [Reference \(dd\)](#) for installation of the safety pin(s).

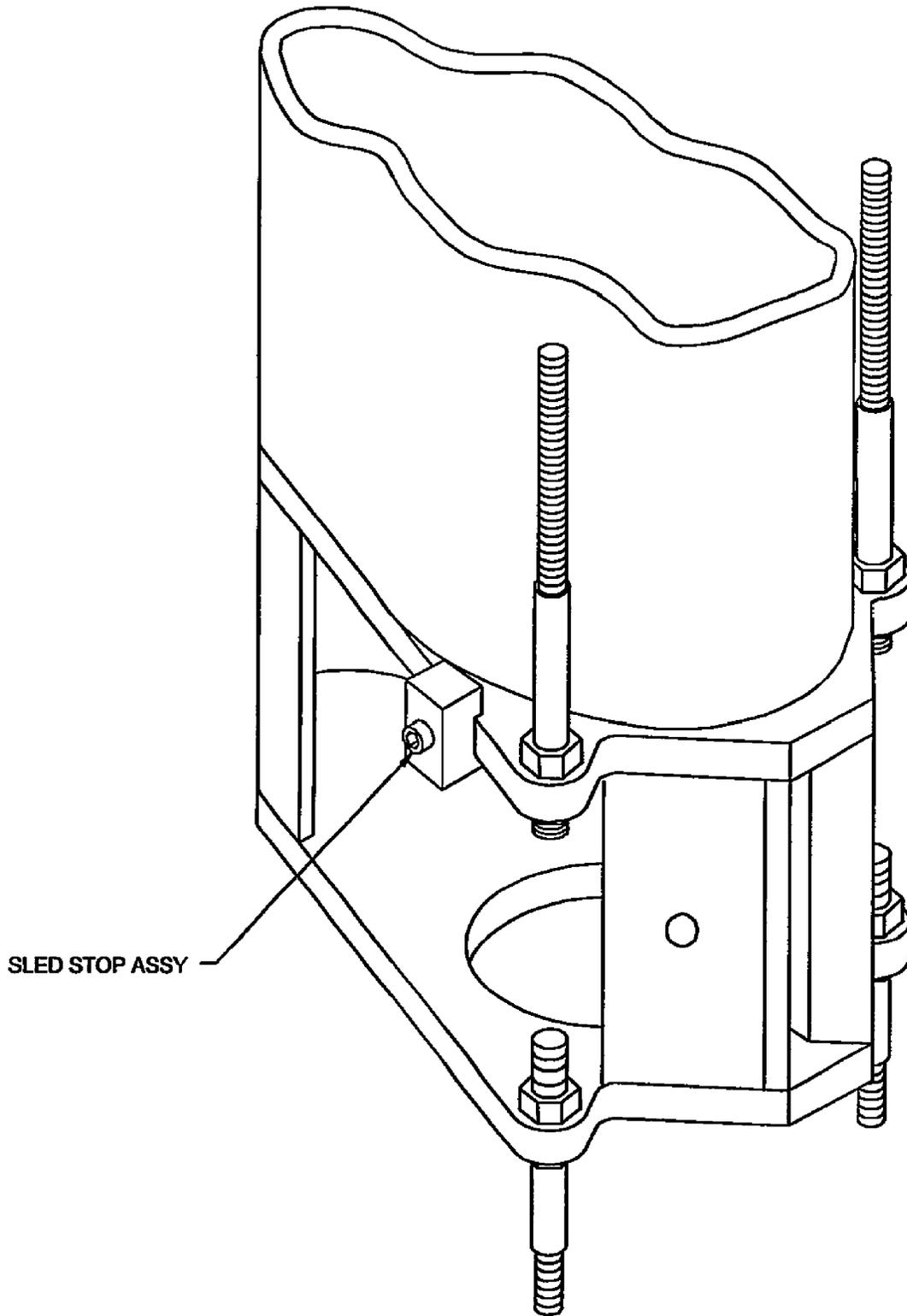


Figure 3-7 Installation of Sled Stop Assembly

### 3.4 INSTALLATION OF SSBN CLASS SNORKEL LIFTING BLOCKS.

3.4.1 GENERAL INFORMATION. Lifting blocks (NAVSEA Dwg 4398614-317/318) are used to secure the snorkel mast in a fixed position while working on, around, or under the mast.

3.4.2 PROCEDURE FOR INSTALLING LIFTING BLOCKS ON SSBN CLASS SNORKEL.



Ensure that the mandatory requirements of [Chapter 2](#) have been accomplished and that all pertinent safety precautions of [Chapter 1](#) are in effect.



Lifting blocks may also be used in conjunction with induction mast support legs. See step g.

- a. Request Ship's Force raise and position the snorkel mast in the desired position.
- b. Remove (8) fairing cap screws (NAVSEA Dwg 4675662-13) from each side of mast.



Ensure lifting blocks are installed on the appropriate side of the mast as stamped on the lifting block, to prevent damage to the bearing retainer plate when the mast is lowered.

- c. Install the lifting blocks using cap screws (NAVSEA Dwg 4398614-324) lubricated with Molykote M-77 or equivalent and special washers (NAVSEA Dwg 4398614-321).
- d. Torque cap screws 40 to 45 ft-lbs. Torque to be accomplished in two increments.
- e. The snorkel mast is settled by its own weight so that the lifting blocks rest on the upper horse collar bearing frame with the notch clearing the bearing shoe retainer. (See [Figure 3-8](#).)
- f. Shut and DANGER tag hoist cylinder isolation valves, mast control switch, and lifting blocks.
- g. If the mast is required to be positioned in the "FULLY-RAISED" position, install the support legs (NAVSEA Dwg 4398614-310/311) using cap screws (NAVSEA Dwg 4398614-324) lubricated with Molykote M-77 or equivalent and special washers (NAVSEA Dwg 4398614-321) and retest as directed above. Measure gap between the lifting blocks, support legs, and shim as required to achieve solid contact between lifting blocks and support legs. This is to be accomplished each time the support legs are used. (See [Figure 3-9](#).)

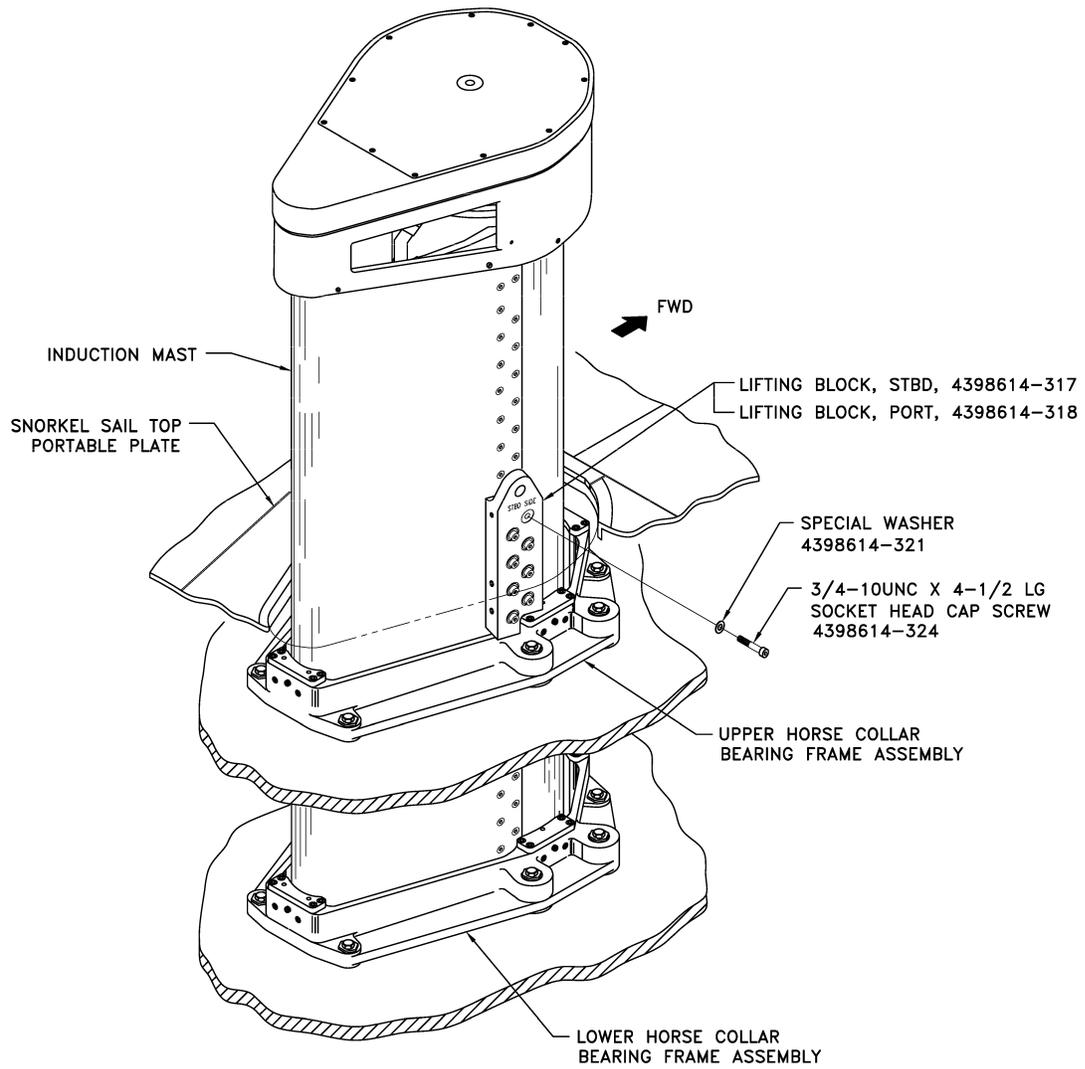


Figure 3-8 Lifting Block Supported by Bearing

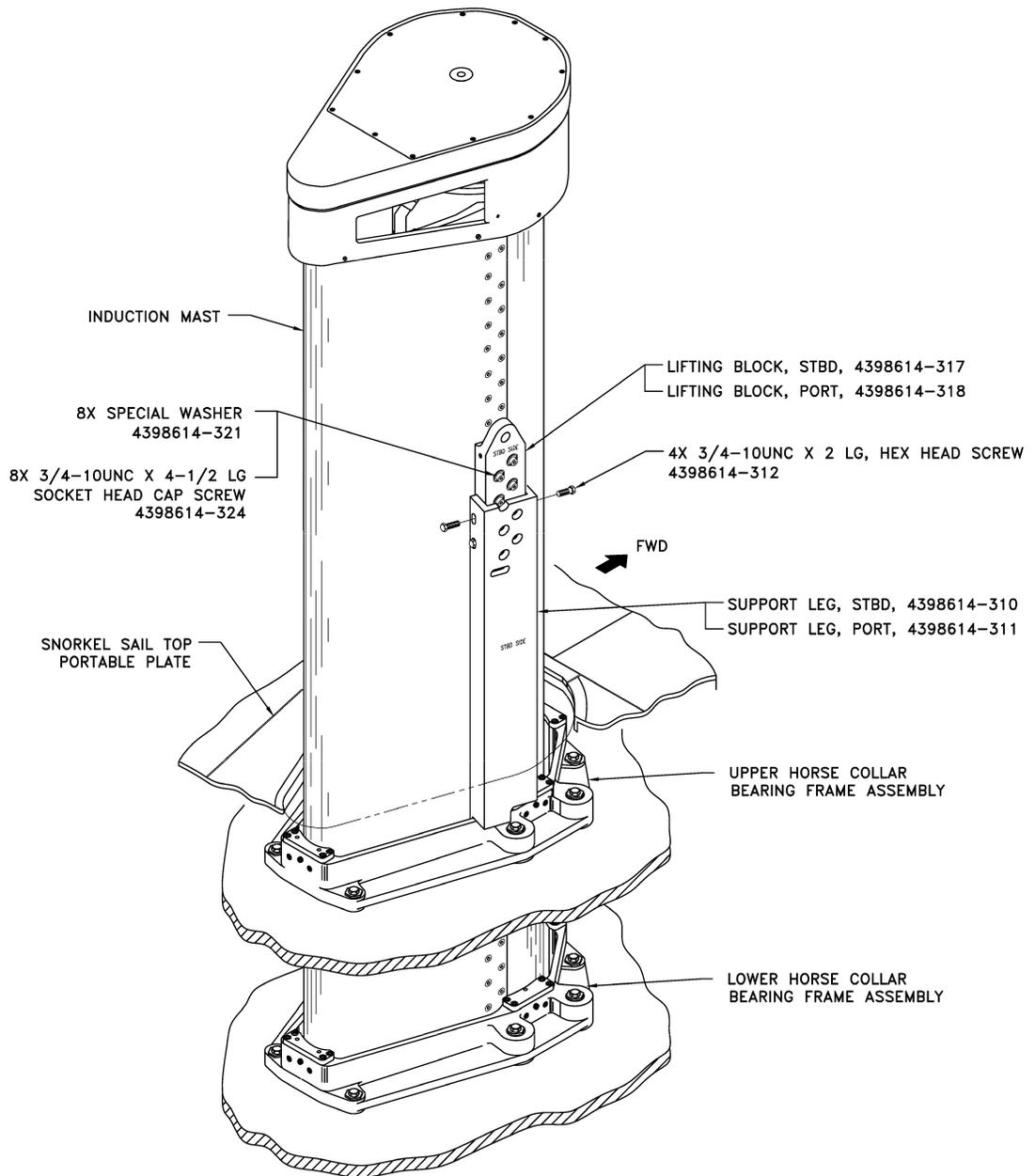


Figure 3-9 Lifting Block Supported by Bearing Frame via Support Legs



## CHAPTER 4

### PROCEDURES FOR INSTALLING LIFTING DEVICES

#### 4.1 INSTALLATION OF LIFTING CLAMP, BACKUP CLAMP, LIFTING DEVICES OR SAFETY STOP PIN FOR REMOVAL/INSTALLATION OF FAIRED MASTS.

#### NOTE

For faired masts/periscopes that have MACHALT-ECP-560, SHIPALT 4173K, SHIPALT 4148K or TRID 0541 installed, see [paragraph 4.1.4](#) for installing lifting devices.

4.1.1 PREREQUISITE AND METHODS. Ensure that the mandatory requirements of [Chapter 2](#) have been accomplished and that all pertinent safety precautions of [Chapter 1](#) are in effect. One of the following safety measures must be implemented simultaneously with the lifting clamp in order to prevent the lifting clamp from slipping, causing injury or damage to equipment. These methods are listed as follows:

- a. Use of a second (backup) clamp.
- b. Use of a safety stop pin.

This procedure is applicable to any style, size, or shape of the clamp listed in [Table 2-1](#) and in [Reference \(a\)](#). The lifting clamp, with one additional safety measure, is to be installed on a faired mast in accordance with the following paragraphs:

4.1.2 INSTALLATION OF LIFTING CLAMP WITH BACKUP CLAMP. The method for the installation of the mast lifting clamp together with a backup clamp is given below and is illustrated in [Figure 4-1](#).

#### WARNING

In addition to a lifting clamp, a backup clamp ([Figure 4-1](#)) or a safety stop pin ([Figure 4-2](#)) is a mandatory requirement for personnel safety when lifting masts. Ensure that the mandatory requirements of [Chapter 2](#) have been accomplished and that all other pertinent safety precautions of [Chapter 1](#) are in effect.

#### CAUTION

To prevent damage to the periscope, the periscope must be removed prior to removing the periscope fairing and installed after the periscope fairing is installed.

**CAUTION**

Snorkel mast clamps extend over the AN/BRD-7, BLD-1, MMM or AN/BRD-7 with MMM (S/A 4412) closure doors. Close and DANGER tag AN/BRD-7, AN/BLD-1 or AN/BRD-7 or MMM hoist cylinder isolation valves when the clamps are installed on the snorkel mast. (See [Table 2-2](#))

**CAUTION**

Periscope faired mast clamps, safety stop, or lifting devices extend over the AN/BRD-7, BLD-1, MMM or AN/BRD-7 with MMM (S/A 4412) closure doors. Close and DANGER tag AN/BRD-7, AN/BLD-1, MMM or AN/BRD-7 hoist cylinder isolation valves when the clamps, safety stop, or lifting devices are installed on the periscope faired mast. (See [Table 2-2](#))

**NOTE**

See [paragraph 4.7](#) for installing lifting and backup clamps to AN/BRD-7, AN/BLD-1 and AN/BRD-7 and MMM.

- a. Position the mast to the desired height hydraulically. Close and DANGER tag the hoist cylinder isolation valves.
- b. Refer to [Table 2-1](#) and [Reference \(a\)](#) for the proper clamp type and install the lifting clamp first.
- c. Fit each clamp half to the mast surface and ensure that they properly conform to the shape of the mast.

**CAUTION**

Never install the clamps onto the fairing access covers or openings. The clamp adjacent to the fairing access should be installed 1 inch minimum away from the access opening edge.

- d. Position the lifting clamp on the mast so that the backup clamp will be at least five inches below the top of the sigma or channel section. See [Figure 4-1](#).

**CAUTION**

Use of thread antiseize compound on the clamp bolts is prohibited.

**CAUTION**

Tightening one side of the clamp first may cause damage to the fiberglass mast.

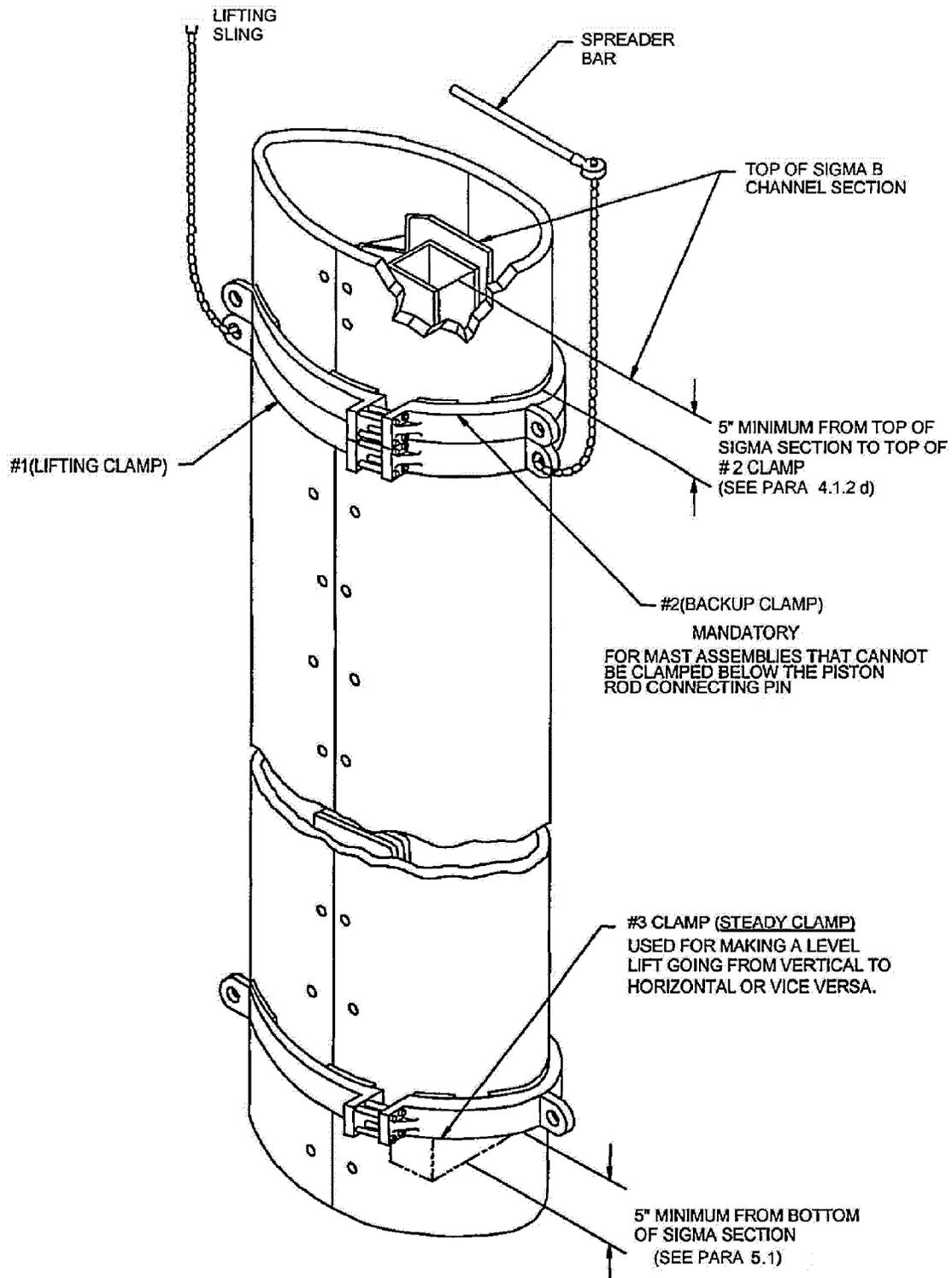


Figure 4-1 Method for Installing Backup Clamp and Lifting Clamp

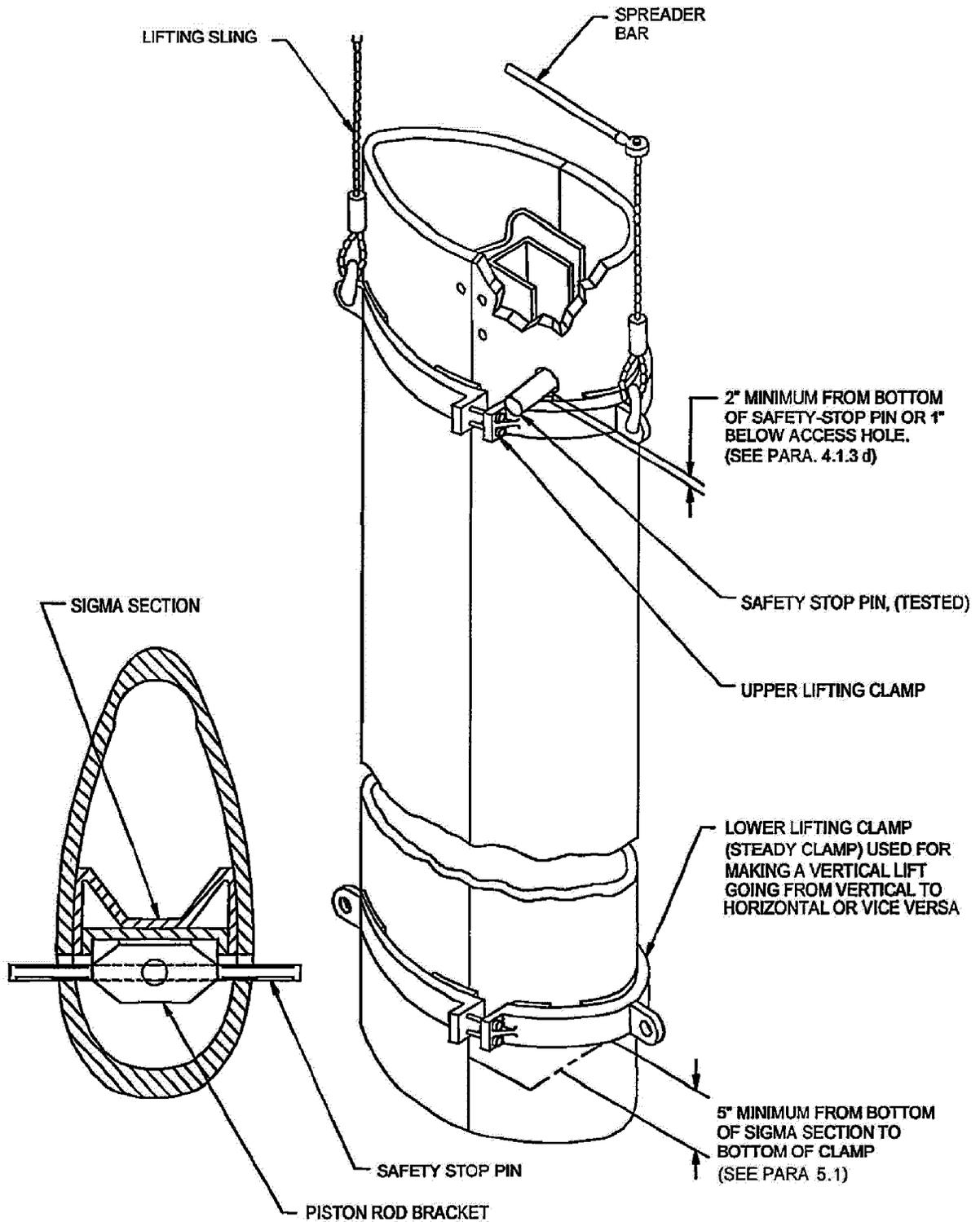


Figure 4-2 Installing Safety Stop Pin and Lifting Clamp

- e. Torque the four holddown nuts on the clamp sequentially as illustrated in [Figure 2-1](#) and in uniform increments until the proper torque value provided in [Table 3-1](#) has been attained on each bolt.

**NOTE**

1. All bolts should be installed and snugged up before torquing.
  2. Torque should be applied slowly and evenly until the specified torque is reached.
  3. The bolts should be cross-tightened as shown in [Figure 2-1](#). It may be necessary to cross-tighten two or three times before an even tightness is reached.
  4. The bolts, when installed and tightened, should protrude a distance of at least one thread beyond the top of the nut.
- f. Check to ensure that all brake linings are contacting the surface of the mast.
  - g. Check to ensure the gaps between the clamp halves are the same on each side (or end) of the mast. The clamp halves must never make metal-to-metal contact.
  - h. Wait 10 minutes to allow the clamping force to redistribute, then recheck the holddown nuts for the proper torque value provided in [Table 3-1](#).
  - i. If the proper torque value is not maintained, repeat [steps 4.1.2.e](#) through [4.1.2.h](#).
  - j. Install the backup clamp above and snug against the lifting clamp following the procedure of [steps 4.1.1.b](#) through [4.1.1.i](#).

**NOTE**

Snorkel mast lifting clamp (Assy. 334 of Reference (a)) will require attachment of support brackets (Assy. 371 of Reference (a)) to the lifting and backup clamps (torque bolts to 5-10 ft-lbs) prior to lifting the mast. The support bracket ensures the lifting slings will not make contact with the snorkel mast.

**CAUTION**

Prior to attempting system removal, ensure that all necessary components are removed in accordance with the applicable system technical manuals and/or drawings.

- k. To prevent mast from damage, attach the lifting slings with a spreader bar to the lower clamp lifting lugs.

**NOTE**

For the Trident Class snorkel induction mast system, the inner induction pipe can be installed with the faired mast, see [Reference \(q\)](#) for the inner induction pipe clamp installation procedures.

**NOTE**

For Seawolf Class periscope faired mast the lifting slings with a spreader bar should be arranged as shown in [Figure 4-3](#).

**NOTE**

At this point in the procedure, the mast is ready for lifting.

4.1.3 INSTALLATION OF LIFTING CLAMP WITH SAFETY STOP PIN. This procedure applies to installation required on mast assemblies that allow the clamp installation below the piston rod connecting pin. The method for the installation of the lifting clamp with the mast safety stop pin is given below and is illustrated in [Figure 4-2](#).

**⚠ WARNING**

In addition to a lifting clamp, a backup clamp ([Figure 4-1](#)) or a safety stop pin ([Figure 4-2](#)) is a mandatory requirement for personnel safety when lifting masts. Ensure that the mandatory requirements of [Chapter 2](#) have been accomplished and that all other pertinent safety precautions of [Chapter 1](#) are in effect.

**CAUTION**

Periscope faired mast clamps, safety stop, or lifting devices extend over the AN/BRD-7, BLD-1, MMM or AN/BRD-7 with MMM (S/A 4412) closure doors. Close and DANGER tag AN/BRD-7, AN/BLD-1, MMM or AN/BRD-7 hoist cylinder isolation valves when the clamps, safety stop, or lifting devices are installed on the periscope faired mast. (See [Table 2-2](#))

**CAUTION**

AN/BRD-7, AN/BLD-1, MMM mast clamps and mast clamps for AN/BRD-7 with MMM closure doors (S/A 4412) installed, extend over the snorkel mast. Close and DANGER TAG snorkel hoist cylinder isolation valves when the clamps are installed on the AN/BRD-7, AN/BLD-1, and MMM or AN/BRD-7 mast. (See [Table 2-2](#))

**CAUTION**

To prevent damage to the periscope, the periscope must be removed prior to removing the periscope fairing and installed after the periscope fairing is installed.

**NOTE**

The clamp/safety stop pin method does not apply to the snorkel and NAVSAT masts.

- a. Raise the mast hydraulically until the piston rod connecting pin is approximately 18 inches above the sail top. Close and DANGER tag the hoist cylinder isolation valves.
- b. Refer to [Table 2-1](#) and [Reference \(a\)](#) for proper clamp type.
- c. Fit each half of the clamp to the mast surface and ensure that they will properly conform to the shape of the mast.
- d. Position the clamp 2 inches below the pin or 1 inch below the opening, See [Figure 4-2](#).

**CAUTION**

Use of thread antiseize compound on the clamp bolts is prohibited.

**CAUTION**

Tightening one side of the clamp first may cause damage to the fiberglass mast.

- e. Torque the four holddown nuts on the clamp sequentially as illustrated in [Figure 2-1](#) and in uniform increments until the proper torque value provided in [Table 3-1](#) has been attained on each bolt.

**NOTE**

1. All bolts should be installed and snugged up before torquing.
  2. Torque should be applied slowly and evenly until the specified torque is reached.
  3. The bolts should be cross-tightened as shown in [Figure 2-1](#). It may be necessary to cross-tighten two or three times before an even tightness is reached.
  4. The bolts, when installed and tightened, should protrude a distance of at least one thread beyond the top of the nut.
- f. Check to ensure that all brake linings are contacting the surface of the mast.
  - g. Check to ensure the gaps between the clamp halves are the same on each side (or end) of the mast. The clamp halves must never make metal-to-metal contact.
  - h. Wait 10 minutes to allow the clamping force to redistribute, then recheck the holddown nuts for the proper torque value provided in [Table 3-1](#).
  1. If the proper torque value is not maintained, repeat [steps 4.1.2.e](#) through [4.1.2.h](#).
  - j. If the hoist cylinder is to be removed with the mast, remove the piston rod pin and replace it with the safety stop pin. Use a strap to secure the hoist cylinder to the hoist cylinder steady bearing assembly.
  - k. If the hoist cylinder is not to be removed with the mast, remove the piston rod pin. After the pin is removed and stowed safely, crane-lift the mast until the piston rod bracket is clear of the piston rod.
  1. Install the safety stop pin through the piston rod bracket.

**CAUTION**

Prior to attempting system removal, ensure that all necessary components are removed in accordance with the applicable system technical manuals and/or drawings.

- m. To prevent the mast from damage, attach the lifting slings with a spreader bar to the clamp lifting lugs.

**NOTE**

For Seawolf Class periscope faired mast the lifting sling with a spreader bar should be arranged as shown in [Figure 4-3](#).

**NOTE**

At this point in the procedure, the mast is ready for lifting.

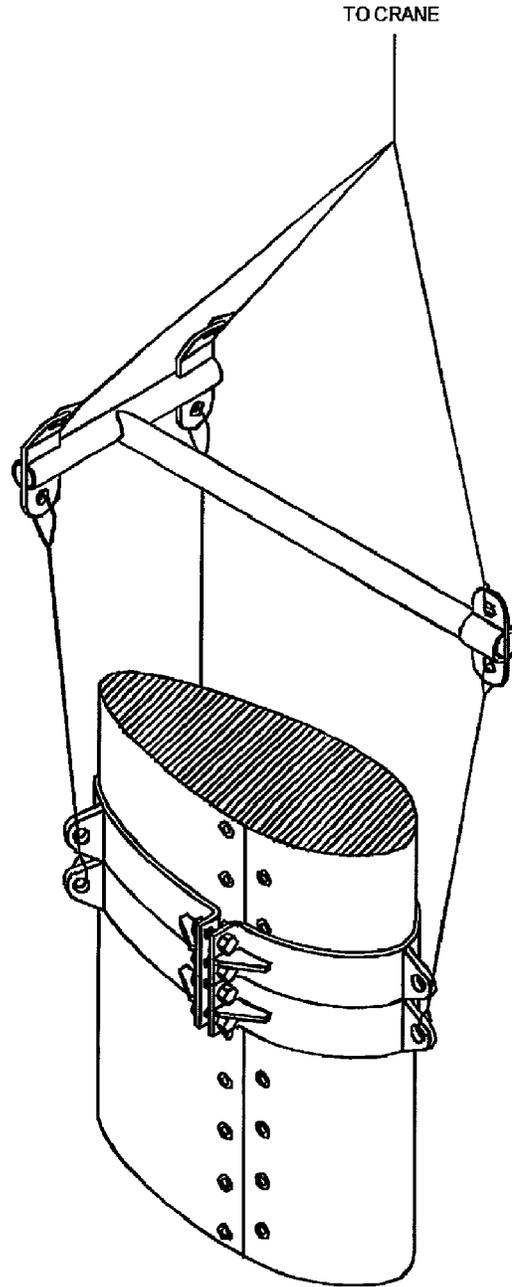


Figure 4-3 Installation of SSN-21 Periscope Fairing Lifting and Backup Clamps with Spreader Bar

#### 4.1.4 INSTALLATION OF LIFTING DEVICES FOR REMOVAL/INSTALLATION OF FAIRED MASTS THAT HAVE MACHALT-ECP-560, SHIPALT 4173K, SHIPALT 4148K OR TRID 0541 INSTALLED.

### CAUTION

The faired mast lifting devices are labeled FWD and AFT. Ensure the devices are installed in the proper locations to avoid the faired mast damage.

### NOTE

The Advanced Communications Mast (ACM) system is only installed on the SSN-23. The ACM main components (fairing, antenna, hoist cylinder) are identical to the Sub High Data Rate (HDR) components. All ACM system safety, lifting and handling requirements therefore are exactly the same as Sub HDR. Pertaining to this manual, all Sub HDR safety, lifting, and handling requirements are to be utilized when handling the ACM components.

4.1.4.1 Prerequisites and Methods. Ensure that the mandatory requirements of [Chapter 2](#) have been accomplished and that all pertinent safety precautions of [Chapter 1](#) are in effect.

This procedure is applicable to the lifting devices listed in [Table 2-1](#) and in [Reference \(v\)](#). The lifting devices are to be installed on a faired mast in accordance with the following paragraphs:

4.1.4.2 Installation of Lifting Devices. The method for the installation of the mast lifting devices is given below and is illustrated in [Figure 4-4](#).

### ⚠ WARNING

Ensure that the mandatory requirements of [Chapter 2](#) have been accomplished and that all pertinent safety precautions of [Chapter 1](#) are in effect.

### CAUTION

Periscope faired mast clamps, safety stop, or lifting devices extend over the AN/BRD-7, BLD-1, MMM or AN/BRD-7 with MMM (S/A 4412) closure doors. Close and DANGER tag AN/BRD-7, AN/BLD-1, MMM or AN/BRD-7 hoist cylinder isolation valves when the clamps, safety stop, or lifting devices are installed on the periscope faired mast. (See [Table 2-2](#))

**CAUTION**

To prevent damage to the periscope, the periscope must be removed prior to removing the periscope fairing and installed after the periscope fairing is installed.

- a. Refer to [Table 2-1](#) and [Reference \(v\)](#) for the proper lifting devices. Install the lifting devices.

**NOTE**

If the mast is being lifted from the sail, position the mast to the proper height hydraulically so the contact screw can be adjusted to provide 1/4 to 1/2-inch gap. Close and DANGER tag the hoist cylinder isolation valves.

**CAUTION**

Damage to the fairing and/or threaded insert can occur if not installed correctly. Each lifting device must be installed only on the conformed surface which the device is marked (AFT/FWD)

- b. Fit each lifting device to the mast surface and ensure that they properly conform to the shape of the mast. The lifting device is labeled with FWD or AFT.

**NOTE**

1. Coat the threads of all attaching hardware with anti-seize compound per [Reference \(v\)](#).
2. Both screws should be installed and snugged up before torquing.
3. Torque should be applied slowly and evenly until the specified torque is reached.

**⚠ WARNING**

Do not use the lifting devices on the mast being worked on when the lifting device fastener spins during installation. Refer to para 4.1 to install the lifting clamp and backup clamp or safety stop pin. Report the damaged insert to local Maintenance Activity.

- c. Torque the mounting screws on the lifting devices in uniform increments until the proper torque value of 36 ft-lbs is obtained on each screw.

**CAUTION**

Prior to attempting system removal, ensure that all necessary components are removed in accordance with the applicable system technical manuals and/or drawings.

**CAUTION**

[Step d](#) is very important on faired mast systems which are fully raised/extended, like SUB HDR and ACM, to provide enough cylinder length to mate and bolt to the cylinder base and to verify positive hydraulic pressure underneath the hydraulic cylinder piston (venting air from hydraulic cylinder), before removing the FWD & AFT lifting devices.

**NOTE**

At this point in the procedure, the mast is ready for lifting.

- d. For faired mast assemblies being lifted to the sail, turn up the contact screws on the FWD and AFT lifting devices, so that the Delrin ® contact buttons contact the lifting device.
- e. For faired mast assemblies being lifted from the sail, adjust the contact screws on the FWD and AFT lifting devices so the contact bottoms have a 1/4 to 1/2-inch gap with the sail top. See [Figure 4-4](#).

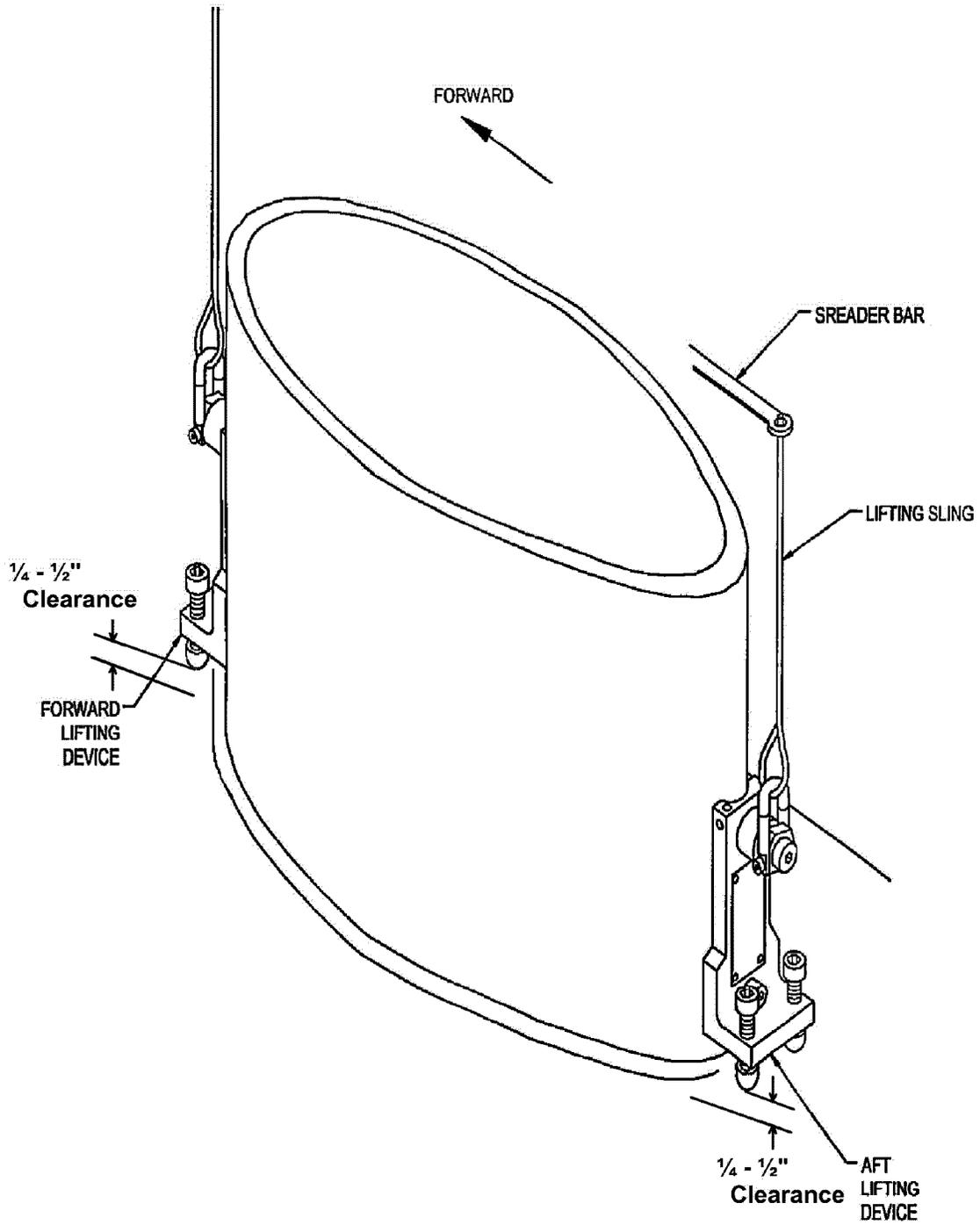


Figure 4-4 Installation of Lifting Devices

## 4.2 ATTACHMENT OF LIFTING CLAMPS TO FIBERGLASS RADOME.

4.2.1 GENERAL INFORMATION. Lifting clamps are used to lift the fiberglass radomes out of a fairing when the radome must be removed for repair/replacement or any other reason.

4.2.2 PROCEDURE. This paragraph provides the procedure for attaching lifting and backup clamps to applicable radomes.

4.2.2.1 Attach Lifting and Backup Clamps To Teardrop-Shaped Radomes (OE-538, OE-207, and OE-592).

- a. Raise the mast hydraulically to a height that will permit removal of OE-538 access covers on the mast. Remove the access covers.
- b. Reposition the mast so that the lower bearing assembly (sled) is centered in the opening at the access doors on the mast.
- c. Close and DANGER tag the hoist cylinder isolation valves.
- d. Install the safety clamps or safety stop with the sled safety stops on the mast in accordance with [paragraphs 3.1.2, 3.3.2, and 3.3.3](#).



### NOTE

Install the sled safety stops if MACHALT-ECP-560 is installed.

- e. Disconnect the electrical cable from the antenna. Secure the cable to the lower bearing assembly with nylon line and clear the path when the faired mast is cycled.
- f. Remove the four bolts which secure the antenna to the antenna lower bearing assembly.



### CAUTION

Remove the sled safety stops if they were installed.

- g. Ensure that the mast is positively supported then remove the safety clamps or safety stop, and sled safety stops from the mast as described in [paragraph 6.1.2](#) or [6.1.3](#).
- h. Clear the tags and lower the mast until the mast is approximately 3 feet above the sail top.
- i. Close and DANGER tag the hoist cylinder isolation valves.
- j. Install assembly 6 lifting clamp and backup clamp to the radome and torque to 60 ft-lbs as described in [paragraph 4.1.2](#).
- k. To prevent the radome from damage, attach the lifting slings with a spreader bar to the lifting lugs on the lifting (lower) clamp.
- l. The radome can now be lifted out of the mast.

### 4.3 INSTALLATION OF LIFTING AND BACKUP CLAMPS FOR REMOVAL/INSTALLATION OF PERISCOPES.

#### CAUTION

Periscope faired mast clamps, safety stop, or lifting devices extend over the AN/BRD-7, BLD-1, MMM or AN/BRD-7 with MMM (S/A 4412) closure doors. Close and DANGER tag AN/BRD-7, AN/BLD-1, MMM or AN/BRD-7 hoist cylinder isolation valves when the clamps, safety stop, or lifting devices are installed on the periscope faired mast. (See [Table 2-2](#))

#### CAUTION

To prevent damage to the periscope, the periscope must be removed prior to removing the periscope fairing and installed after the periscope fairing is installed.

4.3.1 PREREQUISITE. Ensure that the mandatory requirements of [Chapter 2](#) have been accomplished and that all pertinent safety precautions of [Chapter 1](#) are in effect before any lifting is attempted.

#### NOTE

Adjust the trim or list as required to support the removal of the periscope from the ship. Verify that the submarine has an up/down angle no greater than 5 degrees and a port/starboard list no greater than 3 degrees.

4.3.2 REMOVAL OF TYPE 8, 15 AND 18 PERISCOPES. Prior to removal of the periscope from the submarine, ensure that the requirements of the applicable system technical manuals, drawings, or local procedures are adhered to.

#### NOTE

Lifting procedure for all Type 8 (B, K, J, and M) periscopes are the same. The lifting procedure for Type 8B Mod 3 can be used to lift Type 8K, Type 8J, and Type 8M.

- a. Fully raise the periscope hydraulically. On Type 8B periscopes, disconnect the E&E adapter in accordance with system technical manuals and local procedures.
- b. Position the periscope hydraulically such that the eyepiece is approximately chest high. Shut isolation valves.

Disengage the hoisting yoke retainer/cover. Remove all remaining components extending beyond the outer tube diameter and interfering with its passage through the bearings and hull.

- c. Clean the periscope barrel clamping area immediately above the fairwater, in accordance with [paragraph 2.2.1.2](#).

## CAUTION

Do not attach clamps within 52 inches of the top of the periscope antenna assembly. Do not use setscrews which set against the outer periscope barrel.

## NOTE

Protect bearing from debris.

- d. Per [Table 2-1](#), use the assembly 47 clamp. Reinspect for any possible grit or dirt on the clamp lining and install the lifting clamp approximately 1/2 to 1 inch above the fairwater. For safety reasons, this gap should be as small as possible with the lifting lugs positioned parallel to the head window as illustrated in [Figures 4-5, 4-6, and 4-7](#).

## CAUTION

Use of thread antiseize compound on the clamp bolts is prohibited.

- e. Torque each of the four nuts on the clamp sequentially and in uniform increments, until the proper torque values, 60 ft-lbs, have been attained on each bolt. Ensure the gap between the ends of the clamp halves is the same on each side. The clamp halves must never make metal-to-metal contact.
- f. Wait 10 minutes to allow the clamping load to redistribute, then recheck the four holddown nuts, for proper torque value.
- g. If proper torque value is not maintained, repeat [steps 4.3.2.e](#) through [4.3.2.f](#).
- h. Install a backup clamp against and above the lifting clamp. Orient the backup clamp with the lugs 90° from those of the lifting clamps as illustrated in [Figures 4-5 and 4-6](#). Use this arrangement for all periscope clamping except for Type 18B (with Hifax Bearings). The Type 18B (with Hifax Bearings) periscope, [Figure 4-7](#), does not use a backup clamp.
- i. Repeat [steps 4.3.2.e](#) through [4.3.2.g](#).
- j. Hydraulically lower the periscope until the lifting clamp lugs rest on the fairwater. Continue lowering until the hoisting yoke or TBT completely disengages from the periscope barrel. Remove the split rings from the periscope.
- k. Type 18B (both Hifax and Tufflite bearing configurations) and Type 8B Mod 3 periscopes require a sliding clamp, assembly 232 of [Reference \(a\)](#). For Type 18B (with Hifax bearings) periscopes, install the sliding clamp so that it rests above the lifting clamp. For Type 18B (with Tufflite bearing) and Type 8B Mod 3 periscopes, install the sliding clamp so that it rests above the back-up clamp. The ends of the sliding clamp halves do make metal-to-metal contact. Torque each of the four nuts on the sliding clamp, sequentially and in uni-

form increments until the proper torque value, 60 ft-lbs has been attained. Recheck torque value after 10 minutes. Attach one end of each sling, Item 96 of [Reference \(a\)](#), to the lifting clamp lugs and the other end of each sling to the lower holes in the sliding clamp lugs. For Type 18B with Tuflite bearing, use wire rope assembly 389 of [Reference \(a\)](#).

- l. Attach lifting slings to the lifting (lower) clamp lugs. For Type 18B and Type 8B MOD-3, attach lifting slings to the upper holes in the sliding clamp lugs. Ensure slings are long enough to extend above the periscope. A spreader bar is attached to the slings to prevent the head window and other elements on the periscope head assembly from damage. See [Figures 4-5, 4-6, and 4-7](#).
- m. Transfer weight from lifting clamp to crane. Install the protective cover on bottom of the periscope barrel.

**CAUTION**

Cease lifting immediately if binding occurs when the periscope is being rotated.

- n. Slowly crane-lift the periscope out of the hull. Rotate the periscope back and forth (no more than 180°) to observe any tendency to bind in the bearings. If binding occurs, cease lifting immediately until cause is determined and source is eliminated.
- o. Lower the periscope to pier or deck. Insert bottom of barrel into hinge carriage or other suitable device for periscope handling, and continue lowering until the periscope barrel is horizontal in suitable chocks or vehicle.

**NOTE**

On some tenders, or other activities, an additional clamp must be installed on the lower end of the barrel. Install the lower lifting clamp approximately six to eight feet from bottom of periscope barrel, following all previous clamp installation instructions. Ensure the lifting lugs of the lower clamp are in the same plane as those of the lifting clamp. Utilizing a second crane hook, bring periscope into a horizontal position to facilitate transport into the optical shop.

If clamps are to be left on for an extended period of time, with the barrel exposed to the weather, the clamps should be protected by covering with plastic wrap and sealing with tape (i.e., EB Green).

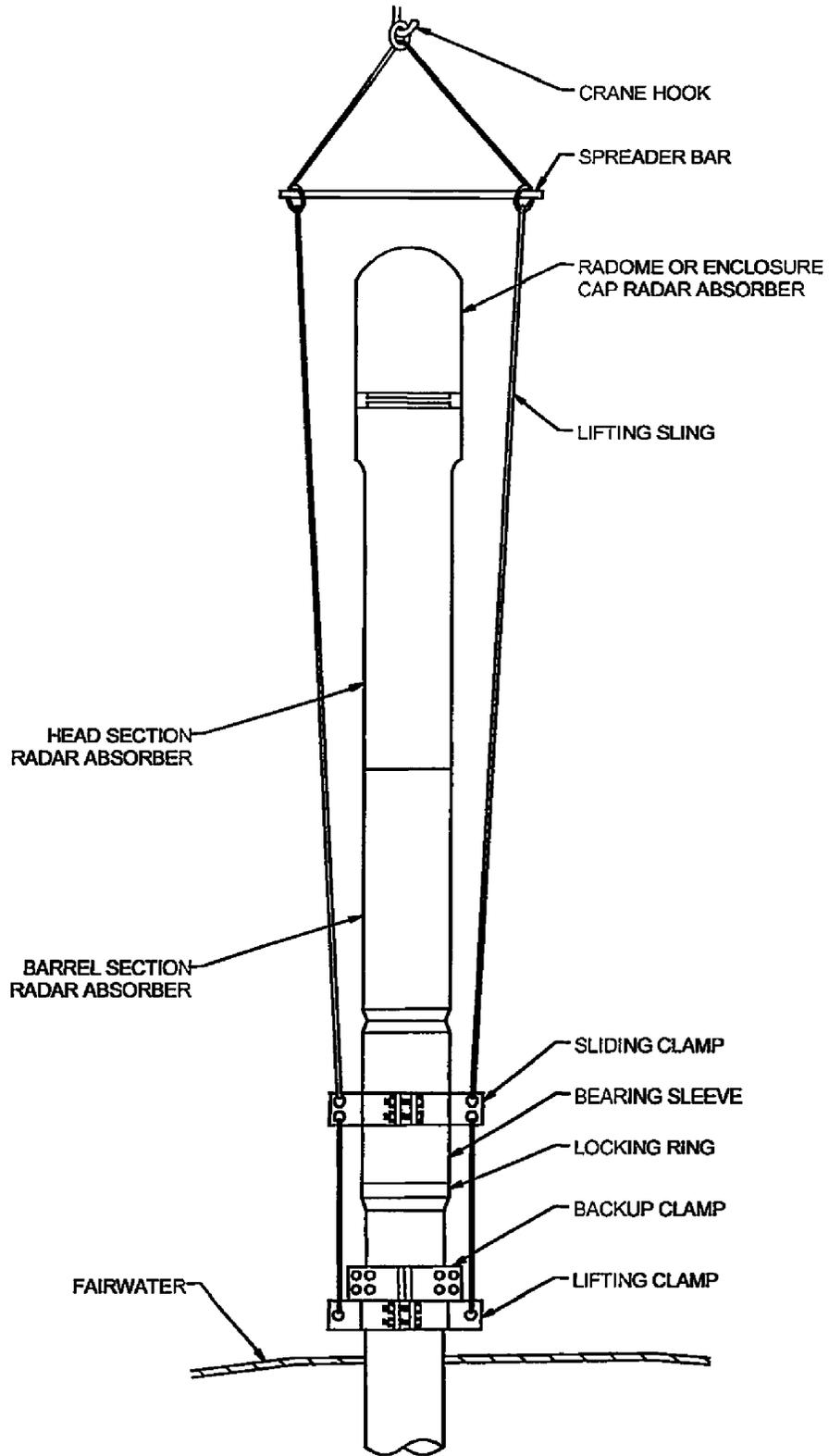


Figure 4-5 Type 8B MOD-3 and Type 18B (with TufLite Bearing) Periscope Rigged for Removal

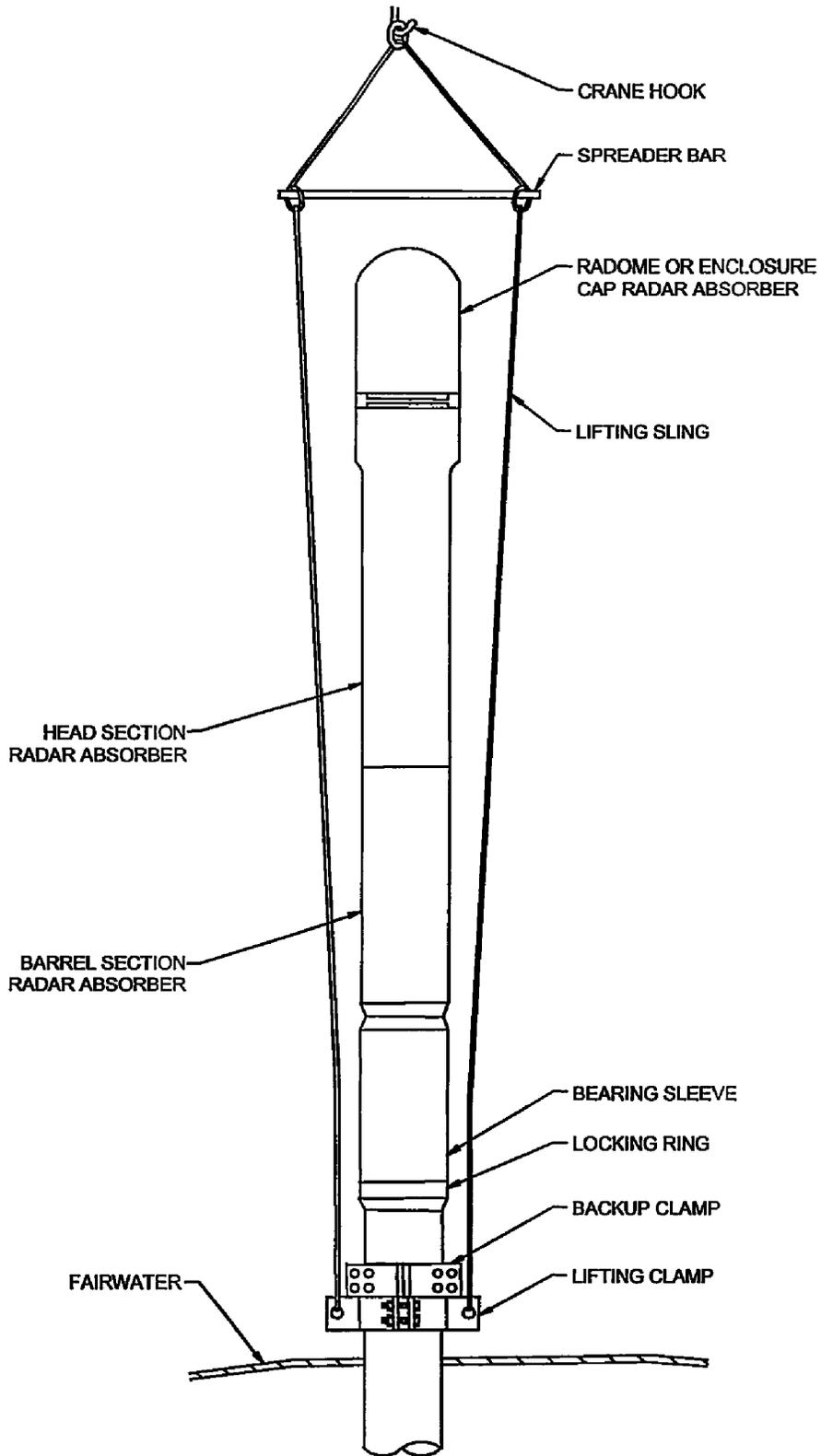


Figure 4-6 Type 15L (TZ726 Modified), Type 8J MOD-3, and Type 18H Periscopes Rigged for Removal

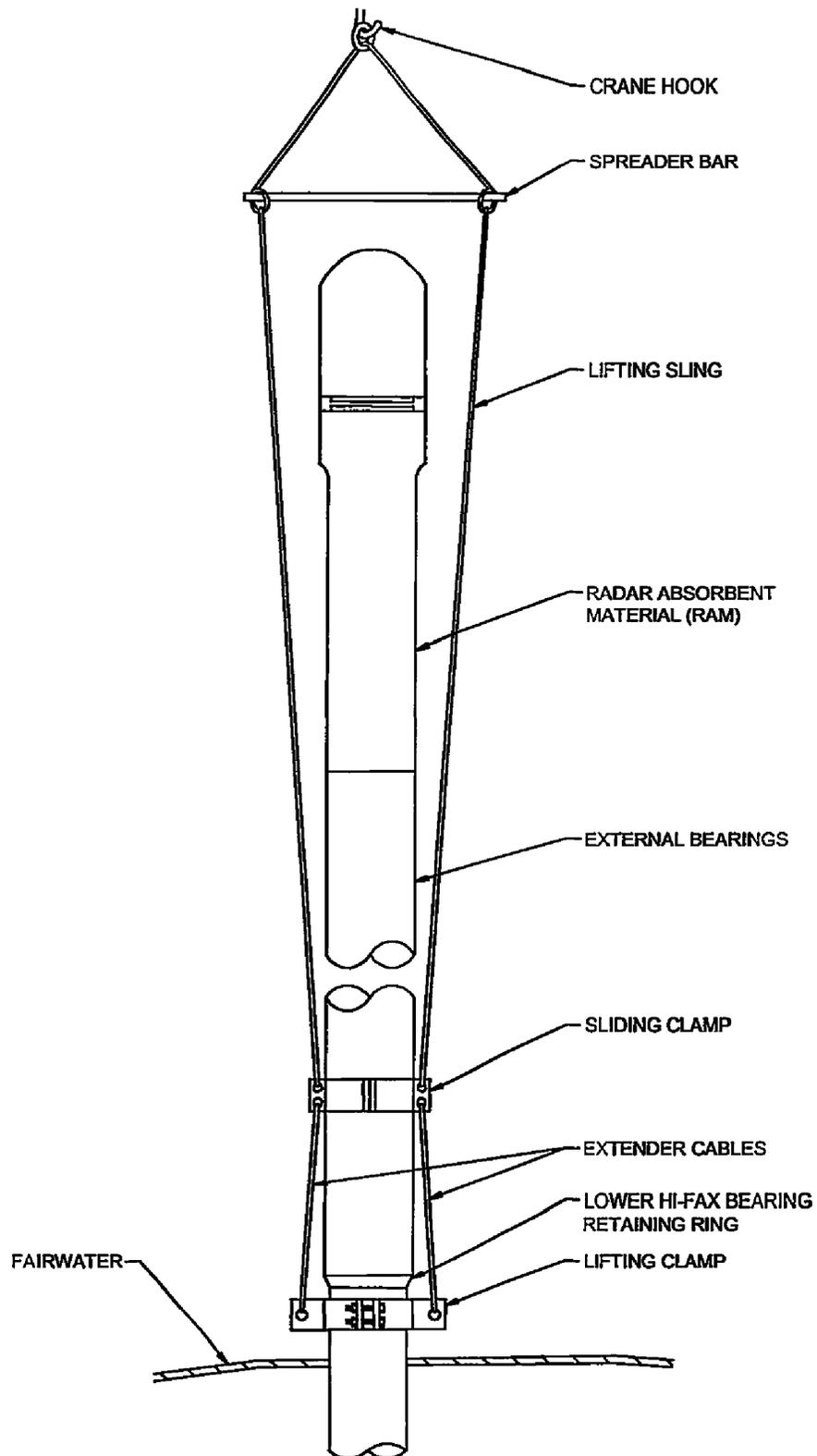


Figure 4-7 Type 18 B (with Hifax Bearings) Periscope Rigged for Removal

#### 4.4 INSTALLATION OF LIFTING CLAMP FOR REMOVAL/INSTALLATION OF BPS-15 RADAR MASTS.

### CAUTION

Do not lift the radar mast by the radar antenna.

4.4.1 PREREQUISITES. Ensure that the mandatory requirements of [Chapter 2](#) have been accomplished and that all pertinent safety precautions of [Chapter 1](#) are in effect.

4.4.2 PROCEDURE. This procedure is applicable to all class submarines with a 3-inch radar mast. The lifting clamp is to be installed in accordance with the following steps:

- a. Position the radar mast to the desired height. Close and DANGER tag the hoist cylinder isolation valves.
- b. Refer to [Table 2-1](#) and [Reference \(a\)](#) for proper clamp type. Reinspect for any possible grit or dirt on the clamp lining and install the lifting clamp snug against the mast See [Figure 4-8](#).

### NOTE

1. Aboard SSN-688 Class submarines the lifting clamp is to be installed above the mast key.
2. Aboard SSN-751 Class submarines the lifting clamp is to be installed directly below the mast key.
3. Aboard Trident Class submarines the lifting clamp is to be installed above the mast key.

### NOTE

The lifting clamp is to be installed with lifting lugs aligned perpendicular to the radar housing.

- c. Torque each of the four holddown nuts on the clamp sequentially as illustrated in [Figure 2-1](#) and in uniform increments to 60 ft-lbs.
- d. Check to ensure that all brake linings are contacting the surface of the radar mast.
- e. Check to ensure that the gaps between the ends of the clamp halves are the same on each side. The clamp halves must never make metal-to-metal contact.
- f. Disconnect the radar mast from the pedestal in accordance with applicable system technical manuals and/or drawings. The radar mast is ready for lifting at this point in the procedure.

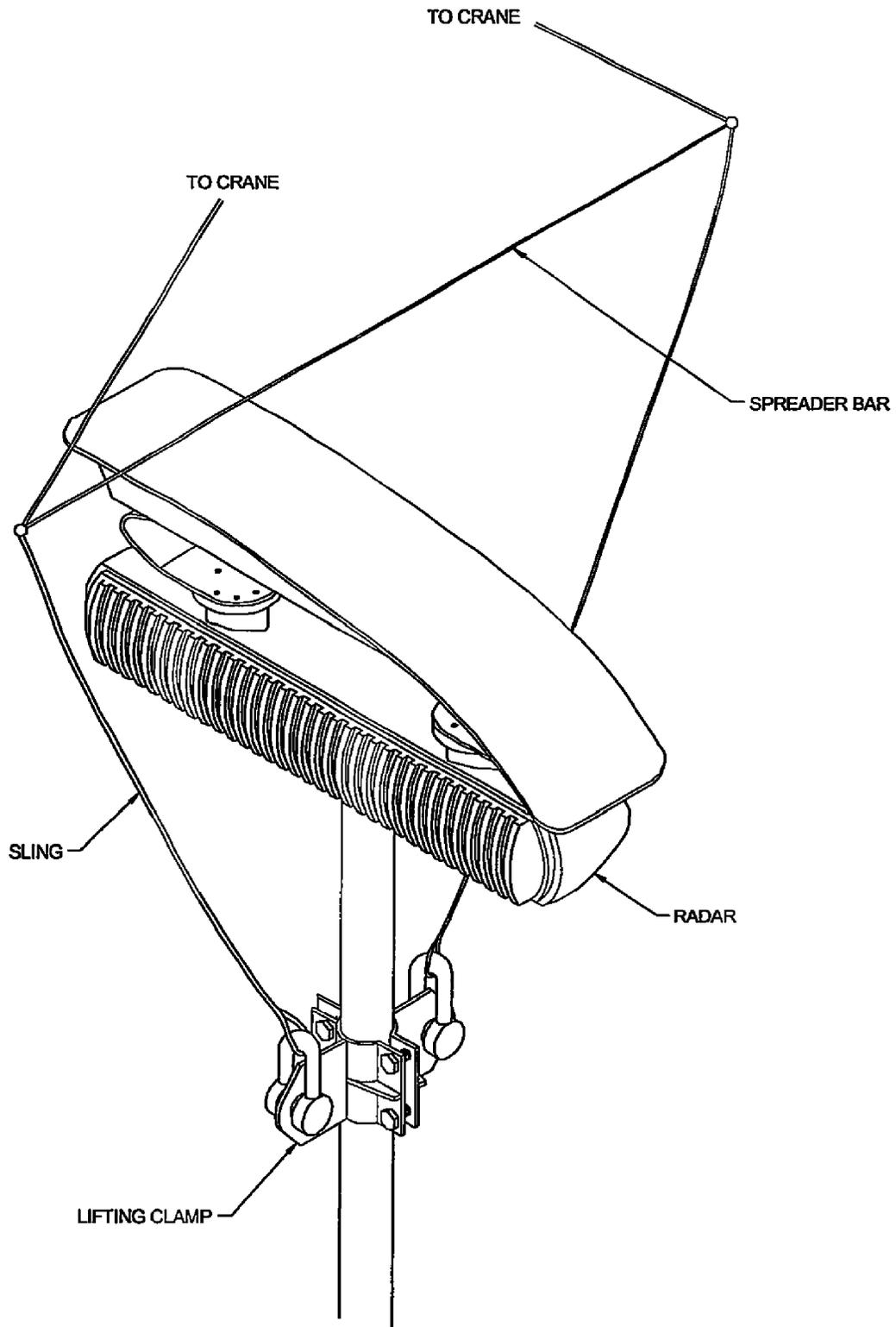


Figure 4-8 Installation of Radar Lifting Clamp

- g. When the radar mast is free of the sail, attach a tag line to the lower end of the mast to prevent unwanted mast movement.

#### 4.5 ATTACHMENT OF LIFTING SLINGS/T-BARS TO TOWED BUOY.

Attach the lifting devices (no safety clamps required) in accordance with the following:

- a. Use only authorized lifting devices of [Reference \(a\)](#) for lifting and handling the buoy antennas. The use of other methods (torpedo slings and so forth) is not allowed.
- b. Consult the applicable system technical manual or the system certification procedure for the proper methods of attaching these devices.

#### 4.6 ATTACHMENT OF E&E ADAPTER SUPPORT BARS.

Use applicable periscope set technical manual for attachment of E&E adapter support bars.

#### 4.7 ATTACHMENT OF LIFTING CLAMPS AND BACKUP TO AN/BRD-7, AN/BLD-1 AND MMM.



AN/BRD-7, AN/BLD-1, MMM mast clamps and mast clamps for AN/BRD-7 with MMM closure doors (S/A 4412) installed, extend over the snorkel mast. Close and DANGER TAG snorkel hoist cylinder isolation valves when the clamps are installed on the AN/BRD-7, AN/BLD-1, and MMM or AN/BRD-7 mast. (See [Table 2-2](#))

##### 4.7.1 INSTALLATION OF LIFTING CLAMP TO AN/BRD-7, AN/BLD-1 AND MMM ANTENNAS.

- a. Use only authorized lifting devices of [Reference \(a\)](#) for lifting and handling.
- b. Use [References \(n\)](#), [\(r\)](#) [\(t\)](#), and [\(pp\)](#) for attachment of lifting devices and removal, installation, and handling of AN/BRD-7, AN/BLD-1, and MMM antennas, for SSN-688 Class submarines and Seawolf Class submarines, respectively.
- c. Remove the MMM mast for SSN 751 - SSN 773 in accordance with [Reference \(pp\)](#).

##### 4.7.2 INSTALLATION OF LIFTING CLAMP AND BACKUP CLAMP TO AN/BRD-7 MAST WITH CLOSURE CAP INSTALLED.

- a. Attach lifting and backup clamps to AN/BRD-7 mast in accordance with [paragraph 4.1.2](#).
- b. Remove the mast for SSN-688 Class Submarines and Seawolf Class Submarines in accordance with [References \(h\)](#), [\(t\)](#), and [\(pp\)](#) respectively.

##### 4.7.3 INSTALLATION OF LIFTING CLAMP AND BACKUP CLAMP TO AN/BRD-7, AN/BLD-1 AND MMM MASTS OR AN/BRD-7 MAST WITH MMM CLOSURE DOORS (S/A 4412) INSTALLED.

- a. Attach lifting and backup clamps to AN/BRD-7, AN/BLD-1 mast, or AN/BRD-7 mast with MMM closure doors (S/A 4412) installed in accordance with [paragraph 4.1.2](#).
- b. Remove the mast for SSN-688 Class submarines in accordance with [Reference \(n\)](#).
- c. Remove the mast for Seawolf Class submarines in accordance with [Reference \(t\)](#).
- d. Remove the MMM mast for SSN 751 - SSN 773 in accordance with [\(pp\)](#).

#### 4.8 INSTALLATION OF LIFTING DEVICE TO HOIST CYLINDER.

The hoist cylinder can be removed from the sail by itself, after faired mast/antenna/inner mast removal, by use of lifting straps. An alternative method to remove a hoist cylinder is the use of a lifting clamp or lifting device.

4.8.1 INSTALLATION OF LIFTING STRAP TO HOIST CYLINDER. Lifting slings (2) are to be installed to a hoist cylinder in accordance with the following steps:



Ensure that the mandatory requirements of [Chapter 2](#) have been accomplished and that all pertinent safety precautions of [Chapter 1](#) are in effect.

- a. Obtain two nylon straps, approximately 6 feet long, with integral sewn loops on each end.

**NOTE**

Each strap should be rated and certified for minimum working load of 2,000 lbs.

**NOTE**

Inspect straps prior to using to ensure that:

1. Straps are not impregnated with oil or grease.
  2. Strap material is not frayed or damaged in any way.
  3. Strap stitching is secure and undamaged.
- b. Lower the piston rod to the lowered position.
  - c. Close and DANGER tag the hoist cylinder isolation valves.
  - d. Attach one lifting strap around the top of the hoist cylinder routed beneath the supply-to-lower, leakoff, and/or vent pipes, i.e., the strap is placed between the pipes and hoist cylinder. Route one end of the strap through the loop and cinch-up. See [Figure 4-9](#).
  - e. Attach the second lifting strap to the top of the hoist cylinder routed similarly to the previous strap and cinch-up.

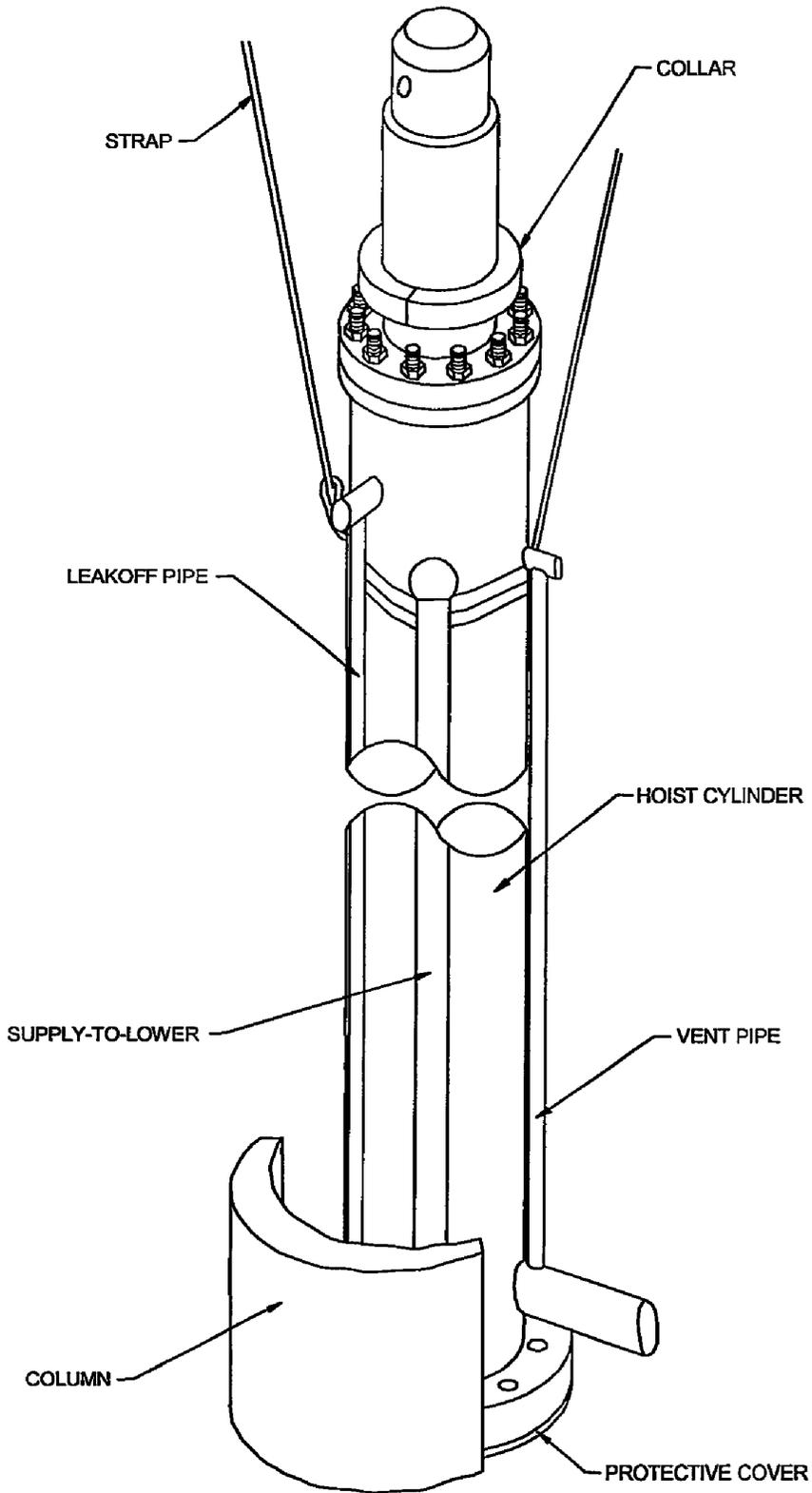


Figure 4-9 Installation of Hoist Cylinder Lifting Straps

- f. Orient the straps such that the free ends are 180° apart.
- g. Attach a 2-ton chain hoist to the crane hook and strap loops.
- h. Remove six hexagon nuts from the hoist cylinder lower flange.
- i. Torque down two jacking bolts in the hoist cylinder lower flange.
- j. Use chain hoist to remove hoist cylinder from the sail.
- k. Cover the hydraulic cylinder bottom flange to prevent dust and dirt from entering cylinder.
- l. Cover the hoist cylinder base with the flushing block.

#### 4.8.2 INSTALLATION OF LIFTING CLAMP TO 2-7/8-INCH DIAMETER HOIST CYLINDER.



Ensure that the mandatory requirements of [Chapter 2](#) have been accomplished and that all pertinent safety precautions of [Chapter 1](#) are in effect.



Use [paragraph 4.8.2](#) for removal of SSN-688 Class snorkel hoist cylinder.



Use [Reference \(s\)](#) for removal of SSBN-726 Class snorkel hoist cylinder.



Use [paragraph 4.8.4](#) for removal of the periscope hoist cylinder with the lifting device (Assy 382, [Reference \(a\)](#)).

- a. Lower the piston rod to the lowered position.
- b. Close and DANGER tag the hoist cylinder isolation valves.
- c. Refer to [Table 2-1](#) and [Reference \(a\)](#) for the proper clamp type. Attach the lifting clamp (Assembly 298, [Reference \(a\)](#)) under the hoist cylinder upper flange. See [Figure 4-10](#).



Use of thread antiseize compound on the clamp bolts is prohibited.

- d. Torque the four holddown nuts on the clamp sequentially as illustrated in [Figure 2-1](#) and in uniform increments to 20 ft-lbs.

- e. Attach lifting slings to the clamp lifting lugs. See [Figure 4-10](#).
- f. Attach a 2-ton chain hoist to the crane hook and lifting slings.
- g. Remove six hexagon nuts from the hoist cylinder lower flange.
- h. Torque down two jacking bolts in the hoist cylinder lower flange.
- i. Use chain hoist to remove the hoist cylinder from the sail.
- j. Cover the hydraulic cylinder bottom flange to prevent dust and dirt from entering cylinder.
- k. Cover the hoist cylinder base with the flushing block.

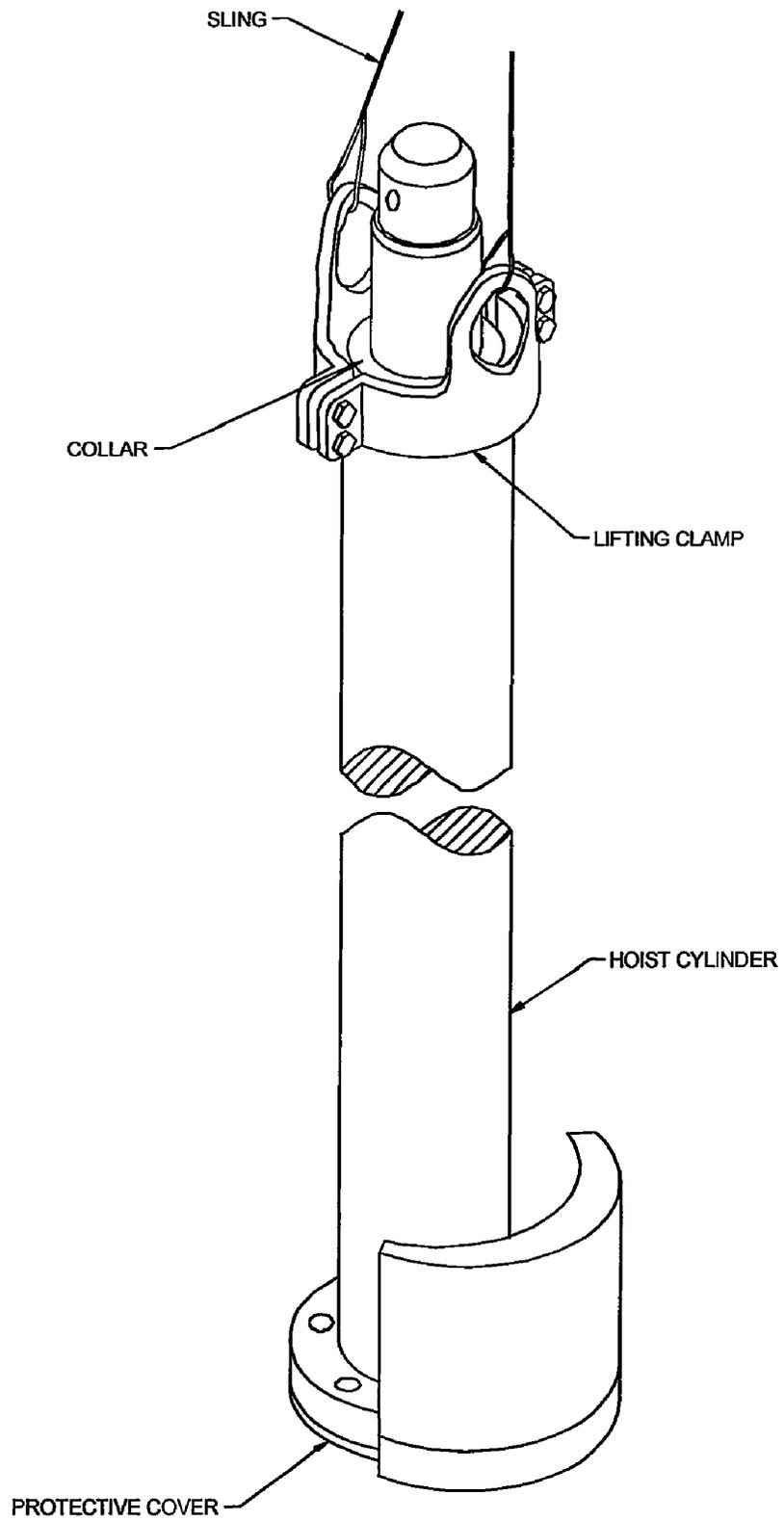


Figure 4-10 Installation of Hoist Cylinder Lifting Clamp (Assy 298)

#### 4.8.3 INSTALLATION OF LIFTING DEVICE TO 688 CLASS SNORKEL HOIST CYLINDER.



Ensure that the mandatory requirements of [Chapter 2](#) have been accomplished and that all pertinent safety precautions of [Chapter 1](#) are in effect.

- a. Lower the piston rod to the lower position.
- b. Close and DANGER tag the hoist cylinder isolation valves.
- c. Attach the lifting device (Assy 377, [Reference \(a\)](#)) under the hoist cylinder upper flange. See [Figure 4-11](#).



Use of thread antiseize compound on the bolts is prohibited.

- d. Torque the holddown nuts on the device sequentially and in uniform increment to 20 ft-lbs.
- e. Attach lifting slings to the swivels. [Figure 4-11](#).
- f. Attach a 2-ton chain hoist to the crane and lifting slings.
- g. Remove six hexagon nuts from the hoist cylinder lower flange.
- h. Torque down two jacking bolts in the hoist cylinder lower flange.
- i. Use chain hoist to remove the hoist cylinder from the sail.
- j. Cover the hydraulic cylinder bottom flange to prevent dust and dirt from entering cylinder.
- k. Cover the hoist cylinder base with the flushing block.

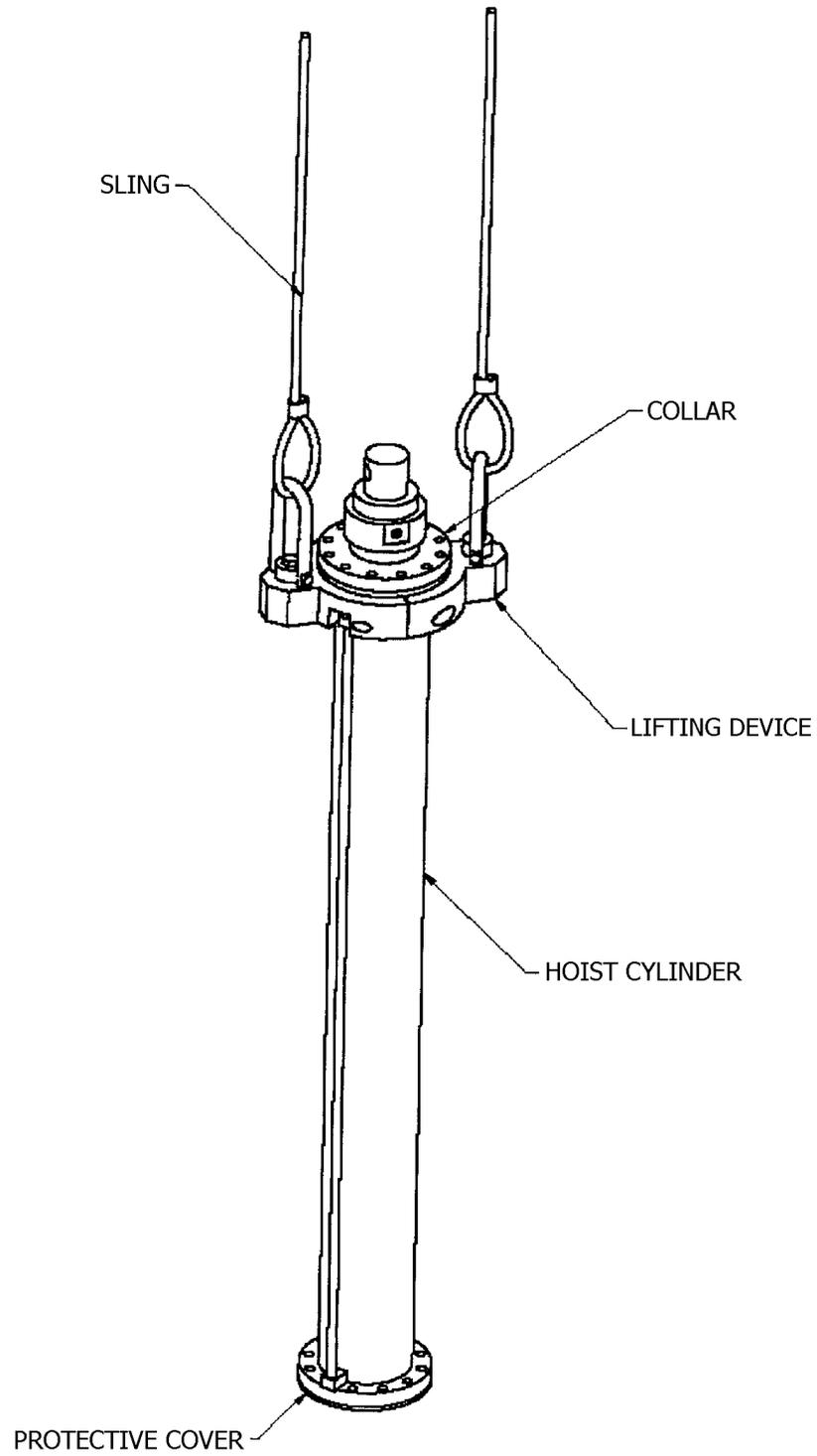


Figure 4-11 Installation of Hoist Cylinder Lifting Device (Assy 377)

#### 4.8.4 INSTALLATION OF LIFTING DEVICE TO PERISCOPE HOIST CYLINDER.



Ensure that the mandatory requirements of [Chapter 2](#) have been accomplished and that all pertinent safety precautions of [Chapter 1](#) are in effect.

- a. Raise the piston rod about a foot.
- b. Install the installation fixture and hand tight the screws, see [Figure 4-11A](#).
- c. Close and DANGER tag the hoist cylinder isolation valves.
- d. Attach the lifting device (Assy 382, [Reference \(a\)](#)) under the hoist cylinder upper flange. See [Figure 4-11A](#).



Use of thread antiseize compound on the bolts is prohibited.

- e. Torque the holddown nuts on the device sequentially and in uniform increment to 20 ft-lbs.
- f. Attach lifting slings to the swivels, [Figure 4-11A](#).
- g. Attach a 2-ton chain hoist to the crane and lifting slings.
- h. Remove six hexagon nuts from the hoist cylinder lower flange. (If FC-30 installed, remove 3 nuts and 3 bolts.)
- i. (FC-30 only) Install three installation rods.
- j. Torque down two jacking bolts in the hoist cylinder lower flange.
- k. Use chain hoist to remove the hoist cylinder from the sail.
- l. Cover the hydraulic cylinder bottom flange to prevent dust and dirt from entering cylinder.
- m. Cover the hoist base with the flushing block.

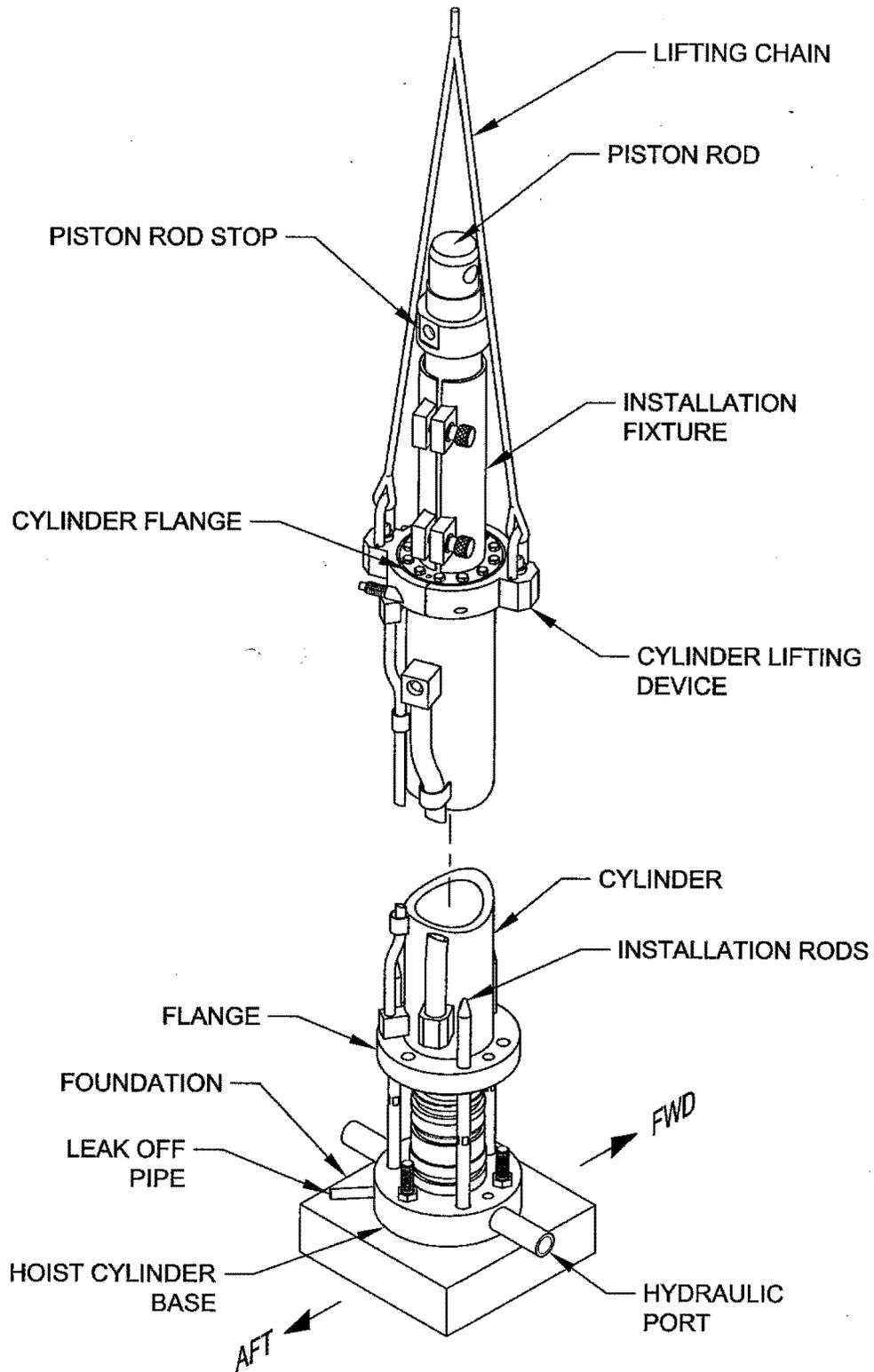


Figure 4-11A Installation of Hoist Cylinder Lifting Device (Assy 382)

## 4.9 INSTALLATION OF LIFTING AND BACKUP CLAMPS FOR REMOVAL/INSTALLATION OF SNORKEL INNER INDUCTION PIPE.

4.9.1 PREREQUISITE. Ensure that the mandatory requirements of [Chapter 2](#) have been accomplished and that all pertinent safety precautions of [Chapter 1](#) are in effect before any lifting is attempted.

4.9.2 INSTALLATION OF LIFTING CLAMP WITH BACKUP CLAMP.



In addition to a lifting clamp, a backup clamp ([Figure 4-12](#)) is a mandatory requirement for personnel safety when lifting snorkel inner induction pipe. Ensure that the mandatory requirements of [Chapter 2](#) have been accomplished and that all other pertinent safety precautions of [Chapter 1](#) are in effect.



To prevent interference between the snorkel inner induction pipe and mast bearing assemblies for SSN 688 Class snorkels which do not have the split ring base design, remove the mast bearing assemblies prior to removing the snorkel inner induction pipe out of the sail.

- a. Refer to [Table 2-1](#) and [Reference \(a\)](#) for the proper clamp type and install the lifting clamp first.
- b. Fit each clamp half to the pipe surface and ensure that they properly conform to the shape of the pipe.
- c. Position the lifting clamp on the pipe so that the backup clamp will be at least 12 inches below the top of the snorkel inner induction pipe. See [Figure 4-12](#).



Use of thread antiseize compound on the clamp bolts is prohibited.

- d. Torque the four holddown nuts on the clamp sequentially as illustrated in [Figure 2-1](#) and in uniform increments until the proper torque value provided in [Table 3-1](#) has been attained on each bolt.



1. All bolts should be installed and snugged up before torquing.
2. Torque should be applied slowly and evenly until the specified torque is reached.
3. The bolts should be cross-tightened as shown in [Figure 2-1](#). It may be necessary to cross-tighten two or three times before an even tightness is reached.

4. The bolts, when installed and tightened, should protrude a distance of at least one thread beyond the top of the nut.
- e. Check to ensure that all brake linings are contacting the surface of the tube.
- f. Check to ensure the gaps between the clamp halves are the same on each side (or end) of the pipe. The clamp halves must never make metal-to-metal contact.
- g. Wait 10 minutes to allow the clamping force to redistribute, then recheck the holddown nuts for the proper torque value provided in [Table 3-1](#).
- h. If the proper torque value is not maintained, repeat [steps 4.1.2.d](#) through [4.1.2.g](#).

**NOTE**

Orient the backup clamp with the lugs 90° from the lifting clamp.

- i. Install the backup clamp above and snug against the lifting clamp following the procedure of [steps 4.1.b](#) through [4.1.h](#).

**CAUTION**

Prior to attempting system removal, ensure that all necessary components are removed in accordance with the applicable system technical manuals and/or drawings.

- j. To prevent the pipe from damage, attach the lifting slings with a spreader bar to the lower clamp lifting lugs.

**NOTE**

At this point in the procedure, the inner induction pipe is ready for lifting.

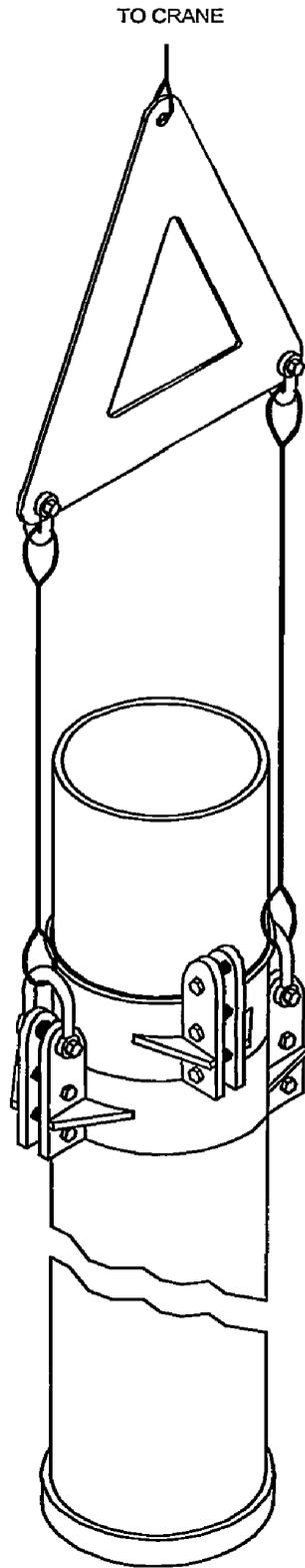


Figure 4-12 Installation of Snorkel Inner Induction Pipe Lifting Clamp

#### 4.10 INSTALLATION OF RADAR LIFTING DEVICE FOR REMOVAL/INSTALLATION OF BPS-16 RADAR MAST.

Use [References \(u\)](#) and [\(gg\)](#) for attachment of radar lifting device and removal, installation and handling of BPS-16 radar masts.

#### 4.11 INSTALLATION OF LIFTING ASSEMBLY FOR REMOVAL/INSTALLATION OF SUB HDR AND ACM ANTENNA MAST ASSEMBLIES.

4.11.1 PREREQUISITES AND METHODS. Ensure that the mandatory requirements of [Chapter 2](#) have been accomplished and that all pertinent safety precautions of [Chapter 1](#) are in effect.

4.11.2 INSTALLATION OF SUB HDR AND ACM ANTENNA LIFTING ASSEMBLY. This procedure is applicable to the antenna lifting assembly listed in [Table 2-1](#) and in [Reference \(y\)](#). The method for installation of the antenna lifting assembly is given below and is illustrated in [Figures 4-13](#) and [4-14](#).



Ensure that the mandatory requirements of [Chapter 2](#) have been accomplished and that all pertinent safety precautions of [Chapter 1](#) are in effect.

- a. Installation with antenna mast assembly horizontal
  1. Slide the lifting ring assembly opening around the FWD or AFT end of the inner mast (swivel hoist rings on topside).
  2. Lift and rotate the lift ring assembly up to the antenna radome flange, so that the FWD line etched on the lift ring is facing fwd.
  3. Install the six 1/4-20UNC x 2 captured hex head bolts (grade 5) into the radome flange threaded hole until hand-tight.
  4. Tighten all six bolts using a 7/16-inch socket or wrench.
  5. Attach all four slings to the four-point lift beam.
  6. Attach the other four ends of each sling to each swivel hoist ring on the lifting ring assembly. Orientation of the four point lift beam to the antenna mast assembly is not important. Ensure slings are not twisted or tangled.
- b. Installation with antenna mast assembly vertical
  1. Attach all four slings to the four-point lift beam.
  2. Attach the other four ends of each sling to each swivel hoist ring on the lifting ring assembly. Orientation of the four-point lift beam to the lifting ring assembly is not important. Ensure slings are not twisted or tangled.
  3. Have the crane operator swing the lifting assembly to the front of the antenna so that the lifting ring can be inserted around the FWD end of the antenna inner mast.
  4. Slide the lifting ring assembly opening around the FWD end of the inner mast.
  5. Lift and rotate the lift ring assembly up to the antenna radome flange, so that the FWD line etched on the lift ring is facing FWD.

6. Install the six 1/4-20UNC x 2 captured hex head bolts (grade 5) into the radome flange threaded holes until hand-tight.
7. Tighten all six bolts using a 7/16-inch socket or wrench.

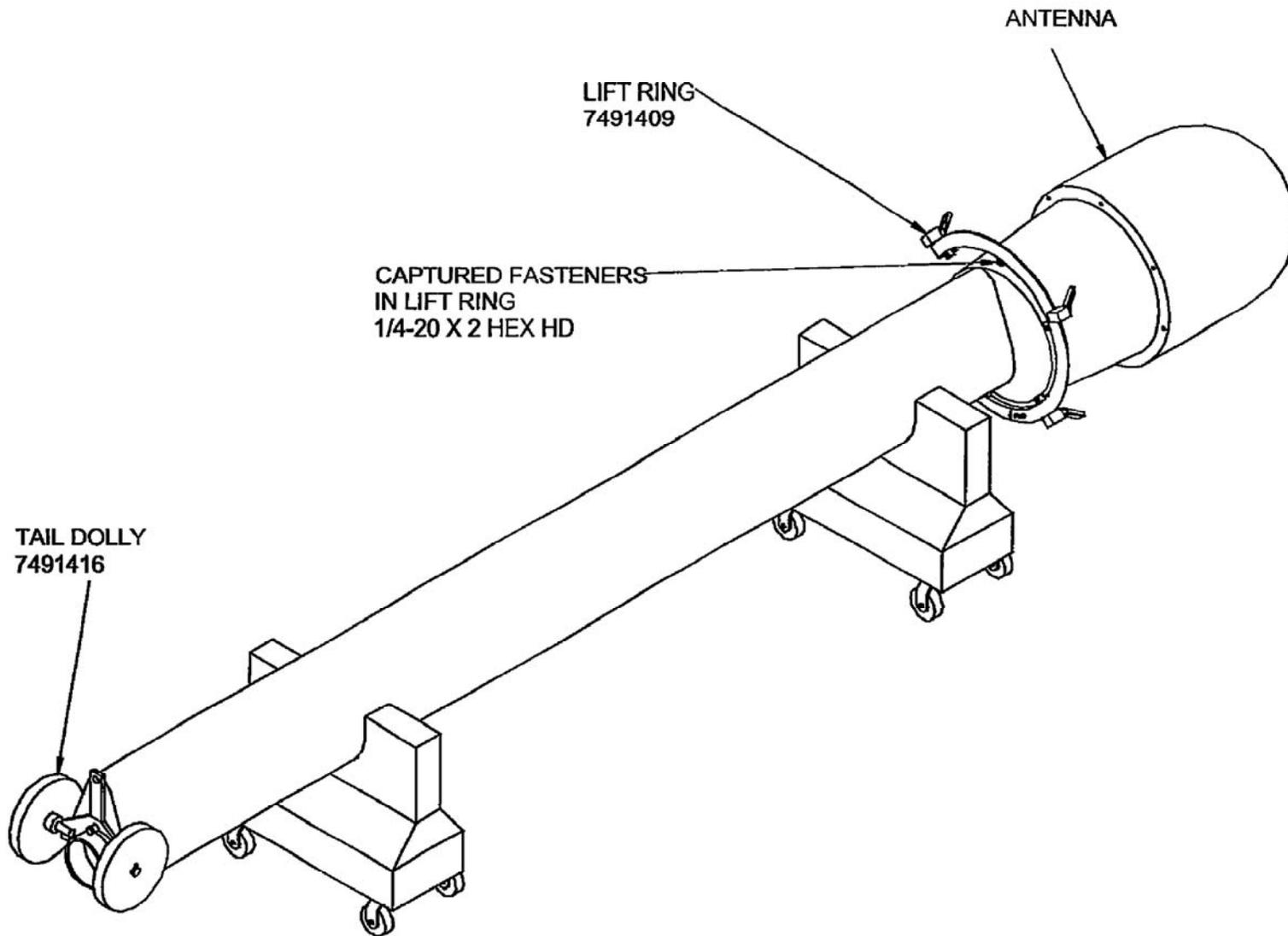


Figure 4-13 SUB HDR, ACM Antenna Installation of Lift Ring

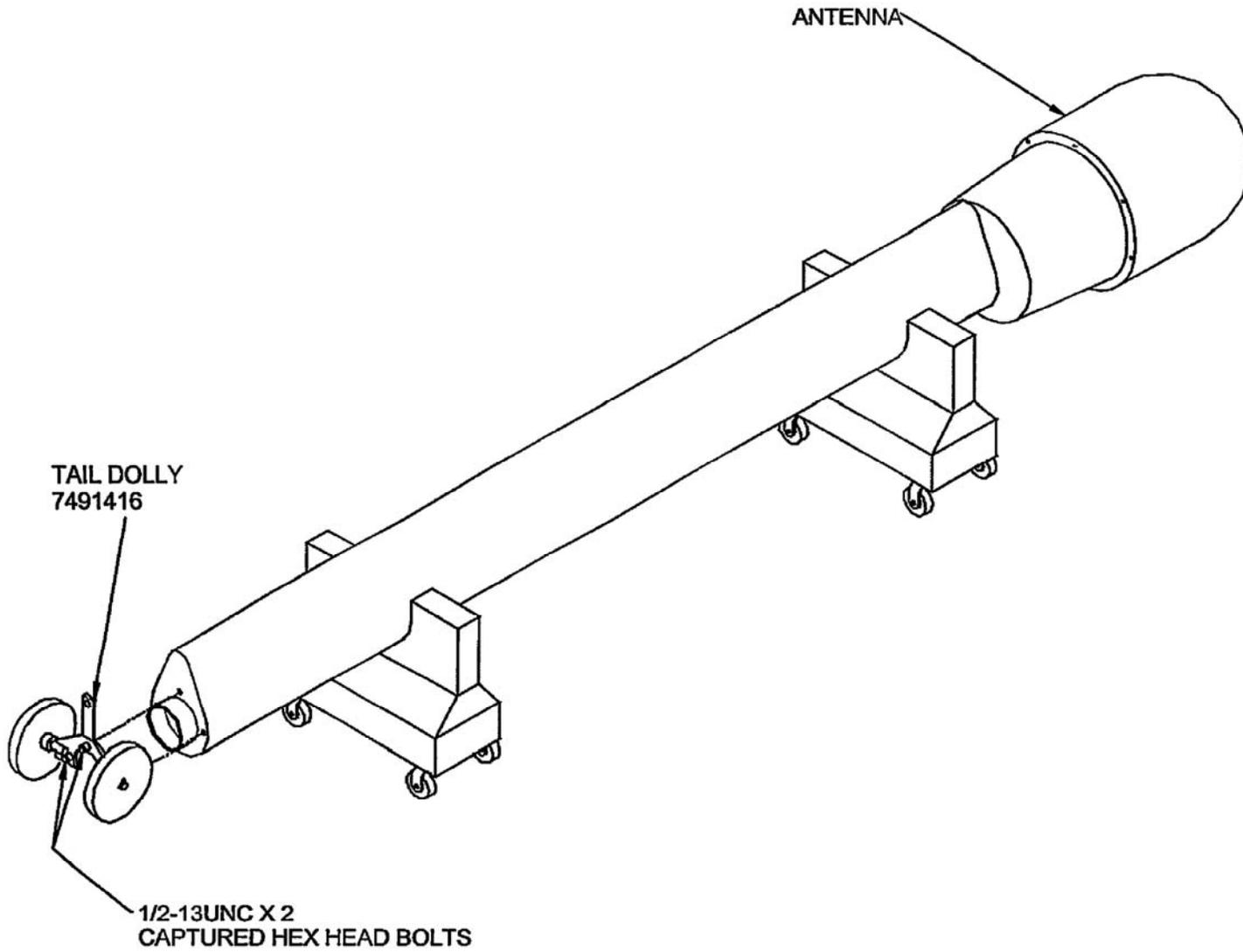


Figure 4-14 SUB HDR, ACM Antenna Installation of Tail Dolly

## 4.12 INSTALLATION OF HDR ANTENNA TAIL DOLLY TO ASSIST REMOVAL/INSTALLATION OF SUB HDR, OE-538, OE-207/BR, OE-592/BRC, and ACM ANTENNA MAST ASSEMBLIES.

4.12.1 PREREQUISITES AND METHODS. Ensure that the three captive 1/2-13UNC x 2 hex head bolts (grade 5) are not bent, damaged, or missing.

4.12.2 INSTALLATION OF ANTENNA TAIL DOLLY. The method for installation of the antenna tail dolly is given below and is illustrated in [Figures 4-14](#) and [4-15](#).

a. SUB HDR and ACM antenna mast assembly:

1.



**CAUTION**

When using the antenna tail dolly on a SUB HDR and ACM antenna mast assemblies, mast orientation when rotating the mast to or from the vertical position will have the forward end facing down. Rotate the antenna tail dolly around the antenna connector, so that the semicircular mounting ring is positioned aft. See [Figure 4-14](#)

2. Install the three 1/2-13UNC x 2 captured hex head bolts (grade 5) into the antenna baseplate mounting holes, until hand-tight.
3. Tighten all three bolts using a 3/4-inch socket or wrench.

b. OE-538, OE-207/BR, and OE-592/BRC antenna mast assemblies:

1. Rotate the antenna tail dolly around the antenna connector, so that the semicircular mounting ring is positioned port or stbd. See [Figure 4-15](#)

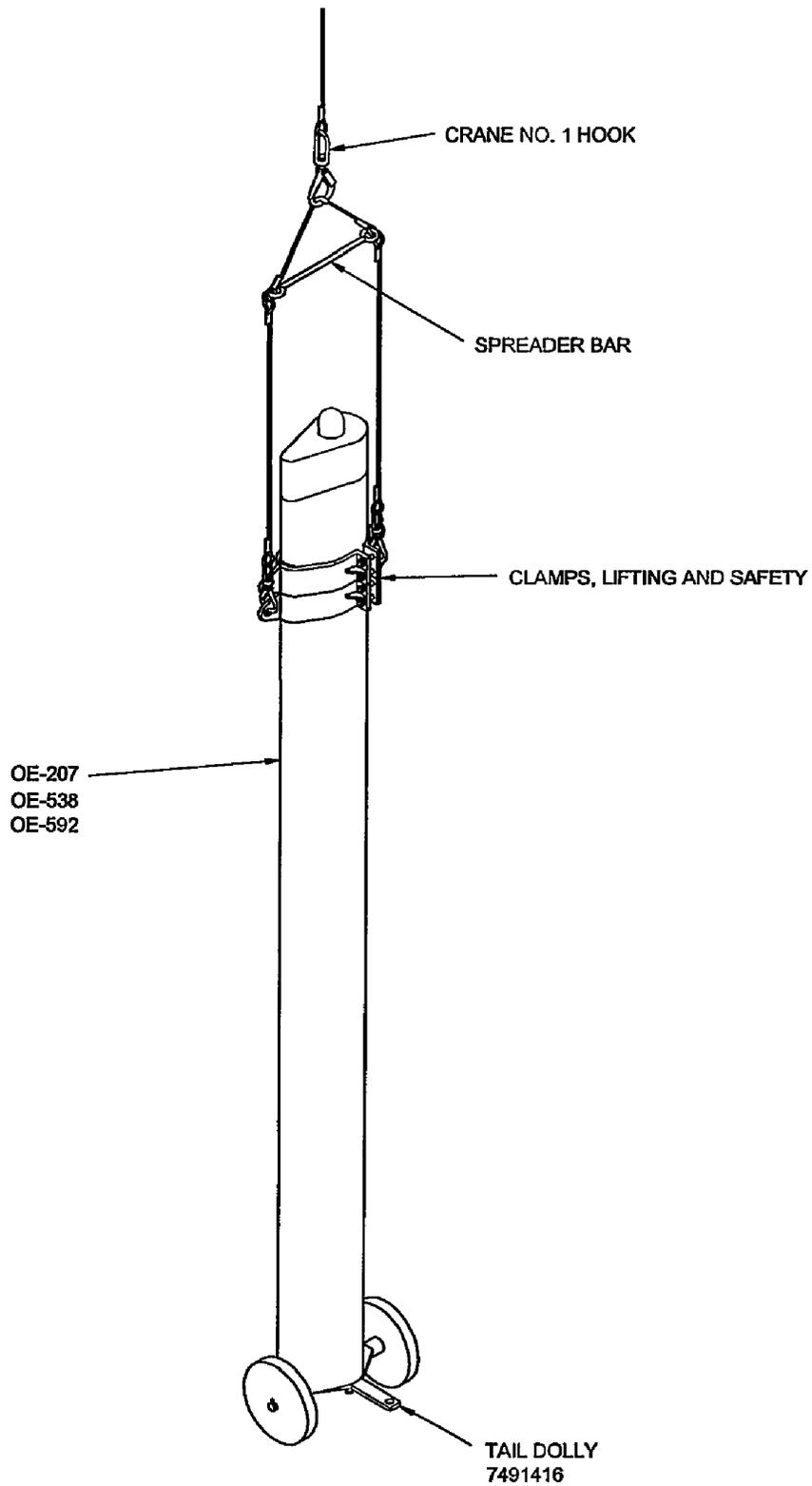


Figure 4-15 Tail Dolly Lifting Arrangement for OE-207, OE-538, or OE-592 Antenna

2. Install the three 1/2-13UNC x 2 captured hex head bolts (grade 5) into the antenna baseplate mounting holes, until hand-tight.
3. Tighten all three bolts using a 3/4-inch socket or wrench.

#### **4.13 INSTALLATION OF HYDRAULIC HOIST CYLINDER DOLLY TO ASSIST REMOVAL/INSTALLATION OF SUB HDR, ACM, OE-538, OE-207, OE-592, NAVSAT AND BRD-7 FAIRED MAST ASSEMBLIES.**

4.13.1 PREREQUISITES AND METHODS. Ensure that the three 1/2-13UNC x 2 hex head bolts (grade 5) are not bent, damaged, or missing.

4.13.2 INSTALLATION OF HYDRAULIC HOIST CYLINDER DOLLY. The method for installation of the hydraulic hoist cylinder dolly is given below and is illustrated in [Figure 4-16](#).

- a. Install the special 6 hole FME plate with gasket over the hoist cylinder lower end. Rotate the plate so that the FWD line on the plate is facing forward.
- b. Install the three 5/8-11UNC x 2-1/2 hex head bolts and nuts through the holes marked with an "H" on the FME plate. Tighten the bolts and nuts with a 15/16-inch wrench and socket combination, so that any residual oil in the hydraulic cylinder cannot escape.
- c. The dolly assembly's three threaded bosses shall be aligned with the three free holes on the FME plate, so that the wheel orientation is facing port and starboard by rotating the dolly assembly so that the FWD line is facing forward.
- d. Insert and tighten the three 1/2-13UNC x 2-3/4 hex head bolts (grade 5) through the hoist cylinder flange top surface into the three threaded bosses on the dolly assembly, with a 3/4-inch wrench.

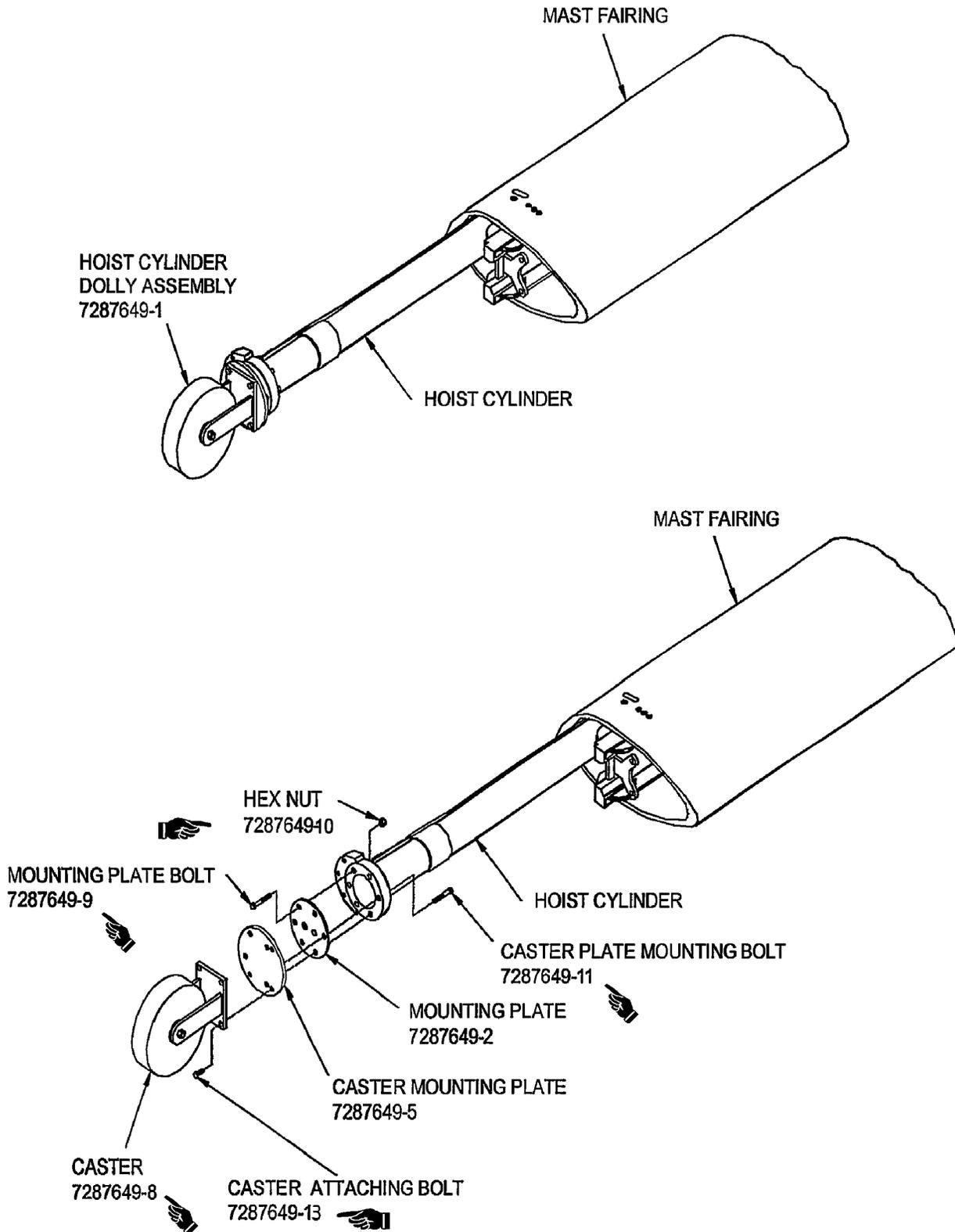


Figure 4-16 Installation of Hoist Cylinder Dolly

**4.14 ATTACHMENT OF LIFTING DEVICES TO UNIVERSAL MODULAR MAST.**

Use [Reference \(dd\)](#) for attachment of lifting devices for installation and handling of Universal Modular Mast.

**4.15 INSTALLATION OF LIFTING DEVICE FOR REMOVAL/INSTALLATION OF UNCOVERED SAIL SYSTEMS.**

For the uncovered sail systems, such as SSN-688 Class AN/WLR-9 hydrophone, and Seawolf Class HF/AE hydrophone and navigation lights, should be removed/installed in accordance with the local approved procedures.



## CHAPTER 5

### PROCEDURES FOR INSTALLING HORIZONTAL LIFTING DEVICES

#### 5.1 PREPARATION FOR A HORIZONTAL LIFT WITH LIFTING DEVICES.

#### NOTE

1. Paragraphs 5.1 and 5.2 are the recommended methods to lift the sail systems horizontally and rotate them to the vertical position, or vice versa. Due to the equipment and/or conditional limitations, the local approved alternative method may be used to handle the sail systems.
2. Refer to paragraphs 5.3 and 5.4 for SUB HDR and ACM horizontal lift.
3. Refer to paragraph 5.5 for periscope horizontal lift.
4. Refer to paragraph 5.6 for the snorkel inner induction pipe horizontal lift.

#### 5.1.1 PROCEDURE TO LIFT THE MAST ASSEMBLY OR INNER MAST FROM THE CHOCKS/TIMBERS AS FOLLOWS:

#### NOTE

BRD-7 and BRD-7/BLD-1 antenna mast can be horizontally lifted without the antenna.

- a. Install the lifting/backup clamps, safety stop pin, or lifting devices on the mast assembly or inner mast in accordance with paragraph 4.1.
- b. Attach a horizontal lifting clamp on the lower end of the mast assembly or inner mast in accordance with paragraph 4.1. See Figures 5-1, 5-2, and 5-3 for rigging guidance.

#### NOTE

1. If applicable, the lower edge of the horizontal lifting clamp is to be installed a minimum of 5 inches above the lower end of the channel or sigma section, except the periscope and snorkel faired masts.
  2. For the periscope faired mast, the lower edge of the horizontal lifting clamp is to be installed a minimum of 12 inches above fairing end.
  3. For the snorkel faired mast, the lower edge of the horizontal lifting clamp is to be installed about 12 inches above the fiberglass fairing end.
- c. Ensure that the components (such as the radome), which might slide out of the mast and upset the center of balance, are properly restrained with line.

**CAUTION**

Prior to reinstallation, the horizontal lifting clamp must be removed before attempting to lower the mast assembly or inner mast into the bearing frame or faired mast.

- d. Attach a second crank hook to the horizontal lifting clamp. If the second crane hook is not available, rig a chain hoist that allows one crane hook to pick up both ends of the mast.

**WARNING**

To prevent the system swinging during transportation, keep the mast assembly level.

- e. The system is ready to be horizontally lifted and rotated to the vertical position by lowering the second crane hook or adjusting the chain hoist length.

5.1.2 PROCEDURE TO LOWER THE MAST ASSEMBLY OR INNER MAST ONTO THE CHOCKS/TIMBERS AS FOLLOWS:

**NOTE**

BRD-7 and BRD-7/BLD-1 antenna mast can be horizontally lifted without the antenna.

- a. Lift the mast assembly or inner mast with the crane out of the sail.
- b. Lower the system about 3 feet above the ground. Attach a horizontal lifting clamp on the lower end of the faired mast or inner mast in accordance with [paragraph 4.1](#). See [Figures 5-1](#), [5-2](#), and [5-3](#) for rigging guidance.

**NOTE**

- 1. If applicable, the lower edge of the horizontal lifting clamp is to be installed a minimum of 5 inches above the lower end of the channel or sigma section, except the periscope and snorkel faired masts.
  - 2. For the periscope faired mast, the lower edge of the horizontal lifting clamp is to be installed a minimum of 12 inches above fairing end.
  - 3. For the snorkel faired mast, the lower edge of the horizontal lifting clamp is to be installed about 12 inches above the fiberglass fairing end.
- c. Ensure that the components (such as the radome), which might slide out of the mast and upset the center of balance, are properly restrained with line.

- d. Attach a second crank hook to the horizontal lifting clamp. If the second crane hook is not available, rig a chain hoist that allows one crane hook to pick up both ends of the mast.



To prevent the system swinging during transportation, keep the mast assembly level.

- e. The system is ready to be rotated to the horizontal position by raising the second crane hook or adjusting the chain hoist length.

## 5.2 PREPARATION FOR A HORIZONTAL LIFT WITH DOLLY

### NOTE

1. Paragraphs 5.1, and 5.2 are the recommended methods to lift the sail systems horizontally and rotate them to the vertical position, or vice versa. Due to the equipment and/or conditional limitations, the local approved alternative method may be used to handle the sail systems.
2. Paragraph 5.2 does not apply to the periscope and snorkel faired mast.
3. Paragraph 5.2 only applies to the antenna (see Figure 4-15) and 2-7/8" diameter hoist cylinder (see figure 4-16).
4. Refer to paragraphs 5.3 and 5.4 for SUB HDR and ACM.
5. Refer to paragraph 5.5 for periscope.

### 5.2.1 PROCEDURE TO LIFT THE MAST ASSEMBLY AND ANTENNA FROM THE CHOCKS/TIMBERS AS FOLLOWS:

- a. Install the lifting/backup clamps, safety stop pin, or lifting devices onto the mast assembly or antenna in accordance with paragraph 4.1.
- b. Attach the antenna tail dolly or hoist cylinder dolly assembly on the lower end of the antenna or hoist cylinder in accordance with applicable paragraphs 4.11 and 4.12. See Figures 4-14, 4-15, and 4-16 for rigging guidance.
- c. Ensure that the components (such as the radome), which might slide out of the mast and upset the center of balance, are properly restrained with line.

### CAUTION

Lift the system slowly and use the hand line to control and guide the dolly travel.

- d. Attach the crank hook to the lifting devices and a hand line to the dolly assembly. The system is ready to be rotated to the vertical position on the dolly assembly.

5.2.2 PROCEDURE TO LOWER THE MAST ASSEMBLY AND ANTENNA ONTO THE CHOCKS/TIMBERS AS FOLLOWS:

- a. Lift the mast assembly or antenna with the crane out of the sail.
- b. Lower the system about 3 feet above the ground.
- c. Attach the antenna tail dolly or hoist cylinder dolly assembly onto the lower end of the antenna or hoist cylinder in accordance with applicable [paragraphs 4.11](#) and [4.12](#). See [Figures 4-14](#), [4-15](#), and [4-16](#) for rigging guidance.
- d. Ensure that the components (such as the radome), which might slide out of the mast and upset the center of balance, are properly restrained with line.
- e. Lower the system until the dolly contacts the ground.
- f. The system is ready to be lowered and rotated to the horizontal position.

**NOTE**

Attach a hand line to the dolly and use the hand line to control and guide the dolly travel.

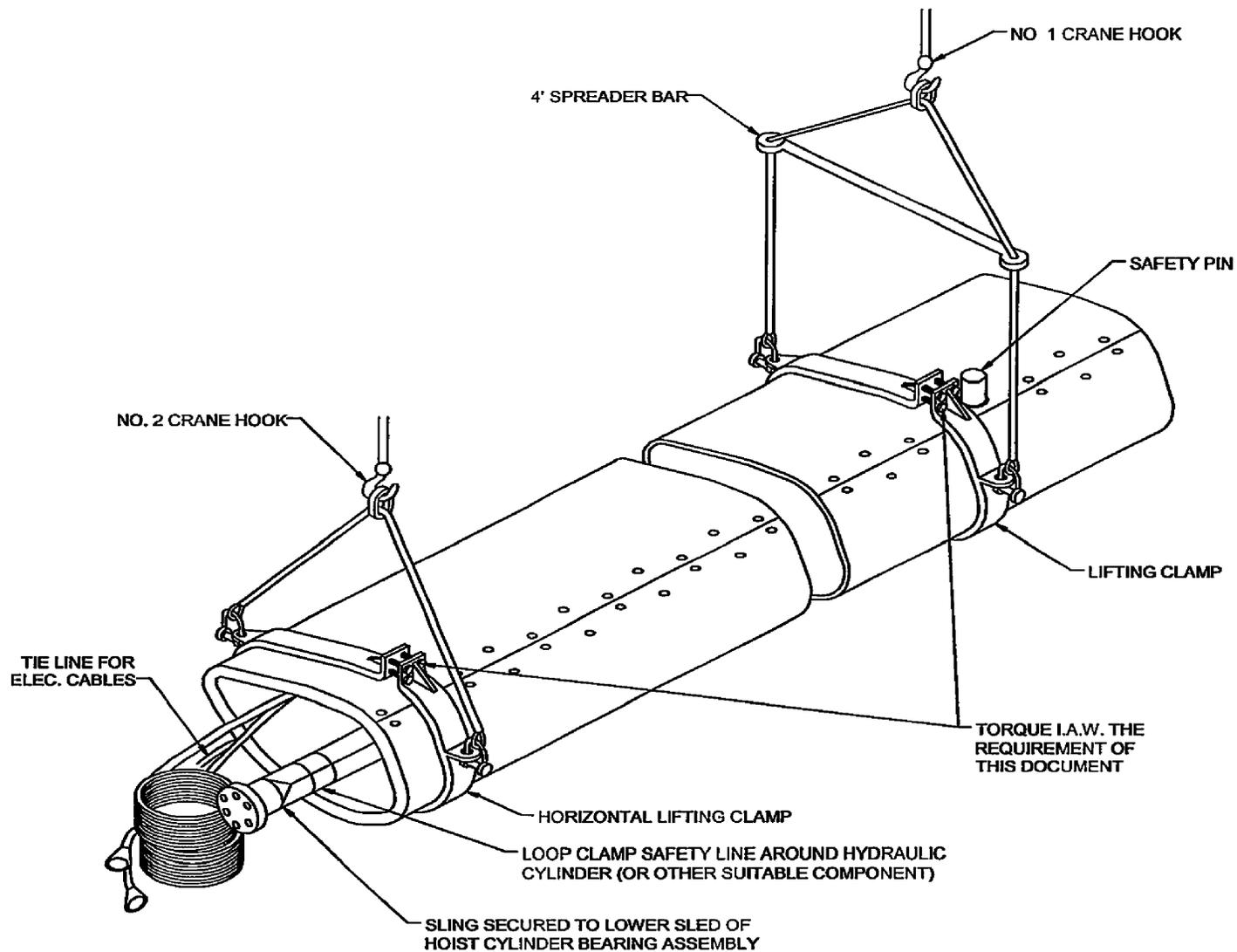


Figure 5-1 Faired Mast Assembly Rigged for Horizontal Lift

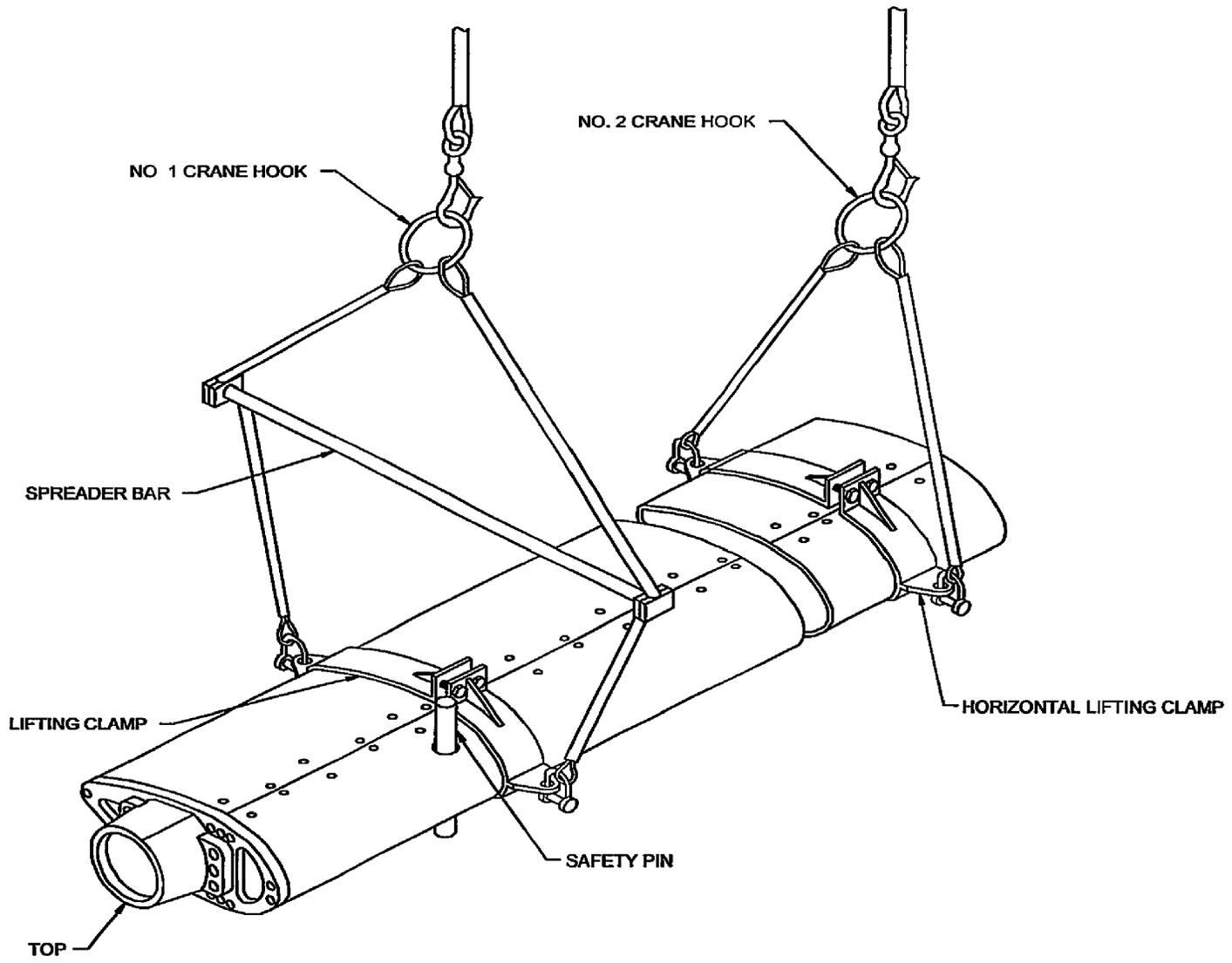


Figure 5-2 Periscope Independent Fairing Horizontal Positioning

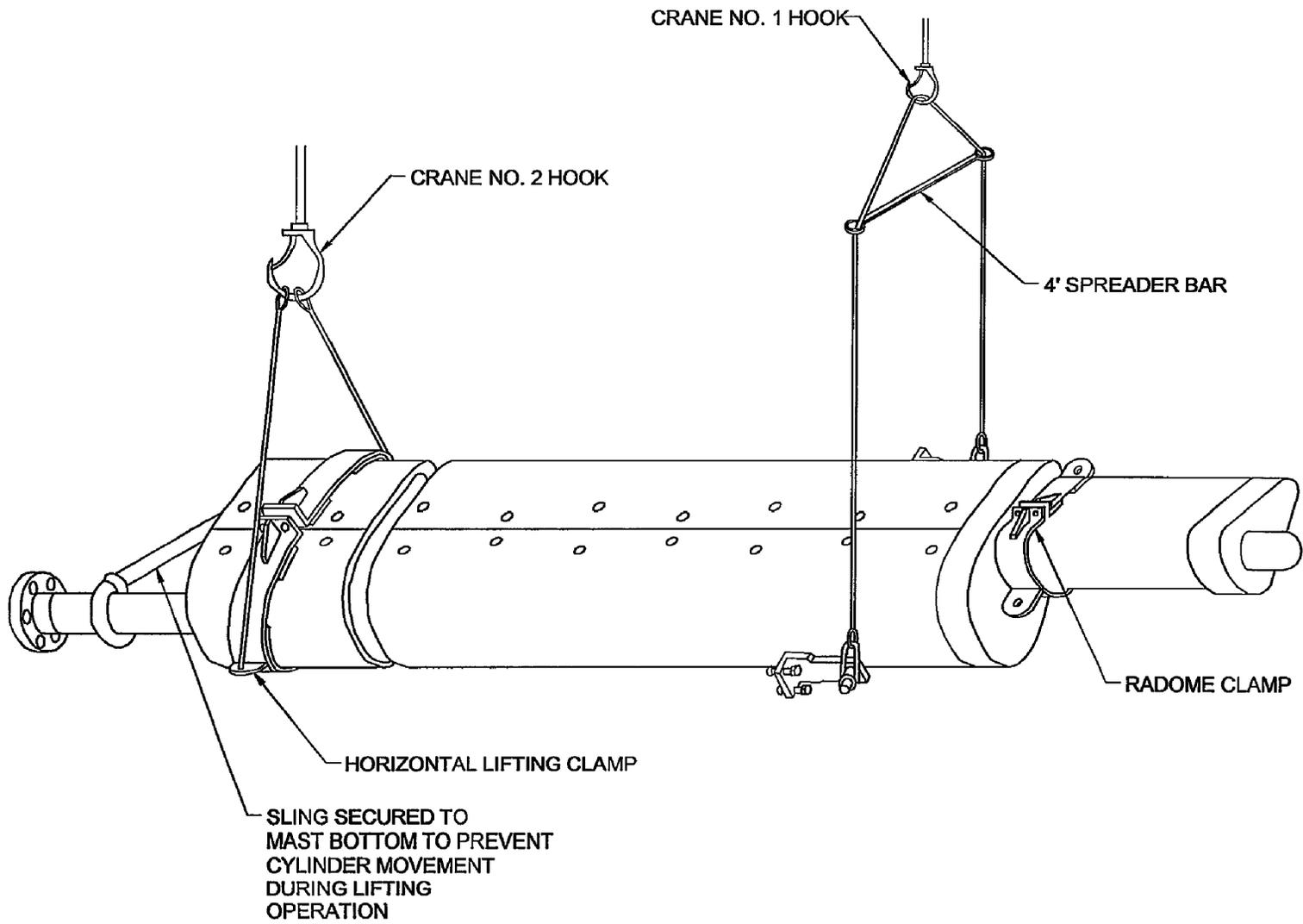


Figure 5-3 Faired Mast Assembly With MACHALT - ECP-560 Installed Rigged for Horizontal Lift

### 5.3 LIFTING THE SUB HDR AND ACM ANTENNA MAST ASSEMBLIES.

#### CAUTION

The antenna mast assembly should **NEVER** be lifted with the faired mast assembly.

#### 5.3.1 LIFTING THE FAIRED MAST ASSEMBLY TO SAIL (Two Hook Crane Lift).

- a. Ensure that the hydraulic cylinder is fully extended. The top of the inner mast lower bearing shall be within 3/4 inch from the top of the fairing access opening cut-out.

#### NOTE

There is no need for a nylon strap to be installed between the cylinder and fairing to prevent cylinder movement, because the cylinder is fully extended.

- b. Ensure that the FWD & AFT lifting devices are installed in accordance with [paragraph 4.1.4.2](#).
- c. Install a tag line to the base of the hydraulic cylinder.
- d. Attach a nylon strap to the hoist cylinder as shown on [Figure 5-4](#).
- e. Prepare cylinder base and faired mast in accordance with applicable [References \(w\), \(ll\), \(nn\), and \(oo\)](#).
- f. Attach crane hook No. 1 to each lifting device swivel hoist ring using a minimum 32-inch length spreader bar assembly. It is recommended that one ton or greater chain-falls be installed between the fwd and aft lifting device swivel hoist rings and spreader bar assembly. The chain-falls shall be adjusted to equal lengths. Attach crane hook No. 2 to the hoist cylinder nylon strap as shown in [Figure 5-4](#).
- g. Crane lift the faired mast assembly in a horizontal position to a height that will allow rotation to the vertical position.

#### CAUTION

Ensure that there is sufficient clearance around the faired mast assembly before rotating to the vertical position.

- h. Use the crane to rotate the faired mast to the vertical position and remove the nylon strap from the hydraulic hoist cylinder.
- i. Position the faired mast over top of the sail opening and then remove the tagline from the hydraulic hoist cylinder.
- j. If chain falls are installed, then lower the cylinder in through the bearing frames so that the chain falls can be adjusted to align the fairing planar orientation to the top bearing shoes. The chain falls can also be used to slowly lower the cylinder over the cylinder base vice using the crane.

- k. Finish installation of the faired mast assembly in accordance with applicable [References \(w\), \(ll\), \(nn\), and \(oo\)](#).
- l. Detach crane from the faired mast assembly.
- m. The lifting devices can be removed in accordance with [paragraph 6.2.4](#).

### 5.3.2 LIFTING FAIRED MAST ASSEMBLY TO SAIL (Single Hook Crane Lift).

- a. Ensure that the hydraulic cylinder is fully extended. The top of the inner mast lower bearing shall be within 3/4 inch from the top of the fairing access opening cut-out.

## NOTE

There is no need for a nylon strap to be installed between the cylinder and fairing, to prevent cylinder movement because the cylinder is fully extended.

- b. Ensure that the FWD & AFT lifting devices are installed in accordance with [paragraph 4.1.4.2](#).
- c. Prepare cylinder base and faired mast in accordance with applicable [References \(w\), \(ll\), \(nn\), and \(oo\)](#) except hoist cylinder FME plate shall be replaced with the hydraulic cylinder dolly assembly.
- d. Install the hydraulic cylinder dolly assembly in accordance with [paragraph 4.13](#).
- e. Attach crane hook to each lifting device swivel hoist ring using a minimum 32-inch length spreader bar assembly, as shown in [Figure 5-5](#). It is recommended that one ton or greater chain-falls be installed between the fwd and aft lifting device swivel hoist rings and spreader bar assembly. The chain-falls shall be adjusted to equal lengths
- f. Use the crane to rotate the faired mast assembly to the vertical position on the dolly assembly. See [Figure 5-6](#).
- g. Lift faired mast assembly to a height that will allow the removal of the dolly wheel assembly from the hydraulic hoist cylinder FME and remove the dolly wheel assembly.
- h. Install a tag line to the base of the hydraulic cylinder.
- i. Position the faired mast over top of the sail opening and then remove the tagline from the hydraulic hoist cylinder.
- j. If chain falls are installed, then lower the cylinder in through the bearing frames so that the chain falls can be adjusted to align the fairing planar orientation to the top bearing shoes. The chain falls can also be used to slowly lower the cylinder over the cylinder base vice using the crane.
- k. Finish installation of the faired mast assembly in accordance with applicable [References \(w\), \(ll\), \(nn\), and \(oo\)](#).
- l. Detach crane from the faired mast assembly.
- m. The lifting devices can be removed in accordance with [paragraph 6-2.2](#).

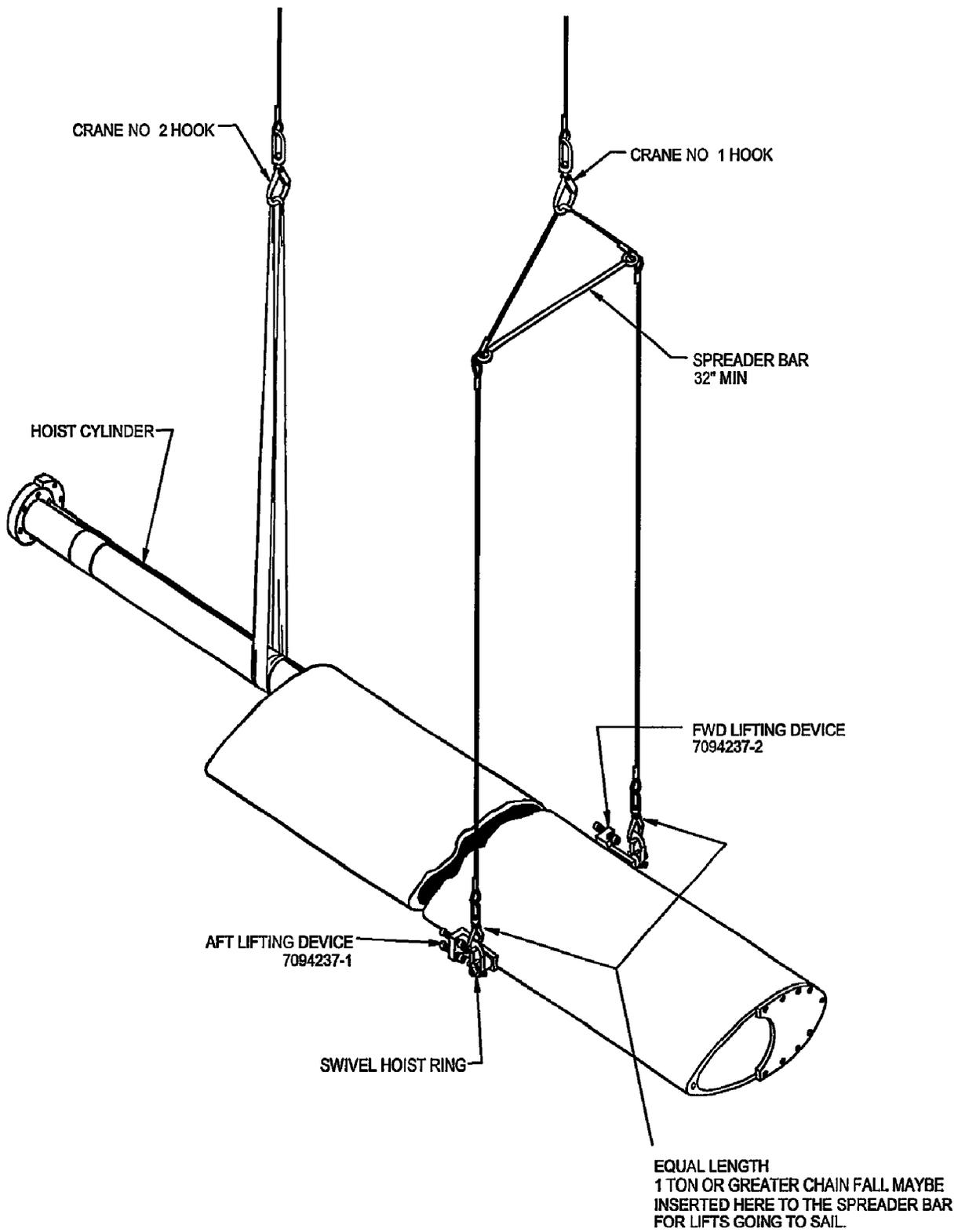


Figure 5-4 Two Hook HDR and ACM Faired Mast Lifting Arrangement

### 5.3.3 LIFTING FAIRED MAST ASSEMBLY FROM SAIL (Two Hook Crane Lift).

- a. Ensure that the FWD & AFT lifting devices are installed in accordance with [paragraph 4.1.4.2](#).
- b. Prepare hydraulic hoist cylinder and faired mast assembly in accordance with applicable [References \(w\)](#), [\(ll\)](#), [\(nn\)](#), and [\(oo\)](#) for the lift.
- c. Attach crane hook No. 1 to each lifting device swivel hoist ring using a minimum 32-inch length spreader bar assembly and place light tension on lifting rig.
- d. Jack cylinder off cylinder base. When cylinder breaks its seal with cylinder base, catch the hydraulic oil.
- e. Lift the faired mast assembly with crane to separate the hydraulic cylinder from cylinder base, in order to install the cylinder FME plate and the cylinder base FME cover in accordance with applicable [References \(w\)](#), [\(ll\)](#), [\(nn\)](#), and [\(oo\)](#).
- f. After the faired mast assembly has been lifted above the sail, install a tagline to the base of the hydraulic hoist cylinder.

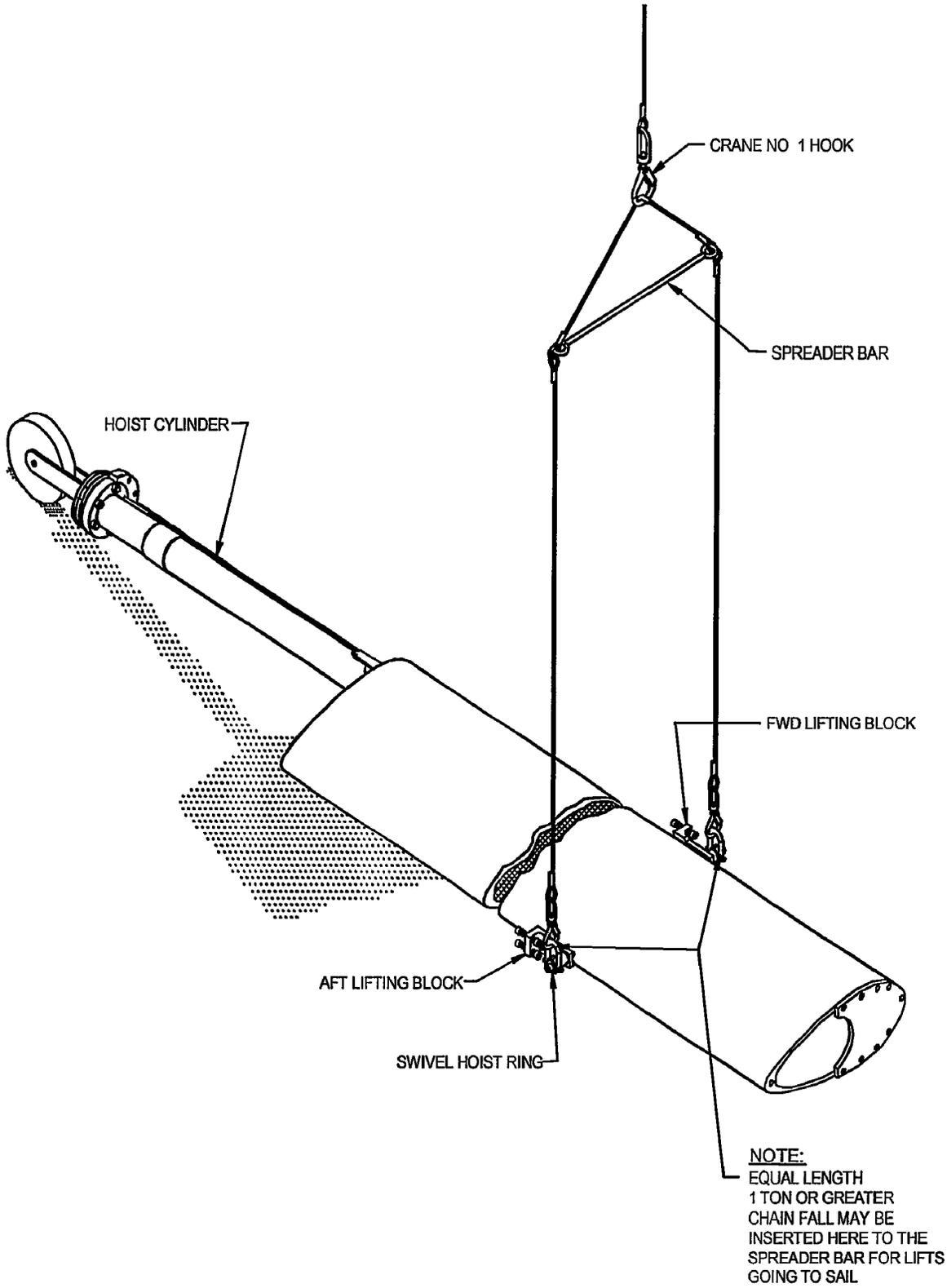


Figure 5-5 One Hook HDR and ACM Faired Mast Lifting Arrangement Horizontal Position

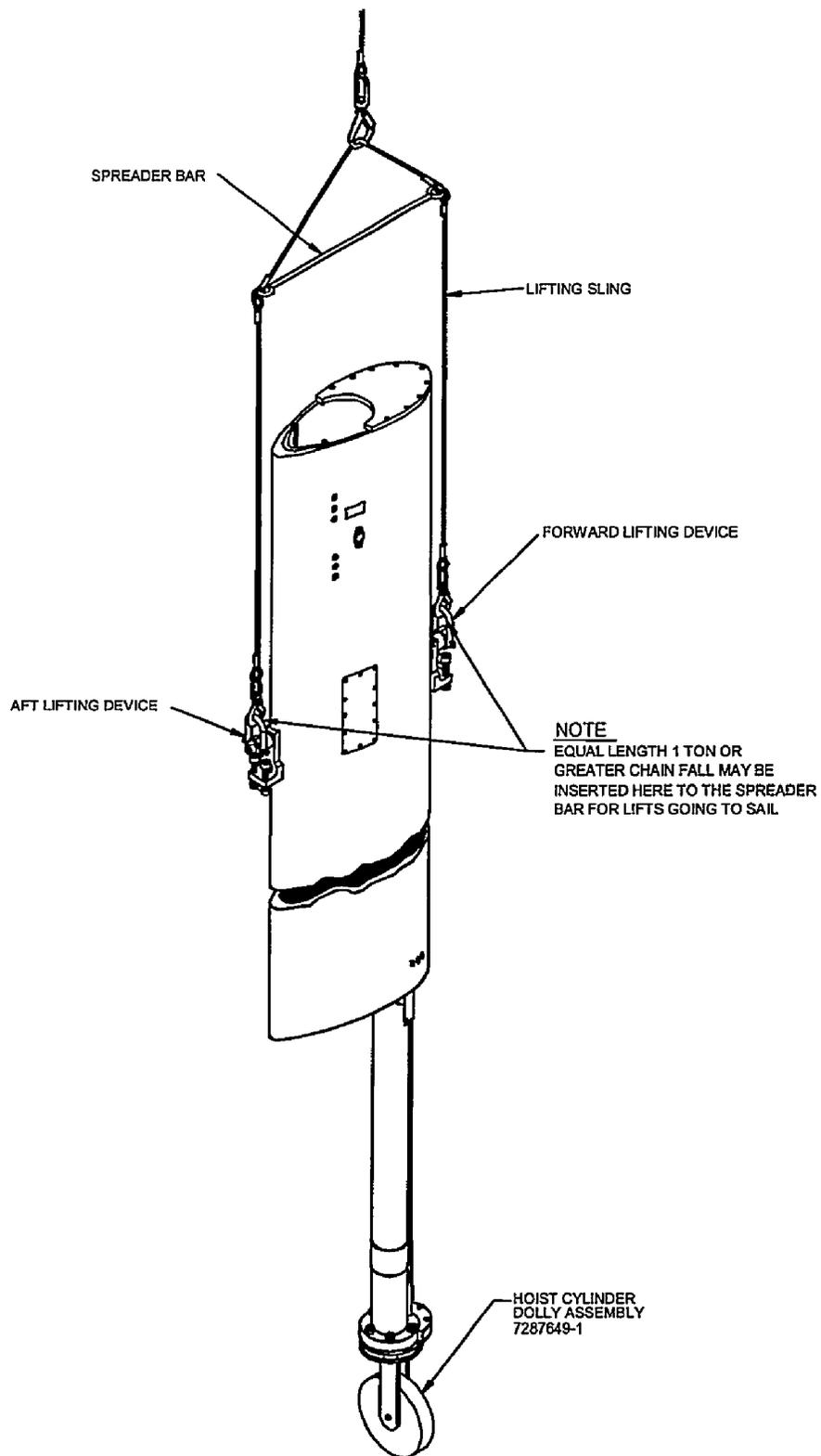


Figure 5-6 One Hook HDR and ACM Faired Mast Lifting Arrangement Vertical Position

- g. Have the crane position the faired mast above the landing area and remove the tagline.
- h. Attach the nylon strap to the base of the hydraulic cylinder and attach crane hook No. 2 to the nylon strap.
- i. Use the crane to rotate the faired mast to the horizontal position. Lay the fairing onto two foam covered pallets positioned at both ends of the faired mast assembly.
- j. Detach crane from the faired mast assembly.
- k. The lifting devices can be removed in accordance with [paragraph 6.2.3](#)

#### 5.3.4 LIFTING FAIRED MAST ASSEMBLY FROM SAIL (Single Hook Crane Lift).

- a. Ensure that the FWD & AFT lifting devices are installed in accordance with paragraph [4.1.4.2](#).
- b. Prepare hydraulic hoist cylinder and faired mast assembly in accordance with applicable [References \(w\), \(ll\), \(nn\), and \(oo\)](#).
- c. Attach crane hook to each lifting device swivel hoist ring using a minimum 32-inch length spreader bar assembly and place light tension on lifting rig.
- d. Jack cylinder off cylinder base. When cylinder breaks its seal with cylinder base catch the hydraulic oil.
- e. Lift the faired mast assembly with crane to separate the hydraulic cylinder from cylinder base, in order to install the cylinder base FME cover in accordance with applicable [References \(w\), \(ll\), \(nn\), and \(oo\)](#).
- f. Install the hydraulic hoist cylinder dolly special FME plate in accordance with [steps 4.13.2.a.](#) and [4.13.2.b.](#)
- g. Lift the faired mast assembly above the sail and install a tagline to the base of the hydraulic hoist cylinder.
- h. Have the crane position the faired mast above the landing area to remove the tagline.
- i. Install the hydraulic hoist cylinder dolly wheel assembly in accordance with paragraph [steps 4.13.2.c](#) and [4.13.2.d.](#)
- j. Lower the faired mast assembly on the dolly wheel. The weight of the faired mast assembly can be used to retract the hydraulic cylinder into the faired mast assembly, so that the faired mast assembly can be transported fully retracted.
- k. Use the crane to rotate the faired mast assembly to the horizontal position using the dolly assembly. Lay the fairing onto two foam covered pallets positioned at both ends of the faired mast assembly.
- l. Detach crane from the faired mast assembly.
- m. The lifting devices can be removed in accordance with [paragraph 6.2.3](#).

#### 5.4 LIFTING THE SUB HDR AND ACM ANTENNA MAST ASSEMBLIES.



The antenna mast assembly should **NEVER** be lifted with the faired mast assembly.

##### 5.4.1 LIFTING THE SUB HDR AND ACM ANTENNA ASSEMBLIES TO SAIL.

- a. The faired mast assembly shall be fully raised.
- b. Ensure that the FWD & AFT lifting devices are installed in accordance with paragraph [4.1.4.2](#) or the safety stop is installed in accordance with [paragraph 3.3.2](#).

- c. The faired mast shall be prepared to receive the antenna assembly including the possible removal of a dummy antenna plate, installation of shim into the fwd inner mast upper bearing pockets and/or fitting the inner mast upper aft bearing to the inner mast. See applicable [References \(w\), \(ll\), \(nn\), and \(oo\)](#) for details.
- d. The antenna mast RAS kit must be installed on the antenna in accordance with [References \(w\), \(ll\), \(nn\), and \(oo\)](#).
- e. The lifting assembly and the tail dolly may be installed dockside or in the shop in accordance with [step 4.11.2.a](#) and [paragraph 4.12](#) respectively.
- f. If lifting the antenna from a shipping crate or off or on a flatbed truck using a forklift truck, install two nylon straps around the inner mast. The center of gravity of the antenna assembly is approximately 5-1/2 feet from the top of the radome and therefore the forks and slings must be centered around this point.

## CAUTION

The SUB HDR and ACM antennas are always lifted or lowered from the horizontal position with the fwd end facing down. Antenna radome chock shall be positioned at the top of the inner mast to provide a stable resting surface with tail dolly installed on the lower end. The chock shall be of a sufficient height to prevent the radome from contacting the dock/pier. If a chock can not be found with sufficient height, then the antenna radome may be laid on a padded foam pallet to protect the radome finish and the tail dolly will support the lower end.

- g. Install tag lines to the four-point lift beam and at the base of the antenna mast. The tagline on the four-point lift beam will be used after the antenna is loaded into the faired mast assembly.
- h. Attach a crane hook to the four-point lift beam and have the crane rotate the antenna to the vertical position and then lift the assembly to a height that will allow the removal of the tail dolly from the inner mast base-plate as shown in [Figure 5-7](#).
- i. Remove the antenna tail dolly from the antenna inner mast base-plate.
- j. Slowly lift the antenna over to the faired mast assembly with the crane. Use the tagline attached to the antenna base to keep the antenna from swinging during movement from the pier to the sail.
- k. Remove the tagline from the antenna base.
- l. Align the antenna base with the aft upper bearing shoe and slowly lower into the faired mast assembly, until the antenna cable connector flange is seated in the inner mast lower bearing assembly (sled) opening.
- m. Install the antenna mounting hardware and antenna cable, if the cable is in position for connection to the antenna, in accordance with applicable [References \(w\), \(ll\), \(nn\), and \(oo\)](#).

## CAUTION

**Do not lower** the mast assembly to remove the lifting assembly, if the antenna cable is run through the cable guide up to the antenna base, unless the cable is connected to the antenna or the cable is not dropped down more than two inch from its installed state.

- n. Grab the tag line attached to the four-point lift beam and have the crane operator swing the four-point lift

beam forward and down. Care must be taken to prevent the four-point lift beam from swinging into the antenna mast assembly. Detach the lifting slings from the lifting ring and have crane set the four-point lift beam on pier.

- o. Remove the FWD & AFT lifting devices or safety stop in accordance with applicable [paragraphs 6.1.3](#) and [6.2.4](#).
- p. Ships Force should lower the mast assembly to your mark. Position the lifting ring assembly about 4 to 3 feet above the sailtop so that it can be removed with ease.
- q. Remove the antenna lift ring and straps from the antenna mast assembly in accordance with [paragraph 6.2.5](#).
- r. Have Ships Force return the mast system to its fully raised or stowed position.

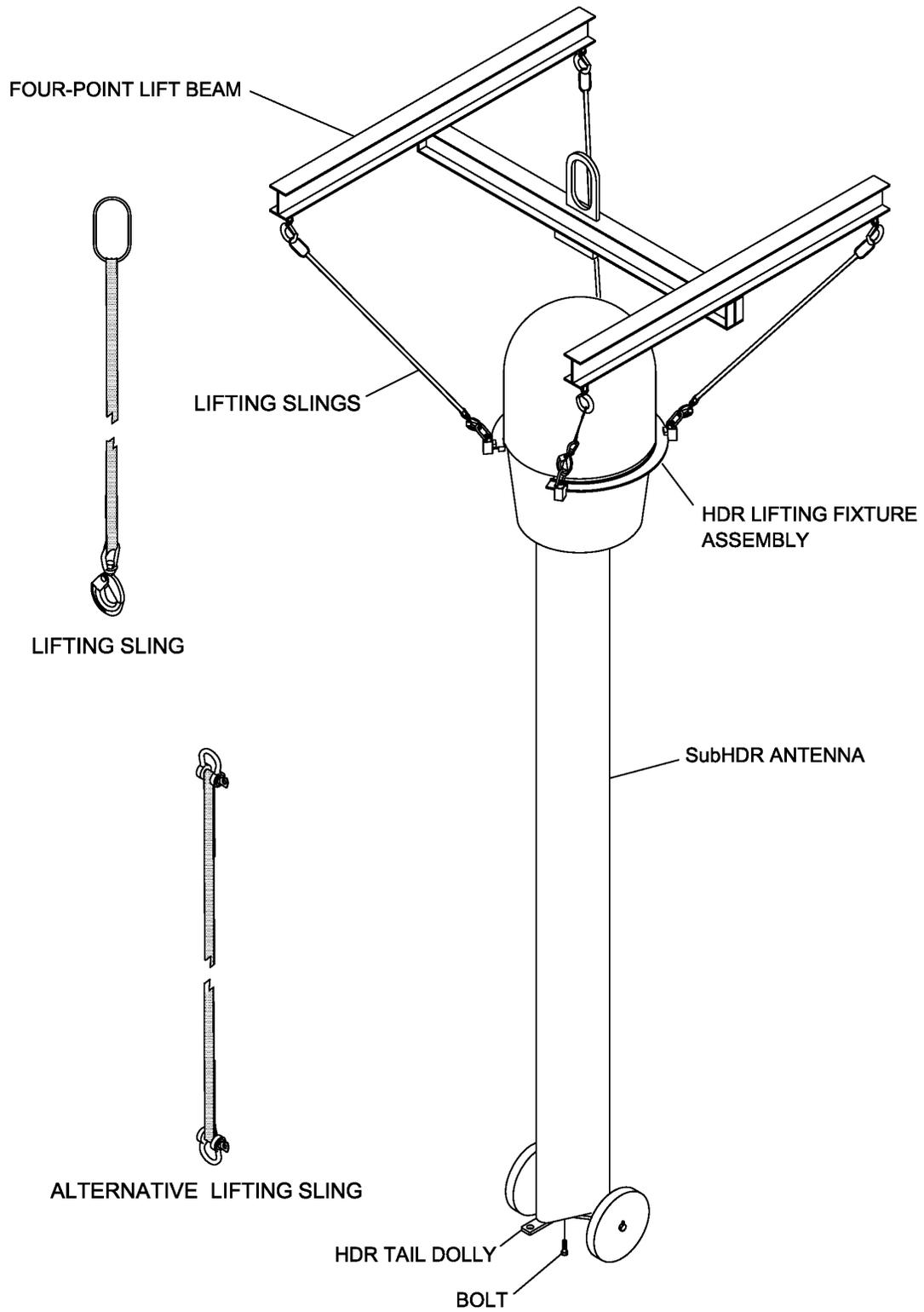


Figure 5-7 SUB HDR and ACM Antenna Lifting Arrangement

#### 5.4.2 LIFTING SUB HDR AND ACM ANTENNA ASSEMBLY FROM SAIL.

- a. The faired mast and antenna assembly shall be fully raised.
- b. Ensure that the FWD & AFT lifting devices are installed in accordance with [paragraph 4.1.4.2](#) or the safety stop is installed in accordance with [paragraph 3.3.2](#).
- c. The faired mast and antenna assembly shall be prepared to remove the antenna assembly which may include the possible removal of the antenna cable assembly to the cable guide roll-over, if an antenna or dummy antenna plate is not being installed immediately. See applicable [References \(w\), \(ll\), \(nn\), and \(oo\)](#) for details.
- d. Remove the FWD & AFT lifting devices or safety stop in accordance with [paragraphs 6.1.3 and 6.2.4](#).



**Do not lower** the mast assembly to install the lifting assembly, if the antenna cable is run through the cable guide up to the antenna base, unless the cable is not dropped down more than two inches from its installed state.

- e. Ships Force should lower the mast assembly to your mark. Position the antenna radome top approximately 7 to 6 feet above the sail-top, so that the lifting ring can be installed on the radome mounting flange with ease.
- f. Install the lifting assembly in accordance with [paragraph 4.11.2](#).
- g. Slowly lift the antenna from the faired mast assembly with crane.
- h. With the antenna clear of the faired mast assembly, attach a tagline to the aft cut-out at the base of the antenna.
- i. Ensure that a plastic FME cover is installed at the base of the antenna and the antenna cable plastic FME is installed.
- j. Have crane operator swing the lifting assembly and antenna to the pier and lower the antenna, so that the antenna dolly can be installed in accordance with [paragraph 4.12](#).



The antenna is always lifted or lowered from the horizontal position with the fwd end facing down. Antenna radome chock shall be positioned at the top of the inner mast to provide a stable resting surface with tail dolly installed on the lower end. The chock shall be of a sufficient height to prevent the radome from contacting the dock/pier. If a chock can not be found with sufficient height, then the antenna radome may be laid on a padded foam pallet to protect the radome finish and the tail dolly will support the lower end.

- k. Have the crane operator rotate the antenna FWD end down onto a radome chock or foam covered pallet.
- l. Disconnect the four-point lift beam from the crane.
- m. Have Ships Force return the Faired mast to it's fully raised or stowed position.
- n. If lifting the antenna to a shipping crate or onto a flatbed truck using a forklift truck, install two nylon straps around the inner mast. The center of gravity of the antenna assembly is approximately 5-1/2 feet from the top of the radome and therefore the forks and slings must be centered around this point.
- o. Remove the antenna tail dolly and antenna lifting device in accordance with applicable [References \(w\), \(ll\), \(nn\), and \(oo\)](#).

**5.5 PREPARATION FOR PERISCOPE HORIZONTAL LIFT WITH HINGE CARRIAGE.**

Refer to [paragraph 4.3.2](#) and [Reference \(e\)](#) for periscope horizontal lift.

**5.6 PREPARATION FOR SNORKEL INNER INDUCTION PIPE LIFT.**

- a. Install the lifting/backup clamp in accordance with [paragraph 4.9](#).
- b. Refer to applicable [References \(r\)](#), [\(s\)](#), and [\(hh\)](#) for the inner induction pipe horizontal lift.



## CHAPTER 6

### PROCEDURES FOR REMOVING SAFETY AND LIFTING DEVICES

#### 6.1 REMOVAL OF SAFETY DEVICES.

6.1.1 PREREQUISITE. Ensure that all pertinent safety precautions of [Chapter 1](#) are in effect.

6.1.2 REMOVAL OF SAFETY CLAMPS. The safety clamps are to be removed in accordance with the following steps:

- a. Remove and properly stow the sled stop assemblies if installed.
- b. Ensure that the hoist cylinder isolation valves are opened and DANGER tags removed.



Never remove the clamps without checking that a positive means of supporting the weight of mast or periscope exists.

- c. Ensure that the lower clamp is not in contact with the sail. If there is a contact, raise the system so that the lower clamp is 1/2" to 1" above the sail top.
- d. Observe at least 5 minutes to ensure that the system weight is fully supported before removing the clamps.
- e. Loosen the holddown nuts on the clamps sequentially and in uniform decrements.
- f. Remove the clamps from the sail to prevent injury and/or damage to the vicinity sail systems.
- g. Hand tighten the nuts and bolts with matched serial number clamp halves together.



It is mandatory that the clamp halves be kept in a matched set by serial numbers. Failure to do so, negates the weight test and holding capacity test.

6.1.3 REMOVAL OF SAFETY STOP. The safety stops are to be removed in accordance with the following steps:

- a. Remove and properly stow the sled stop assemblies if installed.
- b. Ensure that the hoist cylinder isolation valves are opened and DANGER tags removed.



Never remove the safety stop without checking that a positive means of supporting the weight of mast or periscope exists.



In the event that a mast has been inadvertently powered down while the safety stop was installed, the safety stop shall be thoroughly inspected with particular attention paid to the area around the lower mounting screw. Discard the safety stop if any deformation is noted.

- c. Ensure that the safety stop contact bottoms are not in contact with the sail. If there is a contact, adjust the contact screw(s), until it has 1/4 to 1/2 inch gap with the top of the sail.



If a contact still exists, then raise the system so that the contact bottoms have 1/4 to 1/2 inch gap with the top of the sail.

- d. Observe at least 5 minutes to ensure that the system weight is fully supported before removing the safety stops.
- e. Remove and properly stow the safety stop to prevent injury and/or damage in the vicinity of sail systems.

6.1.4 REMOVAL OF SHORING. Shoring is to be removed in accordance with the following steps:



Never remove shoring without checking that a positive means of supporting the weight of the mast or periscope exists.

- a. Ensure that the hoist cylinder isolation valves are closed and danger tagged.
- b. Install safety clamps in accordance with [paragraph 3.1](#) when shoring is installed beneath the mast.



If an interference between the snorkel and BRD-7/BLD-1 clamps or clamps on the AN/BRD-7 mast with MMM closure doors (S/A 4412) installed exists, remove the snorkel clamps and shore the snorkel prior to installing the clamps on BRD-7 or BRD-7/BLD-1 mast.

- c. Observe at least 5 minutes to ensure that the system weight is fully supported before removing shoring.
- d. Cut steel banding and remove with the shoring from the sail to prevent injury and/or damage to the vicinity sail systems.
- e. Remove the safety clamps as required.

6.1.5 REMOVAL OF SAFETY PIN (UMM). Use [Reference \(dd\)](#) for removal of the safety pin(s).

## 6.2 REMOVAL OF LIFTING DEVICES AND PERIPHERALS.

6.2.1 REMOVAL OF LIFTING CLAMP AND BACKUP CLAMP OR SAFETY STOP PIN AFTER SYSTEM INSTALLED. Ensure that all pertinent safety precautions of [Chapter 1](#) are in effect.

- a. If the system has been just installed, then the system shall be vented in accordance with the associated venting procedure as contained with the Ship Systems Manual, [References \(bb\)](#), [\(ii\)](#), and [\(jj\)](#).
- b. Once hydraulic pressure has been verified on the hoist cylinder, use [paragraphs 4.1.3](#) and [6.1.2](#) as a guide to remove the clamps and safety stop pin.

### NOTE

Replace the piston rod pin immediately after the safety stop pin is removed. The lifting clamp should be removed after the safety stop pin or backup clamp is removed.

### NOTE

It is mandatory that the clamp halves be kept in a matched set by serial numbers. Failure to do so, negates the weight test and holding capacity tests.

6.2.2 REMOVAL OF LIFTING CLAMP AFTER SYSTEM INSTALLED.

- a. If the system has been just been installed, then the system shall be vented in accordance with the associated venting procedures as contained in the Ship Systems Manual, [References \(bb\)](#), [\(ii\)](#), and [\(jj\)](#).
- b. Once hydraulic pressure has been verified on the hoist cylinder, loosen the mounting screws on each lifting device.
- c. Remove the lifting devices from the fairing.

6.2.3 REMOVAL OF LIFTING CLAMP AND BACKUP CLAMP OR SAFETY STOP PIN AFTER SYSTEM REMOVED.

- a. Use [paragraph 6.2.1](#), as a guide to remove the lifting clamp and the backup clamp or safety stop pin.

**NOTE**

Ensure that the removed system is resting stably on the mast stands, chocks, or timbers.

**NOTE**

Record the locations of the lifting and backup clamps prior to removal so the clamps can be reinstalled at the same locations if required.

**NOTE**

Don't install the piston rod pin if the mast is not removed with the hoist cylinder.

**NOTE**

It is mandatory that the clamp halves be kept in a matched set by serial numbers. Failure to do so, negates the weight test and holding capacity test.

#### 6.2.4 REMOVAL OF LIFTING DEVICES AFTER SYSTEM REMOVED.

- a. Use [paragraph 6.1.3](#), as a guide to remove the lifting devices from the fairing.

**NOTE**

Ensure that the removed system is resting stably on the mast stands, chocks, or timbers.

#### 6.2.5 REMOVAL OF THE SUB HDR AND ACM ANTENNA LIFTING ASSEMBLIES.

- a. Removal with antenna mast assembly

1. Disconnect the four ends of each sling to each swivel hoist ring on the lifting ring assembly and remove slings and four-point lift beam.
2. Hold lift ring from dropping on mast and loosen all six 1/4-20UNC x 2 captured hex head bolts on the lifting ring assembly using a 7/16-inch socket or wrench.
3. Lower the lift ring assembly to the inner mast, so that the lift ring assembly can be rotated and removed from around the inner mast. Rotate and slide the lifting ring assembly opening to the FWD or AFT end of the inner mast and remove the lift ring assembly from around the inner mast.

6.2.6 REMOVAL OF LIFTING DEVICES FROM UNIVERSAL MODULAR MAST. Use [Reference \(dd\)](#) for removal of lifting devices.

### 6.3 REMOVAL OF SSBN CLASS SNORKEL LIFTING BLOCKS.

6.3.1 PREREQUISITE. Ensure that all pertinent safety precautions of [Chapter 1](#) are in effect.

#### 6-3.2 LIFTING BLOCKS REMOVAL.

- a. Remove DANGER tags from hoist cylinder isolation valves, mast control switch, and lifting blocks, and ensure that the hoist cylinder isolation valves are opened.



Never remove the lifting blocks without ensuring that there is a positive means of supporting the weight of the mast.

- b. Raise the mast so that there is at least 1” of clearance between the bottom on the lifting blocks and the upper horse collar bearing frame.
- c. Observe for at least 5 minutes to ensure that the system weight is fully supported before removing the lifting blocks.
- d. Loosen the cap screws (NAVSEA Dwg 4398614-324) on the lifting blocks sequentially and in uniform decrements.
- e. Remove the cap screws and lifting blocks from the sail to prevent injury and/or damage to the vicinity sail systems.
- f. Reinstall (8) fairing cap screws (NAVSEA Dwg 4675662-13) in each side of mast.



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