

**JOINT FLEET MAINTENANCE MANUAL**  
**VOLUME IV**  
**TESTS AND INSPECTIONS**  
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JOINT FLEET MAINTENANCE MANUAL

**VOLUME IV**

**TESTS AND INSPECTIONS**

**RECORD OF CHANGES**

CHANGE NO.	DATE	TITLE OR BRIEF DESCRIPTION	ENTERED BY (INITIALS)

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JOINT FLEET MAINTENANCE MANUAL CHANGE REQUEST FORM
<p>FROM:                      ACTIVITY/SHIP _____ E-MAIL ADDRESS _____                      CODE/DEPT/SHOP _____ DATE _____                      ORIGINATOR _____ TEL EXT ( ) _____</p>
<p>VOL-PART-PARA NO. _____ FIGURE _____ TABLE _____                      PROCESSING NORMAL _____ URGENT* _____                      * (Justify in rationale below if urgent is marked and transmit via e-mail as "High Importance")                      PROBLEM DESCRIPTION:</p>
<p>RECOMMENDED CHANGE: (Include any proposed text addition/deletion)</p>
<p>RATIONALE:</p>

E-mail to [PTNH.SUBMEPP.JFMMMGR@Navy.Mil](mailto:PTNH.SUBMEPP.JFMMMGR@Navy.Mil)  
 (If mailing, fold on dotted line on reverse side and mail to Submarine Maintenance Engineering,  
 Planning and Procurement (SUBMEPP) Activity or send facsimile to (207) 438-6210.)

FOLD

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Commanding Officer

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OFFICIAL BUSINESS

Commanding Officer  
Submarine Maintenance Engineering,  
Planning and Procurement (SUBMEPP) Activity  
Attn: Code 1832JM  
P.O. Box 2500  
Portsmouth Naval Shipyard  
Portsmouth, NH 03804-2500

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FOLD

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**VOLUME IV**  
**CHAPTER 1**  
**INTRODUCTION**

REFERENCES.

- (a) OPNAVINST 3120.32 - Standard Organization and Regulations of the U.S. Navy
- (b) OPNAVINST 4700.7 - Maintenance Policy for U.S. Naval Ships
- (c) COMLANFLTINST 5400.2 - U.S. Atlantic Fleet Regulations
- (d) COMPACFLTINST 5400.3 - U.S. Pacific Fleet Regulations
- (e) NAVSEAINST 4790.8/OPNAVINST 4790.4 - Ships' Maintenance and Material Management (3-M) Manual

LISTING OF APPENDICES.

- A List of Acronyms

1.1 PURPOSE. To provide guidance in the execution and management for tests, inspections and assessments applicable to units of the Navy.

- a. The Foreword of this manual contains a master listing of all references used throughout the Joint Fleet Maintenance Manual. These references are arranged in alphanumeric order to facilitate their procurement for use with this manual. References used in specific chapters of this volume are listed at the beginning of each chapter in the order in which they appear in the chapter text.
- b. Acronyms are identified when they are initially used in this volume. Appendix A of this chapter contains a master listing of acronyms used throughout this volume.
- c. References (a) through (e) shall be used in conjunction with this manual, however, the requirements of this manual shall **not** take precedence over these higher authority directives, or technical directives from applicable Systems Commands. Where conflicts exist with previously issued Fleet Commander, Commander, Naval Reserve Forces (COMNAVRESFOR), Type Commander (TYCOM) letters, transmittals and instructions, other than references (c) and (d), this manual shall take precedence. Conflicts shall be reported to the cognizant TYCOM for resolution.

1.2 SCOPE. This volume applies to all ships and shore activities under the cognizance of Commander, **United States Fleet Forces Command (COMUSFLTFORCOM)**, Commander, Pacific Fleet (COMPACFLT) and COMNAVRESFOR. This volume is not intended to be all encompassing, since the guidance for many elements of the maintenance programs and their execution are promulgated by higher/technical authority (e.g., Naval Ships' Technical Manuals (NSTM), Office of the Chief of Naval Operations Instruction (OPNAVINST)).

- a. This volume contains general topics, applicable to all ships and units under the cognizance of **COMUSFLTFORCOM** or COMPACFLT. In those cases where chapters, sections and/or paragraphs of chapters are not applicable to certain Forces, an applicability statement has been used for clarification.
- b. Equipment under the cognizance of the Strategic Systems Programs and Naval Sea Systems Command Nuclear Propulsion Directorate (NAVSEA 08) is maintained in accordance with Strategic Systems Programs and NAVSEA 08 directives, respectively.

1.3 CHANGES AND CORRECTIONS. Changes and corrections will be issued as required. Comments and suggestions for improving or changing this volume are invited. Address comments, recommendations, and requested changes to Submarine Maintenance Engineering, Planning and Procurement Activity utilizing the change request form located in the front of this manual. If changes are submitted in electronic format, facsimile or E-mail, each change request shall contain the information required on the change request form.

1.4 REQUEST FOR COPIES OF THE MANUAL. Activities on distribution for the Joint Fleet Maintenance Manual (JFMM) that require additional copies or activities wanting to be added to distribution should submit a letter to their applicable TYCOM, identifying CD-ROM/paper requirements along with justification for the request. To the maximum extent possible, technical publications libraries at each activity will receive all copies of the manual for that activity and coordinate local distribution and updates.

**APPENDIX A**  
**LIST OF ACRONYMS**

3-M	Maintenance and Material Management
ABC	Automatic Boiler Control
ABO	Aviators Breathing Oxygen
ACN	Advance Change Notice
AEL	Allowance Equipage List
AEOG	Automated Electrolytic Oxygen Generator
AIMD	Aviation Intermediate Maintenance Department
ALRE	Aircraft Launch and Recovery Equipment
ALREMP	Aircraft Launch and Recovery Equipment Maintenance Program
APL	Allowance Parts List
<b>ATIS</b>	<b>Advanced Technical Information Support</b>
AWR	Automated Work Request
BIRMIS	Boiler Inspection and Repair Maintenance Information System
CAFSU	Carrier And Field Service Unit
CAI	Completion of Availability Inspection
CASREP	Casualty Report
CD-ROM	Compact Disk
CHT	Collection, Holding and Transfer
CMAV	Continuous Maintenance Availability
CNO	Chief of Naval Operations
COMNAVAIRLANT	Commander Naval Air Force Atlantic
COMNAVAIRPAC	Commander Naval Air Force Pacific
COMNAVRESFOR	Commander Naval Reserve Force
COMNAVSURFLANT	Commander Naval Surface Force Atlantic
COMNAVSURFPAC	Commander Naval Surface Force Pacific
COMPACFLT	Commander, Pacific Fleet
COMSUBLANT	Commander Submarine Force Atlantic
COMSUBPAC	Commander Submarine Force Pacific
COMSUBRON	Commander Submarine Squadron
<b>COMUSFLTFORCOM</b>	<b>Commander, United States Fleet Forces Command</b>
COSAL	Coordinated Shipboard Allowance List
CPO	Chief Petty Officer
CSMP	Current Ship's Maintenance Project
CWP	Controlled Work Package
DCA	Damage Control Assistant
DDS	Dry Deck Shelter
DEI	Diesel Engine Inspector
DFS	Departure From Specification
DFT	De-Aerating Feed Tank
DLSS	Diver Life Support System
DMP	Depot Modernization Period
DO	Duty Officer
DOD	Department of Defense
DOP	Designated Overhaul Point
ECI	Eddy Current Inspection
EDG	Emergency Diesel Generator
EDO	Engineering Duty Officer
EOG	Electrolytic Oxygen Generator
EOOW	Engineering Officer Of the Watch

EOSS	Engineering Operational Sequencing System
ESU	Elevator Support Unit
FMA	Fleet Maintenance Activity
FWP	Formal Work <b>Package</b>
GFE	Gas Free Engineering
GS	Gas Turbine Technician
GTB	Gas Turbine Bulletin
GTRR	Gas Turbine Readiness Review
HSC	Hierarchical Structure Code
ILPE	Integrated Low Pressure Electrolyzer
ILS	Integrated Logistics Support
INSURV	Board of Inspection and Survey
IRAC	Interim Rapid Action Change
ISIC	Immediate Superior In Command
ISV	Industrial Support Visit
ITP	Index of Technical Publications
JCN	Job Control Number
JFMM	Joint Fleet Maintenance Manual
JSN	Job Sequence Number
LCEM	Life Cycle Engineering Manager
LET	Logistics and Escape Trunk
LMD	Library Management Database
LWC	Lead Work Center
MDS	Maintenance Data System
METCAL	Metrology and Calibration
MGTI	Marine Gas Turbine Inspector
MGTIS	Marine Gas Turbine Information System
MI	Material Inspection
MILSPEC	Military Specification
MIP	Maintenance Index Page
MOA	Memorandum of Agreement
MPA	Main Propulsion Assistant
MPDE	Main Propulsion Diesel Engine
MR	Maintenance Requirement
MRC	Maintenance Requirement Card
MS	Maintenance Standard
MSC	Maintenance Support Center
MSD	Marine Sanitation Device
NATEC	Naval Air Technical Data and Engineering Service Command
NAVAIR	Naval Air Systems Command
NAVAIRWARCEN	Naval Air Warfare Center
NAVFAC	Naval Facilities Engineering Command
NAVSEA	Naval Sea Systems Command
NAVSEA 08	Naval Sea Systems Command Nuclear Propulsion Directorate
NAVSUP	Naval Supply Systems Command
NEC	Navy Enlisted Classification
NFPA	National Fire Protection Agency
NMF	Naval Maintenance Facility

NSDSA	Naval Systems Data Support Activity
NSF	Nuclear Support Facility
NSN	National Stock Number
NSTM	Naval Ship's Technical Manual
NSWCCD	Naval Surface Warfare Center, Carderock Division
NSWCCD-SSES	Naval Surface Warfare Center, Carderock Division - Ship System Engineering Station
NTE	Nuclear Test Equipment
O <sub>2</sub> -N <sub>2</sub>	Oxygen - Nitrogen
OEM	Original Equipment Manufacturer
OGP	Oxygen Generating Plant
OJT	On the Job Training
OOD	Officer Of the Deck
OPNAVINST	Office of the Chief of Naval Operations Instruction
PLAD	Plain Language Address Directory
PMS	Planned Maintenance System
PMT	Performance Monitoring Team
POAM	Plan of Action and Milestones
PQS	Personnel Qualification Standard
PSAI	Pre-Start of Availability Inspection
QA	Quality Assurance
QPL	Qualified Products List
RBO	Repair Before Operating
REC	Re-Entry Control
RIRMIS	Reboiler Inspection and Repair Management Information System
RMC	Regional Maintenance Center
RMCSG	Regional Maintenance Center Support Group
RPM	Reactor Plant Manual
RSG	Regional Support Group
RTE	Remote Temperature Element
SAI	Start of Availability Inspection
SAMM	Shipboard Automated Maintenance Module
SCA	System Certification Authority
SCIRMIS	Steam Catapult Inspection and Repair Maintenance Information System
SCSC	System Certification Survey Cards
SDI	Ship's Drawing Index
SEIE	Submarine Escape Immersion Ensemble
SEMAT	Systems and Equipment Material Assessment Team
SGPI	Steam Generating Plant Inspector
SME	Subject Matter Expert
SOC	Scope Of Certification
SOSMIL	Safety Of Ship Maintenance Item List
SRC	Submarine Rescue Chamber
SRDRS	Submarine Rescue Diving Recompression System
SSDG	Ship Service Diesel Generator
SSES	Ship System Engineering Station
SUBSAFE	Submarine Safety
SWL	Safe Working Load
<b>TDKM</b>	<b>Technical Data Knowledge Management</b>
TDMIS	Technical <b>Data</b> Management Information System

TRF	TRIDENT Refit Facility
TWD	Technical Work Document
TYCOM	Type Commander
VLA	Visual Landing Aids
VRT	Voyage Repair Team
VSV	Variable Stator Vane
WAF	Work Authorization Form
WC	Work Center
WHE	Weight Handling Equipment

## VOLUME IV

## CHAPTER 2

## FLEET MAINTENANCE ACTIVITY ASSESSMENT

REFERENCES.

- (a) NAVSEA S9810-AA-GTP-010 - Intermediate Maintenance Activity Work Center Requirements Manual
- (b) COMPACFLTINST 4700.5/COMLANTFLTINST 4700.1 - Navy Afloat Maintenance Training Strategy (NAMTS) Job Qualification Requirements (JQR) Management
- (c) NAVSEAINST 4790.8/OPNAVINST 4790.4 - Ships' Maintenance and Material Management (3-M) Manual
- (d) OPNAVINST 5100.23 - Navy Occupational Safety and Health (NAVOSH) Program Manual
- (e) OPNAVINST 5100.19 - Navy Occupational Safety and Health (NAVOSH) Program Manual for Forces Afloat
- (f) OPNAVINST 3120.32 - Standard Organization and Regulations of the U.S. Navy
- (g) NAVSEA SS521-AG-PRO-010 - U.S. Navy Diving Manual

LISTING OF APPENDICES.

- A Typical Core Capability Assessment Areas
- B Typical Core Capability Assessment Projects
- C Sample FMA Assessment Report
- D FMA Assessment Deficiency Format

2.1 PURPOSE. To provide guidance for conducting a Fleet Maintenance Activity (FMA) Assessment, including areas to be assessed, responsibilities for conducting the assessment and deficiency correction and reporting requirements.

2.1.1 Scope. Fleet Maintenance Activity assessments will be conducted by the Type Commander (TYCOM) or Fleet Commander with cognizance over the FMA. For assessments conducted by the cognizant TYCOM, the assessment team will be comprised of members from each TYCOM that the FMA performs repairs for, with the senior member from the cognizant TYCOM. For assessments conducted by the cognizant Fleet Commander, the assessment team will be comprised of members from each TYCOM that the FMA performs repairs for, with the Fleet Commander, or Fleet Commander assigned TYCOM representative as the senior member of the assessment team. Assessments will be conducted in accordance with references (a) through (g) using the Quality Assurance assessment areas prescribed by Volume V, Part I, Chapter 9 of this manual.

- a. Assessments of Afloat FMAs will be performed annually, not to exceed 18 months.
- b. Assessments of shore based FMAs will be performed every 18 months, not to exceed 24 months. (TYCOM Quality Assurance assessments, explained in Volume V, Part I, Chapter 9 of this manual, will be accomplished concurrently with FMA assessments when scheduled in the same calendar year.)
- c. (Regional Maintenance Centers only) The following Regional Maintenance Centers (RMC) will be assessed every 18 months not to exceed 24 months. Areas may be assessed more frequently based upon results of previous assessments. These assessments encompass all functions of the RMC standard departments as listed in **Commander, Naval Regional Maintenance Center Ship Organization and Regulation Manual**:

Norfolk Ship Support Activity (NSSA)  
 Southeast Regional Maintenance Center (SERMC)  
 Southwest Regional Maintenance Center (SWRMC)  
 Pearl Harbor Naval Shipyard and Intermediate Maintenance Facility  
 Puget Sound Naval Shipyard and Intermediate Maintenance Facility  
 U.S. Naval Ship Repair Facility and Japan Regional Maintenance Center (SRF-JRMC)

- d. Assessments are to evaluate the ability of the FMA to execute maintenance in accordance with applicable technical directives and specifications. The assessment of FMAs encompasses Repair Department Work Centers (WC) and the direct repair WC support functions performed by other departments.

2.1.2 Applicability. The assessments described in this chapter are applicable for non-nuclear work only. This chapter does not apply to nuclear work and systems; they are addressed separately in Volume V, Part I, Chapter 9 of this manual.

## 2.2 ASSESSMENT AREAS.

- a. FMAs are expected to maintain a broad spectrum of capabilities at full readiness. The FMA can expect that many of these capabilities will be observed and evaluated during the course of the assessment. The Assessment Team will place primary emphasis on the essential core capabilities, utilizing the guidelines of references (a) and (b).
- b. Core capability craftsman demonstration areas are shown in Appendices A and B of this chapter. These represent the typical areas to be assessed and, as time permits, the team leader may observe other areas/projects. Observation of "in process work" is preferred to the assignment of projects or mockups in core capability areas. The team leader will make all decisions regarding the assignment of projects.

2.3 ASSESSMENT RESULTS. An overall grade of satisfactory or unsatisfactory will be assigned based on the FMA's compliance with higher-level requirements and governing technical documents.

## 2.4 RESPONSIBILITIES.

### 2.4.1 Type Commander.

- a. Promulgate an assessment schedule by 30 November for the following calendar year.
- b. Forward a precepts letter, or a message, to the FMA's Commanding Officer at least two weeks prior to the assessment. This letter should include:
  - (1) The date of the assessment.
  - (2) Assessment Team member's security clearance information.
  - (3) Core capability areas for the observation of in process work.
  - (4) Logistic support requirements.
  - (5) Additional information as appropriate.
- c. Conduct an inbrief and outbrief with the Immediate Superior in Command (ISIC) (if assigned), FMA's Commanding Officer and designated personnel. A preliminary copy of the Assessment Report will be provided to the FMA at the outbrief.
- d. Issue the Assessment Report (Appendix C of this chapter) to the FMA via the ISIC within 15 calendar days following completion of the assessment.

### 2.4.2 Fleet Maintenance Activity.

- a. Forward team security clearance information to the local base security office and to all units who are or will be in availability during the period of the assessment.
- b. Designate an Assessment Coordinator to act as the point of contact between the Assessment Team and the command. Notify the appropriate TYCOM of the name and phone number of the Assessment Coordinator upon receipt of the assessment precepts letter.
- c. Ensure the following assessment support is provided:
  - (1) Access to all industrial areas within the FMA.
  - (2) An adequate and dedicated administrative work area to allow the Assessment Team to assemble.

- (3) Parking for the Assessment Team.
- (4) A telephone with off-ship and long distance capability.
- (5) Access to Maintenance Resource Management System.
- (6) Clerical personnel to assist. These personnel will report to the Assessment Team Leader for assignment of working hours and duties.
- (7) Copying services.
- (8) Access to all Controlled Work Packages (CWP) and standard Formal Work Packages (FWP), including the index of FWPs.
- (9) Access to selected Repair Department training records and the departmental weekly training schedule for the week of the assessment.
- (10) A list of all non-nuclear Technical Work Documents performed since the last assessment.
- (11) A list of key personnel and telephone numbers.
- (12) A list of capabilities required per references (a) and (b), but not held.
- (13) A list of all critical path jobs scheduled during the assessment.
- (14) A list of all production/management meetings scheduled during the assessment.
- (15) In the Assessment Team work area, provide:
  - (a) One desk top computer and a laser printer.
  - (b) A copy of the following reference documents:
    - 1 The previous TYCOM/Fleet Assessment report with corrective actions.
    - 2 Equipment out of commission lists.
    - 3 All FMA instructions and notices, including those pertaining to safety, production and repair functions, and the Command Availability Guide (if applicable).
    - 4 Activity manpower documents.
    - 5 Navy Afloat Maintenance Training Strategy-Training Reports.
    - 6 FMA Capabilities (currently titled IMA Capabilities) and WC Validation Reports for all applicable WCs.
    - 7 Joint Fleet Maintenance Manual.
    - 8 TYCOM Training Manual.
    - 9 Repair Department Equipment Status Log.
    - 10 FMA Audit and Surveillance Program records.
    - 11 FMA self-assessments.
    - 12 Departure from Specification files.
- d. Initiate action to systematically correct each assessment deficiency finding (Appendix D of this chapter) in accordance with paragraph 2.5.1 and 2.5.2 of this chapter.

## 2.5 ASSESSMENT FINDINGS/CORRECTIVE ACTION.

- a. For each noted deficiency in an assessment area, a finding will be written and classified as either “Immediate Corrective Action Required” or “Corrective Action Required”.

- b. Audit cards must clearly “stand on their own” and indicate if certification is or is not impacted by the finding when the audit card deals with SUBSAFE or Deep Submergence Systems deficiencies. All audit cards annotating a certification issue will be classified as “Immediate Corrective Action Required”.
- c. The FMA will annotate in the corresponding assessment report enclosure, the corrective actions taken for each finding.
- d. The Commanding Officer will also submit a findings status report to the TYCOM via the administrative chain of command within 60 days following receipt of the official assessment report.
- e. Unless a delay is specifically authorized by the TYCOM, all findings will be corrected within the time limits specified in paragraphs 2.5.1 and 2.5.2 of this chapter.

2.5.1 Immediate Corrective Action Required. A deficiency that poses a significant safety hazard or results in a total loss or extreme degradation of the FMA’s readiness to perform work or provide a service within an area of required capability. Findings classified as “Immediate Corrective Action Required” require the immediate attention of the Commanding Officer and must be corrected within 15 days following the date of the assessment out-brief. Additionally, the TYCOM may direct the immediate suspension of work in any area(s) pending resolution of critical deficiencies.

2.5.2 Corrective Action Required. A deficiency which poses a potential hazard to personnel safety or has a significant impact on the FMA’s readiness to perform work or provide a service within an area of required capability. Findings classified as “Corrective Action Required” require the prompt attention of the Commanding Officer to preclude them from developing into “Immediate Corrective Action Required” deficiencies and must be corrected within 60 days following receipt of the official assessment report.

**VOLUME IV**  
**CHAPTER 3**  
**BOILER INSPECTION**

**REFERENCES.**

- (a) OPNAVINST 9220.3 - Propulsion and Auxiliary Plant Inspection and Inspector Certification Program
- (b) NAVSEA S9086-GY-STM-010 - NSTM Chapter 221 (Boilers)
- (c) NAVSEA S9221-D2-MMA-010 - Steam Generating Plant Inspection (Non-Nuclear)
- (d) NWP 1-03.1 - Naval Warfare Publication Operational Report
- (e) NAVSEA S6470-AA-SAF-010 - Gas Free Engineering Manual
- (f) NAVSEA S9086-CH-STM-030 - NSTM Chapter 074 Volume 3 (Gas Free Engineering)
- (g) NAVSEA S0400-AD-URM-010/TUM - Tag-Out Users Manual
- (h) NAVSEA S9086-GX-STM-020 - NSTM Chapter 220 Volume 2, (Boiler Water/Feedwater Test and Treatment)
- (i) NAVSEA S9086-RK-STM-010 - NSTM Chapter 505 (Piping Systems)
- (j) NAVSEA S9086-G3-STM-010 - NSTM Chapter 225 (Steam Machinery Controls Systems)
- (k) OPNAVINST 9220.2 - U.S. Navy Boiler Water and Feedwater Test and Treatment Program (Nuclear Excluded)
- (l) OPNAVINST 4100.11 - Navy Energy Usage Reporting System (NEURS)
- (m) COMLANTFLTINST/COMPACFLTINST 4100.3 - Navy Energy Usage Reporting System (NEURS)

**LISTING OF APPENDICES.**

- A Sample Boiler Inspection Request Message
- B Sample Inspection Confirmation Message
- C Summary of Boiler Inspection Scheduling and Responsibilities
- D Sample Boiler Inspection Report Cover Letter
- E Sample Boiler Inspection - RBO/Severely Degraded Deficiencies Message
- F Sample RBO Rescission Message
- G Sample 30 Day Update Message

3.1 **PURPOSE.** To establish policy and provide procedures and inspection requirements for the inspection of all conventional steam generating plants in surface **force** ships and training sites including schedules, preparations for inspection, inspection guidelines and reporting.

3.1.1 **Policy.** Periodic standardized inspections are required of all non-nuclear propulsion, auxiliary, waste heat and training site boilers by a certified Steam Generating Plant Inspector (SGPI) and/or Naval Surface Warfare Center, Carderock Division (NSWCCD) Life Cycle Engineering Manager (LCEM), as applicable. The maximum interval between boiler inspections and other occasions requiring boiler inspections, including responsibilities for continuation and standardization of the boiler inspection program, are formally assigned in reference (a).

**3.2 TYPES OF BOILER INSPECTIONS.**

- a. Routine Inspection.
- b. Pre-start of Availability Inspection (PSAI).
- c. Start of Availability Inspection (SAI).
- d. Strength and Integrity Inspection.
- e. Industrial Support Visit (ISV).
- f. Completion of Availability Inspection (CAI).
- g. Inactivation or Reactivation Inspection.
- h. Engineer Officer Inspection.

- i. Major Repair Inspection.
- j. Special Inspection.
- k. Operational Assessments.

### 3.3 RESPONSIBILITIES.

3.3.1 Naval Sea Systems Command. NAVSEA shall provide technical authority oversight over all main, auxiliary, waste heat and training site boiler systems and associated equipment. The designated NAVSEA Technical Warrant Holder shall:

- a. Assure safe and reliable system operation.
- b. Set and enforce all technical requirements.
- c. Approve all major Departure from Specifications (DFS).
- d. Provide technical oversight and management of the SGPI and NSWCCD LCEM programs:
  - (1) Establish and enforce requirements for SGPI certification and recertification.
  - (2) Ensure periodic SGPI seminars are conducted.
  - (3) Ensure periodic technical audits of all Integrated Logistics Support documentation and Training.
  - (4) Maintain the Boiler Inspection and Repair Management Information System (BIRMIS).
  - (5) Routinely evaluate and ensure state of the art inspection, maintenance and repair tools and techniques are used.

3.3.2 Naval Surface Warfare Center, Carderock Division. NSWCCD shall:

- a. Provide support to NAVSEA for the SGPI and NSWCCD LCEM programs. Ensure that the required technical documentation to support the SGPI/NSWCCD LCEM Inspector programs is maintained current.
- b. Establish and monitor the requirements and standards for routine and industrial inspections of steam generating plants.
- c. Develop, implement and maintain a program to train and certify NSWCCD LCEM Inspectors in accordance with reference (a).
- d. Ensure that inspections of newly constructed ships and ships undergoing major overhaul and/or conversion are conducted in accordance with this instruction.
- e. Conduct periodic technical audits of the SGPI Training Course per reference (a).
- f. Provide management of technical data, boiler history and the associated repair management information database system.
- g. Provide technical support to the semi annual seminars.
- h. Maintain a roster of all certified SGPIs by name, rating, duty station, date of certification and expiration date of certification. Revoke inspector certification and initiate action to decertify inspectors who fail to comply with requirements of reference (a).
- i. Ensure that the requirements for SGPI certification, recertification and certification extensions are met prior to final approval.

3.3.3 Fleet Commander. The Fleet Commander shall:

- a. Identify and designate those fleet activities which have inspection responsibilities and maintain a base of certified SGPIs within those activities.
- b. Ensure the availability of "school ships" to support SGPI/NSWCCD LCEM Inspector training. Student certification must be conducted on "D" type boilers.

- c. Host the semi-annual SGPI seminars on an alternating coast basis.

3.3.4 Regional Maintenance Center. The Regional Maintenance Center (RMC) shall:

- a. Provide certified SGPIs to perform inspections per section 3.6 of this chapter.
- b. Review the guidelines and inspection requirements for all boiler inspections required by this instruction and ensure that each inspection report is recorded and updated into BIRMIS.
- c. Schedule and coordinate inspections of all steam generating plants required by this instruction with the appropriate technical activities to avoid the unnecessary opening of boilers.
- d. Provide a qualified SGPI when requested by the ship, Immediate Superior in Command (ISIC) or Type Commander (TYCOM).

3.3.5 Regional Maintenance Center Commanding Officers. RMC Commanding Officers shall:

- a. Coordinate inspections in cognizant maintenance areas.
- b. Maintain an up-to-date status of required steam generating plant inspections which shall include the latest inspection for all ships assigned to RMCs in their respective area of responsibility.

3.3.6 Immediate Superior In Command. The ISIC shall:

- a. Maintain overall cognizance of the Steam Generating Plant Inspection Program within their area of responsibility to ensure requirements and standards are met.
- b. Schedule routine steam generating plant inspections in coordination with the cognizant RMC.
- c. Arrange for the availability of an SGPI during the SAI and CAI in coordination with NSWCCD and the cognizant RMC.
- d. Monitor the follow-up action required to correct noted discrepancies by randomly sampling the ship's deferred maintenance action file and most recent boiler inspection report.
- e. Assist Commanding Officers in arranging for the corrective action of items beyond the capability of Ship's Force, when requested.

3.3.7 Ship Commanding Officer/Officer In Charge/Maintenance Team. Ship Commanding Officers/Officers In Charge/Maintenance Team shall:

- a. Request boiler inspections via Naval Message using the format in Appendix A of this chapter.
- b. Prepare for scheduled inspections to include required operational testing in accordance with references (b) and (c).
- c. Review inspection results and initiate corrective action for those items within Ship's Force capability. Initiate requests for the correction of items beyond Ship's Force capability. If any of the discrepancies of paragraph 3.9.2 of this chapter cannot be corrected within 72 hours following completion of the inspection, or if said discrepancies will impact the ship's operational schedule, initiate a Casualty Report (CASREP) for the affected boiler(s) in accordance with reference (d).
- d. Assess the impact (if any) of corrective action on operating schedules and advise the operational commanders. Decide (with repair activities) the optimum timing of repair actions to minimize impact on operating schedules.
- e. Submit reports per paragraph 3.7.2 of this chapter.
- f. Schedule boiler inspections as required by appropriate Planned Maintenance System (PMS)/Class Maintenance Plan item.

3.3.8 Regional Maintenance Center Senior Inspector. RMC Senior Inspectors shall:

- a. Ensure all assigned SGPIs maintain current certifications per reference (a).
- b. Perform steam generating plant inspections per section 3.9 of this chapter, when directed.
- c. Review and submit reports per paragraph 3.7.2 of this chapter.

- d. Send inspection confirmation messages using Appendix B of this chapter.
- e. Administer an SGPI pre-test for SGPI training school candidates per reference (a).

3.3.9 Steam Generating Plant Inspector. The SGPI shall:

- a. Maintain SGPI certifications per reference (a).
- b. Perform steam generating plant inspections per section 3.9 of this chapter, when directed.
- c. SGPIs are part of the technical authority chain-of-command and are accountable to the NAVSEA Technical Warrant Holder for the performance of their inspection duties.
- d. The shipboard SGPI shall:
  - (1) Monitor all repairs conducted on the boilers, such as tube replacements, casing/refractory work, burner settings, hydrostatic test, etc., and annotate findings in Boiler Water/Feedwater log.
  - (2) Observe PMS performed on the boilers to include MLOCs (burner front checks), greasing of sliding feet, setting safety valves, high and low static checks, flex tests and auxiliary support equipment safety/governor settings.
  - (3) Accomplish special inspections and repairs on boilers after boiler casualties while underway and report in BIRMIS. Also, accomplish operational assessments on ship's boiler auxiliary support equipment prior to upcoming availabilities and report in BIRMIS and in ships Current Ship's Maintenance Project (CSMP), if repairs are required.
- e. It is recommended that the shipboard SGPI be assigned as the LCPO of the Oil Lab in order to monitor the boiler water chemistry, boiler lay-ups and the Boiler Water/Feedwater Program (not to be assigned as Ships Oil King).

**NOTE: THE SHIP'S FORCE SGPI CAN ONLY ACCOMPLISH SPECIAL INSPECTIONS AND OPERATIONAL ASSESSMENTS ON THEIR OWN SHIP, AS DESCRIBED IN PARAGRAPHS 3.6.9 AND 3.6.10 OF THIS CHAPTER. THE SHIP'S FORCE SGPI WILL ASSIST THE RMC SGPI/NSWCCD LCEM INSPECTOR DURING ROUTINE AND AVAILABILITY RELATED INSPECTIONS. THE SHIP'S FORCE SGPI MAY NOT INDEPENDENTLY CONDUCT ROUTINE, STRENGTH AND INTEGRITY, PSAI, SAI, ISV, CAI INSPECTIONS ON THEIR OWN SHIP.**

3.4 INSPECTION SCHEDULING. Commands will initiate boiler inspection requests in a timely manner to assist with inspection scheduling coordination to include operational testing. Commands shall ensure the inspection scheduling complies with the following:

- a. Commanding Officers/Officers In Charge of ships shall request boiler inspections by message. In addition, OPNAV 4790/2-Kilo shall be submitted to the RMC requesting a certified SGPI/NSWCCD LCEM inspector as required to conduct inspections.
- b. Inspections should coincide with the required routine waterside and fireside maintenance.
- c. Boiler inspection services shall be coordinated by geographic areas for maximum utilization of SGPIs/NSWCCD LCEM Inspectors. ISICs will combine inspection requests and schedule inspections.

3.5 BOILER SAFETY PROCEDURES. The safety of personnel must be given the highest priority. Observance of good engineering practices and careful control of boiler water chemistry will reduce the frequency of pressure vessel entry.

- a. Ensure "idle boiler condition" is accomplished per the provisions of the Engineering Operational Sequencing System (EOSS) and reference (b). Where conflicts occur, an EOSS feedback form should be submitted for resolution.

- b. Do not enter any part of a boiler or De-Aerating Feed Tank (DFT) until it has been fully ventilated and certified by a Naval Maintenance Facility Gas Free Engineer/National Fire Protection Agency marine chemist as safe for entry in accordance with references (e) and (f), as applicable, and Chapter 25 of this volume.
- c. Ensure the idle boiler is tagged out (valves wired shut and danger tagged). Observe two-valve protection per **reference (g)** where applicable. Open to the atmosphere the drain connections on all dead interconnecting piping to observe drainage.
- d. The use of unshielded or non-approved portable lighting in an open boiler is prohibited. Portable lighting shall be watertight. (National Stock Number (NSN) 9S-6230-00-701-2947 applies.)
- e. Ensure all precautions cited in Section 2.24 of reference (b) are followed before entering an idle boiler.
- f. There shall be a safety observer outside the boiler entrance to provide assistance whenever personnel are inside a boiler (steam drum, water drum, firebox or smokepipe).
- g. Maintain an inventory log for accountability of all items taken into a boiler. The pockets of all personnel working in a boiler shall be emptied and all jewelry removed. The removal of all items from the boiler shall be verified from the inventory log prior to the close-up inspection. The Chief Engineer or his designated representative shall inspect the boiler prior to final close-out.
- h. Cleaning of firesides or repairs conducted to the pressure vessel exterior of a boiler is acceptable with a steaming boiler in the same space provided the precautions cited in Section 2.7 of reference (b) are observed. Water washing of the firesides is not authorized without NAVSEA approval.
- i. Requiring personnel to enter the steam/water side of a boiler with an adjacent steaming boiler is considered an unnecessary risk and will be avoided unless operations dictate otherwise. The decision to override normal safety precautions will be made by the Commanding Officer/Officer In Charge and will be reported to the TYCOM by message.
- j. Keep the area under the boiler clean and dry.
- k. Place signs warning that personnel are working in the boiler at the Boiler Console Operating station in the boiler operating space. The sign shall remain there until the work has been completed and personnel are clear of the secured boiler.

3.6 **BOILER INSPECTIONS AND REQUIREMENTS.** Main propulsion, auxiliary, waste heat and training site boiler inspections conducted per the requirements of this chapter shall fulfill all other requirements for comprehensive inspections of propulsion, auxiliary and waste heat boilers. All boiler inspections, including pre- and post-operational assessments, should be scheduled for coincidental performance. Appendix C of this chapter is a summary of boiler inspection scheduling and responsibilities. Propulsion, auxiliary and waste heat boilers will be inspected by a certified SGPI at the following intervals:

3.6.1 **Routine Inspection.** Routine Inspections will be conducted at least once every **Fleet Readiness Training Plan** and shall not exceed 24 months from its last inspection. For newly constructed ships, the 24 month period shall begin at the completion of the Board of Inspection and Survey (INSURV) Acceptance Trials. The normal interval between routine boiler inspections shall be 18 months. To provide scheduling flexibility, boiler inspections may be performed as early as 12 months or as late as 24 months after the previous inspection. Inspections that exceed the 18 month interval will require a minor DFS to the TYCOM with recommendation from NSWCCD-SSES. Extensions shall not result in the inspection interval exceeding 24 months. Any boiler which exceeds the inspection interval shall be placed out of commission until inspected by a certified SGPI. A major DFS with NAVSEA Technical Warrant Holder approval is required to operate a boiler beyond 24 months without a Routine Boiler inspection. The CAI or Strength and Integrity required inspections fulfill the requirements of a routine inspection.

- a. The boiler inspection will be scheduled by the cognizant ISIC.
- b. The boiler inspection will be performed by the cognizant SGPI.
- c. The TYCOM may utilize PSAIs, CAIs, and Strength and Integrity Inspections which are documented in BIRMIS, to satisfy the pressure vessel portion of a routine boiler inspection. This will reduce the number of boiler openings. A Routine Inspection will not be considered completed until an SGPI has

certified all items required in NSTM 221-2.1.2.3 Ship's Pre-inspection Checklist For Up-coming Routine Boiler Inspection by U.S. Navy Steam Generating Plant Inspector and reference (c), Appendix E, F and Figure E-6 addressing Operational Assessments has been accomplished. Once completed, this resets the periodicity required for the next inspection to 18 months not to exceed 24 months.

3.6.2 Pre-start of Availability Inspection. The PSAI may be required at the discretion of the TYCOM to support early bid specification and work package development.

- a. The PSAI will be scheduled by the ISIC, as approved by the cognizant TYCOM.
- b. The PSAI will be performed by the NSWCCD LCEM Inspector and the RMC SGPI.

3.6.3 Start of Availability Inspection. The SAI may be required to be accomplished at the beginning of an overhaul/availability to better define or re-evaluate the boiler bid specifications and/or work items at the discretion of the ISIC with TYCOM concurrence.

- a. The SAI will be scheduled by the ISIC, as approved by the cognizant TYCOM.
- b. The SAI will be performed by the NSWCCD LCEM Inspector and the RMC SGPI.

3.6.4 Strength and Integrity Inspection. The normal interval between Strength and Integrity Inspections shall be 60 months. Strength and Integrity Inspections may be performed as early as 48 months or as late as 72 months after the last Strength and Integrity Inspection to provide scheduling flexibility. Inspections that exceed the 60 month interval will require a minor DFS to the TYCOM with recommendation from NSWCCD-SSES. Strength and Integrity Inspections **shall not** exceed 72 months since the last inspection. Any boiler which exceeds the inspection interval shall be placed out of commission until inspected by an NSWCCD LCEM Inspector and a certified SGPI. A major DFS with NAVSEA Technical Warrant Holder approval is required to operate a boiler beyond 72 months without a Strength and Integrity Inspection.

- a. The Strength and Integrity Inspection will be scheduled by the cognizant ISIC.
- b. The Strength and Integrity Inspection will be performed by an NSWCCD LCEM Inspector and the cognizant RMC SGPI.

3.6.5 Industrial Support Visit Inspection. The ISV inspection shall be scheduled during the availability, but may be waived by the TYCOM for availabilities of short duration.

- a. The ISV inspection will be scheduled by the industrial activity or Supervising Authority as applicable.
- b. The ISV inspection will be performed by an NSWCCD LCEM Inspector and the cognizant SGPI.

3.6.6 Completion of Availability Inspection. The CAI will be conducted before reinstallation of steam drum internals and de-superheater for the Strength and Integrity Inspection.

- a. The CAI will be scheduled by the industrial activity or Supervising Authority, as applicable, and may be conducted in conjunction with a Routine Inspection.
- b. The CAI will be performed by an NSWCCD LCEM Inspector and the cognizant SGPI.

3.6.7 Inactivation or Reactivation Inspection. The Inactivation/Reactivation Inspection shall be conducted on all boilers prior to completion of the inactivation/reactivation.

- a. The Inactivation/Reactivation Inspection will be scheduled by the industrial activity, Supervising Authority or Inactive Ship Facility as applicable.
- b. The Inactivation/Reactivation Inspection will be performed by an NSWCCD LCEM Inspector and the cognizant SGPI.

3.6.8 Engineer Officer Inspection. The Engineer Officer Inspection shall be conducted per PMS and situational requirements of references (b) and (c), but does not qualify as a Routine Inspection described in paragraph 3.6.1 of this chapter. This inspection will be scheduled and performed by the ship's Engineer Officer. All results are to be documented in the Boiler/Water Feedwater logs and the Engineering Logs.

### 3.6.9 Special Inspection.

- a. A special inspection shall be conducted whenever major repair work as defined by references (b) and (g) is accomplished. This inspection is arranged by the ISIC in coordination with the TYCOM and the RMC and performed by an SGPI.
- b. Additionally, SGPIs are authorized to conduct special no-notice inspections at their discretion to assess operational, chemistry and maintenance related problems.

3.6.10 Operational Assessments. An operational assessment shall be accomplished prior to and at the completion of all Chief of Naval Operations (CNO) scheduled maintenance availabilities. These assessments are part of the Routine and Strength and Integrity Inspection requirements. These assessments will include both cold and hot plant inport safety checks and an operational evaluation. Detailed assessment requirements and check lists are available in reference (c), Figure E-6.

## 3.7 BOILER INSPECTION GUIDELINES AND REPORTS.

### 3.7.1 Guidelines.

- a. Routine Inspections of boilers will be conducted by certified SGPIs.
- b. Only an SGPI with a current certification may issue a Repair Before Operating (RBO) deficiency. All RBO items shall be corrected prior to boiler operation and reinspected by a certified SGPI or NSWCCD LCEM Inspector, as applicable, and preferably the same SGPI/NSWCCD LCEM Inspector who originally inspected the boiler. RBO discrepancies include those for which continued unrestricted operation could endanger personnel. RBOs may not be departed via DFS. If there is not an immediate or near future danger to personnel, the discrepancy shall be assigned as SEVERELY DEGRADED with major operational restrictions.
- c. An SGPI-designated discrepancy discovered in accordance with reference (c) and paragraph 3.9.2 of this chapter which is assigned as severely degraded with major operational restrictions, and is considered for a DFS submission, is a major DFS and must be brought forward to the attention of the NAVSEA Boiler and Condenser Technical Warrant. A Major DFS must be forwarded for NAVSEA review and approval with accompanying engineering analysis recommendations from the originator. A severely degraded discrepancy in accordance with this chapter must be corrected/repared prior to boiler operation unless it has been properly approved as a Major DFS.
- d. The status of a boiler related DFS will be verified by the SGPI during the inspection for conformance with the requirements of this manual prior to placing the boiler into operation.

### 3.7.2 Reports.

- a. The SGPI shall provide an oral critique and preliminary report to the ship's Commanding Officer or his designated representative. The report will contain the findings of the inspection, with special note of recurring discrepancies from previous inspections. The SGPI shall ensure a maintenance ready 2-Kilo for every discrepancy found during the inspection is entered into the Current Ship's Maintenance Project.
- b. The Senior Inspector will forward a copy of the BIRMIS report with cover letter per the sample shown in Appendix D of this chapter to the ship's Commanding Officer no later than ten days after satisfactory clearance of all discrepancies.
- c. The SGPI shall report deficiencies discovered during the inspection by message within 24 hours, using the message format of Appendix E of this chapter. This message shall contain both RBO and severely degraded deficiencies as described in paragraph 3.7.1 of this chapter.
- d. The cognizant SGPI shall report by message, using the format in Appendix F of this chapter, the correction and re-inspection of all RBO deficiencies prior to lighting off an inspected boiler.
- e. The ship's Commanding Officer shall submit a copy of the Current Ship's Maintenance Project to the SGPI for verification of downloaded 2 Kilos.

- f. The ship's Commanding Officer shall report corrected deficiencies, by message, to the ISIC and TYCOM using the format in Appendix G of this chapter, within 30 days of the completed inspection and at 30 day intervals thereafter until all deficiencies are corrected or deferred to a CNO Maintenance Availability. The TYCOM is the sole authority for deferral of deficiencies. Update messages shall list the BIRMIS item number/2K Job Sequence Number of those items which have been completed since the last update message. A corrected BIRMIS report will be provided to the ship after BIRMIS status codes are updated.
- g. The ship's Commanding Officer shall notify the ISIC (as applicable)/TYCOM when a scheduled steam generating plant inspection cannot be conducted by submitting a DFS request. State the reason why the inspection cannot be conducted and recommend a revised date.

### 3.8 BOILER INSPECTION PREPARATION.

- a. Conduct the operational assessment before disassembling the boiler for inspection. Detailed assessment requirements are reported in reference (c).
- b. Prepare the boiler using the guidance provided in reference (b).
- c. Keep air passages, including the air box beneath the boiler and uptake spaces, clean and dry.
- d. Wire shut and danger tag all steam and water valves to the boiler per the ship's Tag Out Users Manual. Open to the atmosphere the drain connections on all dead interconnecting piping to observe drainage.
- e. The ship's Engineer Officer shall ensure all Ship's Force responsibilities are complete using the guidance provided in reference (c).
- f. Open DFT for inspection.

### 3.9 BOILER INSPECTION.

3.9.1 Boiler Inspection Forms. Boiler inspections will be conducted using the appropriate BIRMIS forms. Include specific comments on the state of preservation and material condition of the boiler, hull structural members beneath the boiler and the effectiveness or ineffectiveness of the boiler water chemistry program.

3.9.2 Boiler Inspection Areas. A discrepancy is classified as an RBO, if left uncorrected, it could endanger personnel safety. All RBO items shall be corrected prior to boiler operation and re-inspected by a certified SGPI or NSWCCD LCEM Inspector as applicable, and preferably the same SGPI/NSWCCD LCEM Inspector who originally inspected the boiler. As inspected by an SGPI/LCEM inspector, RBO discrepancies may include but are not limited to the following:

- a. Active oxygen attacking the boiler watersides.
- b. Hard scale or baked sludge.
- c. Significant lube oil/fuel oil contamination of watersides.
- d. Inoperative/misadjusted/missing safety devices.
- e. Refractory deterioration which allows heat penetration to casings or causes incomplete combustion.
- f. Ship's Force Boilerwater/Feedwater certifications, chemical inventory and shelf life not within requirements in reference (h).
- g. Inability to maintain water chemistry within limits. Ineffective Boilerwater/Feedwater program based on log review which left uncorrected may result in severe degradation of the boiler watersides. Inoperative or degraded treatment, sampling and blow-down systems.
- h. Excessively fouled or tacky firesides, fireside deposits built up on the crown of the water drum.
- i. Sliding feet that do not accept grease and/or do not show indication of movement.
- j. Lack of maintenance and preservation of the boiler, resulting in deterioration and weakening of boiler and hull structural members. This includes deterioration in the air casing which allows water and combustion air/gasses into the space.

- k. Lube oil contamination of Automatic Boiler Control (ABC) Systems.
- l. Fire/safety hazards (fuel/lube oil in the machinery room), deteriorated or missing flange shields. Oil soaked lagging and insulation.
- m. Inoperative or missing fire fighting equipment.
- n. ABC equipment inoperable or failed cold/hot checks.
- o. Steam smothering system inoperative (plugged nozzles, deteriorated or improperly installed piping).
- p. Deteriorated boiler smoke pipes which allow stack gas to escape. Clogged or deteriorated stack drains.
- q. Incorrectly adjusted burners or inoperative air registers. Safety Shut-off Devices which do not meet the leakage criteria of reference (b). Insufficient amount of sprayer plates, burner barrels and go-no-go gages to meet main space requirements as specified in reference (b).
- r. Boiler that does not pass design hydrostatic test.
- s. Non-deferrable defects/indications in the pressure vessel and piping boundary.
- t. Damaged or deteriorated internals.
- u. Defective tubes such as blistered, excessively warped or married tubes which prevent proper gas passage. Cracked tube bells.
- v. Ultrasonic test results on soot blower heads or pressure vessel piping that are currently or projected to be at or below minimum requirements, out of periodicity, or when visual inspection dictates replacement before the next scheduled ultrasonic inspection.
- w. Out of periodicity, in-operative temperature or pressure measuring instruments.
- x. In-operative, out of adjustment Forced Draft Blower counterweight shutters.
- y. Non-functioning DFT components or defects in the pressure vessel.
- z. In-operative fuel and steam systems remote isolation devices.
- aa. Valve tightness integrity and operation which limits its ability to perform its intended function and exceeds the criteria of reference (i).
- ab. Non-conformance of electrical safety and deteriorated or damaged wiring or components.
- ac. Any other discrepancy deemed by the SGPI which would cause injury to personnel.

**NOTE: A SEVERELY DEGRADED DESIGNATION IS ASSIGNED TO A DEFICIENCY THAT IS NOT AN IMMEDIATE OR NEAR FUTURE DANGER TO PERSONNEL, BUT WILL HAVE MAJOR OPERATIONAL RESTRICTIONS. A SEVERELY DEGRADED DISCREPANCY IN ACCORDANCE WITH THIS CHAPTER MUST BE CORRECTED/REPAIRED PRIOR TO BOILER OPERATION UNLESS IT HAS BEEN PROPERLY APPROVED AS A MAJOR DFS.**

3.9.3 Completion of Inspection. An oral critique and a preliminary inspection report, including a summary of restrictive deficiencies, will follow the inspection. Paragraph 3.7.2 of this chapter identifies official reporting requirements.

### 3.10 AUTOMATIC BOILER CONTROL SYSTEMS/ONLINE VERIFICATION GUIDELINES.

- a. ABC Systems, which include Automatic Combustion Controls, Boiler Feedwater Level Controls, and Automatic Feed Pump Controls and DFT Level Controls have been designed and installed for the purpose of permitting steady and transient operation with the least variation possible. Proper utilization and maintenance of these systems will also allow a reduction of watch standers on station thereby enabling engineering personnel to devote more time to routine maintenance of machinery and upkeep of spaces, as well as providing the ship with instant response to signaled engine orders.
- b. The following guidelines shall be adhered to regarding any or all ABC Systems installed:

- (1) Ships shall use the controls at all times while steaming. Manual operation at the control panel/console (remote manual) shall be used when lighting off or securing the boiler. ABCs should be cut out and the boiler controlled in local manual only when required for casualty control, maintenance of equipment, or training of personnel. When ABCs cannot be operated in automatic, this fact shall be reported by a CASREP message.
  - (2) Installed multi-element feedwater regulators shall be cut in and used at all times except for periods devoted to training operators in the manual operation of feed check valves. Prime reliance for the control of water level in the boiler steam drum shall be placed on the automatic regulator. When any indicator, alarm or feedwater regulating valve is not functioning properly, or is out of commission, a qualified checkman shall be assigned. He/She shall have no other duties as directed by temporary standing orders.
  - (3) Prior to boiler light off, all ABCs shall be tested in accordance with EOSS.
  - (4) Maintenance and calibration of the ABC Systems shall be accomplished by qualified technicians in accordance with the direction provided in applicable PMS, reference (j) and the manufacturer's technical manuals.
- c. Online Alignment Verification procedures provide a set of checks to verify proper performance of each of the sub-systems or control loops within the automatic combustion, feedwater and feed pump control systems. Online Alignment Verification shall be accomplished using the periodicity and procedures in PMS and applicable ABC ship specific technical manuals.

3.11 BOILER FLEXIBILITY TESTS. PMS and Online Alignment Verification procedures contain the necessary procedures for a boiler flexibility test. The periodicity is provided by and included in the PMS scheduling. The applicable Maintenance Requirement Card contains the NAVSEA guidelines governing the performance level of the boiler flexibility tests. Level I is the desired boiler flexibility performance level. Boilers with performance levels of II and III are considered safe to steam and safe for the conduct of Engineering Casualty Control Exercises. Boilers which cannot achieve a minimum level III flexibility are unsafe to steam and the ABC System should be reported by CASREP in accordance with the requirements of reference (d).

3.12 CERTIFIED BOILER WATER AND FEEDWATER TESTER REQUIREMENTS. All personnel who are required in the course of their duties to test, treat and/or manage boiler water/feedwater programs shall be certified as specified in reference (k).

3.13 OPERATING AND CASUALTY PROCEDURES. Each ship with steam generating plants will have approved Steam Generating Plant Operations Procedures in the format prescribed by their respective TYCOM. They shall contain detailed procedures and precautions for:

- a. Normal operations including startup and shutdown.
- b. Infrequent operations such as initial steam generating plant light-off following an availability.
- c. Operating parameters, limitations, alarms and set points.
- d. Casualty conditions including indications, immediate and supplementary actions.
- e. Propulsion fuel economy per references (l) and (m).
- f. JP-5 for use as boiler fuel.
- g. Management of boiler water and feedwater.
- h. Quality Assurance (QA) requirements for boiler repairs.
- i. Maintenance and storage of boiler burner atomizers.

**VOLUME IV**  
**CHAPTER 4**  
**DIESEL ENGINES**

**REFERENCES.**

- (a) OPNAVINST 9220.3 - Propulsion and Auxiliary Plant Inspection and Inspector Certification Program
- (b) NAVSEA S9233-CJ-HBK-010/020 - U.S. Navy Diesel Engine Inspectors Handbook, Parts 1 (Inspection Procedures) and 2 (Technical Information)
- (c) NAVSEAINST 4730.1 - Shipyard Inspection and Required Conditions of Propulsion Plant Systems (Non-Nuclear) on Nuclear Powered Submarines
- (d) NAVSEA S9086-HB-STM-010 - NSTM Chapter 233 (Diesel Engines)
- (e) NAVSEAINST 4730.2 - Inspection and Required Conditions of Propulsion Plant Systems (Non-Nuclear) for Nuclear Powered Aircraft Carriers
- (f) NWP 1-03.1 - Naval Warfare Publication Operational Report
- (g) NAVSEAINST 4790.8/OPNAVINST 4790.4 - Ships' Maintenance and Material Management (3-M) Manual
- (h) NAVSEA S9086-H7-STM-010 - NSTM Chapter 262 (Lubricating Oil)
- (i) NAVSEA S9086-GX-STM-020 - NSTM Chapter 220, V3 (Water Treatment)

**LISTING OF APPENDICES.**

- A Assessment/Inspection Main Propulsion Diesel Engine and Ship Service Diesel Generators for LSD-41/49 and LPD-17 Class Ships

4.1 **PURPOSE.** To provide guidance for the conduct of diesel engine inspections, timely correction of discrepancies and the general operation and maintenance of diesel engines.

4.2 **DIESEL ENGINE INSPECTOR CERTIFICATION.** The Diesel Engine Inspector (DEI) Program Manager is Naval Sea Systems Command (NAVSEA) Philadelphia. The Regional Maintenance Center (RMC) is the administrative manager for their respective region. DEI certification and certification extension requirements as outlined in reference (a), are amplified as follows:

- a. Initial Certification. All DEI candidates that have satisfactorily completed the required Certification course, Service School Command A-652-0311, shall receive an Interim Navy Enlisted Classification (NEC). The DEI candidate will have a period of one year from course completion date to satisfactorily perform two diesel inspections under instruction from a certified DEI. Upon completion of the second, successful inspection, the candidate must submit a request to be assigned the DEI NEC 4314, through his chain of command to the appropriate RMC for their review. The RMC will forward their endorsement to the Type Commander (TYCOM) for their endorsement, if required, and then to NAVSEA Philadelphia, who initiates the process of assigning the 4314 NEC. Initial qualification to perform diesel inspections will be for a period of 36 months. The requesting letter must contain:
  - (1) A copy of the two completed inspection reports performed under the observation and supervision of a DEI.
  - (2) Date of graduation from the certification course of instruction.
- b. Transfer of the DEI will not require re-designation or re-qualification, as long as the DEI has maintained his qualifications in accordance with paragraph 4.2.c. of this chapter.
- c. Maintaining Certification. All DEIs must maintain up to date knowledge of approved inspection practices and policies. Certification will be maintained by:
  - (1) Successfully conducting a minimum of two inspections annually in accordance with reference (b).
  - (2) In each calendar year, attending one of the semi-annual inspector seminars. DEIs unable to meet this requirement may obtain a waiver from the Program Manager.

- (3) Extending Qualification. Qualified inspectors may request to extend their initial or subsequent qualifications, in 36 month increments, providing that the requirements in paragraph 4.2.c. of this chapter are met. To extend qualification:
  - (a) The DEI shall submit a letter to the RMC requesting qualification extension that includes a brief description of the inspector's duties during the qualification period, specify the date of the latest seminar attended and provide as enclosures a copy of the two most recent inspection report cover letters performed by the inspector.
  - (b) The RMC shall endorse the letter and forward it to the Diesel Program Manager.
  - (c) The TYCOM may require endorsement on these extension requests.
- d. Revoking Certification. If an inspector has not maintained the qualification requirements of paragraph 4.2 of this chapter, the RMC may submit a request to the Program Manager to have the DEI NEC4314, removed from the inspector. The TYCOM requires endorsement on this action.
- e. Reinstatement of Expired/Revoked Certification. A DEI whose certification either expired or was revoked may request reinstatement of his certification by submitting a letter to the Program Manager via his chain of command and the RMC. The letter must contain:
  - (1) A brief description of the DEI's duties during and following the certification period.
  - (2) Copies of the two most recent inspections performed. If the DEI's certification has been expired for more than six months prior to the request or was revoked, the two most recent inspections shall be completed under the instruction of a certified DEI.

#### 4.3 DIESEL INSPECTIONS.

**NOTE: FOR THE ASSESSMENT/INSPECTION OF MAIN PROPULSION DIESEL ENGINES (MPDE) AND SHIP SERVICE DIESEL GENERATORS (SSDG) ON LSD-41/49 AND LPD-17 CLASS SHIPS SEE APPENDIX A.**

##### 4.3.1 Diesel Engines Requiring Inspections.

- a. All diesel engines, including main propulsion, ship service and emergency diesel generators onboard ships and submarines shall be inspected in accordance with references (a) and (b).
- b. All small boat diesel engines, including main propulsion, ship service and emergency diesel generators that are 400 Brake Horsepower and above, unless otherwise determined by TYCOM, shall be inspected in accordance with references (a) and (b). TYCOMs may exempt diesel engines on small boats and craft from inspection requirements where the engine or boat configuration provides insufficient access to accomplish the inspection.

4.3.2 Periodicity of Inspections. Diesel engines shall be inspected in accordance with references (a) and (b) on the following events:

- a. Routine/Pre-Availability Inspections.
  - (1) Once during the unit's cycle, not to exceed 24 months. The normal interval between routine diesel inspections is 18 months. Routine/Pre-Availability Inspections may be performed as early as 12 months or as late as 24 months to allow for maximum scheduling flexibility and utilization of assessment findings. The TYCOM, Immediate Superior in Command (ISIC) and other Fleet Maintenance Managers shall ensure the Routine/Pre-Availability Inspection is scheduled to allow adequate time prior to availabilities to utilize the inspection/assessment results to plan work on the diesel. As per reference (a), in no case shall the interval between Routine Inspections exceed 24 months. A Routine/Pre-Availability Inspection normally consists of all three phases as discussed in paragraph 4.3.4 of this chapter. For Emergency Diesel Generators (EDG) onboard nuclear powered vessels, industrial activity work on the diesel engine(s) or its support systems will not normally be approved except during a Chief of Naval Operations (CNO) Availability. The TYCOM/ISIC shall ensure that adequate upkeep time is made available prior to the availability to ensure there are a sufficient number of diesel engines with no outstanding discrepancies to provide the required standby power during the availability.

- (2) For Submarine CNO Availabilities greater than six months.
- (a) The Pre-Availability Inspection shall be integrated into the Shipyard's work definition period and shall be considered the Pre-Availability Test for the EDG.
  - (b) SUBMEPP shall enter this Pre-Availability Inspection in the applicable 000-Series SWLIN as a Pre-Availability Test assigned to Forces Afloat.
  - (c) The DEI shall include the Executing Shipyard (Code 260) and the Supervisor of Shipbuilding/NAVSEA Shipyard Representative's Office, as applicable, on distribution for all DEI reports conducted as a Pre-Availability Inspection or during the availability.
  - (d) As Lead Maintenance Activity, the executing shipyard will work with the TYCOM to assign all deferred inspection deficiencies to the appropriate repair activity for repair.
  - (e) The Shipyard's technical review of this inspection report may satisfy the Pre-Availability technical assessment requirement of reference (c).
- b. Post Casualty/Pre-Overhaul. When major internal engine malfunctions have occurred or are suspected (e.g., crankcase explosion, major bearing, blower or crankshaft failure), or there are indications that the engine is in need for overhaul. Extent of disassembly/inspection is at the discretion of the DEI based on the casualty or observed indications. For Post Casualty Inspections, the DEI must determine the full extent of damage and the cause, along with recommendations for repairs. For Pre-Overhaul Inspections, the TYCOM may require the DEI confirm that an overhaul is required and determine the scope of the overhaul. Partial inspections do not satisfy the requirement for a complete Routine Inspection and this fact will be annotated in the DEI's written report.
- c. Post Overhaul/Repair. When an engine has been overhauled or significant maintenance/repair has been completed. A Post Overhaul/Repair Inspection shall be conducted by a DEI prior to continuous operation. The DEI will make the final determination of whether the overhaul/repair was extensive enough to warrant a Post Overhaul/Repair Inspection. The inspection shall consist of a review of actions taken to complete the overhaul/repair, external visual inspection, tests of safety devices, review of required readings/clearances and a Phase III operational test. Unless there are indications of internal discrepancies, Phase II (internal inspection) is waived and the Routine Inspection periodicity requirement in paragraph 4.3.2.a of this chapter will be considered complete and valid. The Post Overhaul/Repair inspection should be an integral part of the overhaul/repair vice a separate inspection. Specifically, the Phase III operational test should be part of the final operational testing of the overhaul/repair vice a separate operational test.
- (1) For contractor accomplished work, the contractor specification will contain requirements for the contractor to document required readings/clearances on applicable forms and have appropriate check points made by a DEI/Industrial Subject Matter Expert (SME) during the overhaul/repair. If there is evidence of poor workmanship, use of improper parts, discrepancies in reassembly/test documentation or missing information as part of the repair process or during the inspection, the DEI/Industrial SME will advise the Repair Project Manager of the quality issues and required actions. The Repair Project Manager will coordinate required actions with the RMC Technical Authority and Maintenance Team. The RMC shall liaise with the TYCOM and obtain TYCOM concurrence on all required actions and shall advise the TYCOM of all potential cost and schedule impacts.
  - (2) For Ship's Force/Fleet Maintenance Activity accomplished engine overhauls, a Post Overhaul/Repair Inspection will be conducted by a DEI prior to starting the engine. The scope of the inspection will be as specified in paragraph 4.3.2.c of this chapter. Commanding Officer (or designated representative) permission is required to perform Phase II (internal inspection) when requested by the DEI.
- d. New Construction (Acceptance Inspection).

- (1) Prior to the delivery of a newly constructed ship, when requested by the Board of Inspection and Survey. An acceptance inspection will normally be conducted in conjunction with the open-and-inspect phase of Board of Inspection Survey acceptance trials. The acceptance inspection does not satisfy the requirements of a routine inspection.
  - (2) The initial Routine Inspection on a new construction unit shall occur prior to initial start up by Ship's Force. The cognizant Supervisor of Shipbuilding should incorporate the DEI as part of the Government Test Plan/Acceptance Plan. The cognizant Supervisor of Shipbuilding shall notify the DEI for new construction acceptance test prior to Ship's Force accepting responsibility of the diesel engine. This will ensure that an inspection baseline is established and construction discrepancies are identified/corrected early in the life of the unit.
  - (3) For submarine and CVN construction programs, the initial Routine Inspection on a new construction unit shall occur prior to initial start up by Ship's Force. For ships with temporary systems in place or less than 95 percent load available, the Phase I (see paragraph 4.3.4a of this chapter) and Phase II (see paragraph 4.3.4b of this chapter) inspections shall occur in conjunction with crew Operational Control Transfer including an operational test at available load. The Phase III (see paragraph 4.3.4c of this chapter) inspection shall occur prior to ship delivery when sufficient loading is available. Any as found conditions requiring corrections shall be adjudicated via the normal shipyard Operational Control Transfer inspections adjudication process. The routine diesel inspection periodicity shall commence upon completion of all three diesel engine inspection phases.
- e. Reactivation of Engines in Inactive Equipment Maintenance. Prior to the first operation of engines which have been placed in Inactive Equipment Maintenance. The inspection consists of a Phase I review of the actions taken to place the engine in and out of lay-up status, external visual inspection, test of safety devices and a Phase III operational test. Unless there are indications that an internal inspection (Phase II) is required, the inspection will be considered complete. This inspection should be requested far enough in advance of the first key event requiring use of the diesel. This will ensure any significant discrepancies found can be corrected prior to the start of the key event. This inspection does not satisfy the requirements of a routine inspection as per paragraph 4.3.2.a of this chapter unless a complete Phase II is accomplished.

#### 4.3.3 Inspection Scheduling.

- a. Diesel inspections are scheduled by the ship with RMC, via ISIC when appropriate, in accordance with reference (a) and the Planned Maintenance System (PMS). As part of this process, units shall contact the local RMC/ISIC Diesel Inspector to schedule the diesel inspection 120 days prior to the desired inspection date and submit a work request (OPNAV 4790/2K) to the appropriate RMC a minimum of 90 days in advance of the desired dates to allow for DEI scheduling.
- b. It is the responsibility of the Fleet Maintenance Managers (the ship, ISIC, and **Ashore Ships Maintenance Managers**, as appropriate) to schedule the diesel inspection with the RMC during a period where the inspection's condition assessment can be best utilized for repair planning. The inspection may require that each engine being inspected normally be placed out of commission for five to seven days at the minimum. This time frame may increase when significant Repair Before Operating (RBO) discrepancies are discovered that require extensive repairs. Sufficient time must be allowed for the performance of the operational phase of the inspection which requires specific load testing as defined by PMS. SSDGs normally have the operational phase performed inport, whereas operational assessment of MPDEs requires the ship to be underway for a minimum of one day. Units with MPDEs must allot underway time to allow the DEI to complete the operational phase. The operational phase of the inspection must be completed within 90 days of the start of the inspection. If the operational phase cannot be completed within these 90 days, a TYCOM approved Departure From Specification (DFS) per Volume V, Part I, Chapter 8 of this manual is required. Without a DFS, the inspection will be terminated and rescheduled. Ships should integrate the operational phase of the inspection into the **Fleet Response Training Plan** underway schedule.
- c. A Diesel Inspection shall be accomplished by an ISIC/RMC DEI. It is encouraged that persons holding the DEI NEC that may be assigned to the ship being inspected be part of this inspection.

4.3.3.1 Inspection Deferrals. TYCOMs may approve a minor DFS for diesel inspections in the 18 to 24 month window. With the flexibility to schedule a diesel inspection within a 24 month period, requests to delay or cancel required inspections shall only be granted in extreme circumstances. It is therefore critical that the Ship and the Fleet Maintenance Managers schedule the diesel inspection/assessment in accordance with paragraph 4.3.3.a of this chapter well in advance of the 24 month date since the last inspection. In those extreme circumstances when an inspection cannot be accomplished within 24 months, the unit shall submit a DFS request to the TYCOM no later than the 23<sup>rd</sup> month since the last inspection, that includes satisfactory operating trend data reviewed by a DEI confirming that the engine is in sound operating condition. For inspection deferrals of greater than 24 months, the TYCOM will forward endorsement to NAVSEA 05Z for approval of the DFS.

4.3.4 Inspection Phases. The diesel inspection consists of a detailed records check, internal material condition inspection and observation of engine operating characteristics. During all phases of an inspection, all safety precautions with the engine and space shall be strictly adhered to. The degree of the inspection shall be decided by the DEI based on the results of reference (b) mandatory check points, TYCOM directed check points, if any, operating data and other records maintained on the diesel engine. The inspection will include the following phases (For LSD-41/49 Class ships and LPD-17 Class ships see Appendix A):

- a. Phase I - Administrative Inspection. This is a complete review of the administrative records associated with the diesel engine(s).
- b. Phase II - Secured Inspection (partial disassembly). Based on the results of Phase I, the inspector will decide the degree of disassembly and will conduct a thorough evaluation of the internal condition of the engine as warranted by Phase I and Phase II findings. In accordance with reference (b), disassembly of the engine will be minimized. Submarines shall have a complete Phase II Inspection in accordance with reference (b).
- c. Phase III - Operation Inspection. The DEI will observe and analyze operating data on all inspected engines in accordance with reference (b) and PMS Maintenance Requirement Card (MRC) for performance testing/troubleshooting the engine. If no PMS guidance exists, then 100 percent or maximum attainable load on all inspected engines should be achieved.

4.3.5 Preparation for Diesel Engine Inspection.

- a. The DEI shall meet with the inspected ship's Commanding Officer or his designated representative, Engineer Officer and a diesel system expert prior to the start of the inspection. **Where appropriate, either** the Reactor Officer or the Engineer Officer may fulfill this role. This visit will ensure that Ship's Force is aware of the extent of the inspection, what PMS is to be accomplished, required support to be provided to the DEI and interference to be removed to allow access to the diesel engine. Coordination between the ship and the DEI can significantly reduce the time the diesel will be out of commission for inspection purposes and maximize the training to Ship's Force. Ship's Force will perform diesel engine disassembly, reassembly and operation, as well as correcting Ship's Force capable discrepancies concurrent with the inspection. It is the responsibility of Ship's Force to order all software and repair parts for Ship's Force capable work, to include all gaskets, lockwire, etc., for engine reassembly. Discrepancies beyond Ship's Force capability will be scheduled to be corrected through the Fleet Maintenance Managers, utilizing the Current Ship's Maintenance Project. At all times during the inspection, safety precautions with the engine and the space will be strictly adhered to. The DEI will meet with the Main Propulsion Assistant or Engineer Officer on a daily basis to ensure the unit's leadership is informed and produce optimal coordination efforts.
- b. The ship will:
  - (1) Prepare the diesel engine for inspection.
  - (2) Provide the DEI with dedicated time and the appropriate personnel to conduct the inspection. The inspection will be structured to maximize training of shipboard personnel. The ship should ensure continuity of personnel is maintained during the inspection/assessment.
  - (3) Assign a Job Control Number for accomplishing the inspection and record all parts usage through the Maintenance and Material Management system.

- (4) Ensure all equipment directly associated with the engine(s) is operable.
- (5) Ensure all records are available and in good order.
- (6) Ensure that the tools listed on the appropriate MRCs, technical manuals, and DEI check sheets are available for use during the inspection.
- (7) Ensure that all applicable MRCs and technical manuals for the engine and related support systems are available.
- (8) Test diesel engine lubricating oil in accordance with the applicable Lube Oil Quality Management program, as defined by PMS, prior to the inspection. In most cases, this requires Navy Oil Analysis Program results of recent oil sample be available.
- (9) Test jacket water treatment in accordance with PMS prior to the inspection.
- (10) For SSN/SSBN/SSGN Class Submarine EDGs, the unit should evaluate existing conditions of battery capacity, propulsion plant status and shore power reliability. Based upon this evaluation, if conditions warrant, the ship will submit a request for a stand-by generator for emergency power during the diesel inspection.

4.3.6 Inspection Findings. The inspection will report “as found” conditions.

4.3.6.1 Repair Before Operating. RBO discrepancies include those for which continued unrestricted operation could endanger personnel and/or cause serious damage to the engine or associated equipment. If there is not an immediate or near future danger to personnel or equipment the discrepancy shall be assigned as Major and a DFS submitted by Ship’s Force. Discrepancies that may cause an RBO include but are not limited to:

- a. Malfunctioning overspeed governor or trip.
- b. Inoperative alarms or safety devices.
- c. Low lube oil pressure.
- d. Readings that exceed the limits of PMS or manufacturer specifications that are unsafe for continued unrestricted operation.
- e. Uncontrollable lube oil or fuel oil leaks. Reference (d) provides guidance for lube oil and fuel oil leaks.
- f. Lube oil fuel dilution (five percent or greater) and/or lube oil unfit for further use. (For additional guidance on LSD-41/49 Class, see Appendix A.)
- g. Evidence of serious internal failure (bearing, connecting rod, crankshaft, or piston failure).

4.3.6.2 Major Deficiency. This finding is made when major problems exist, but the engine is still operable with restrictions approved by the TYCOM. Any deficiency that has been noted as major shall require either immediate correction within 30 days of discovery or reported by Naval message in accordance with paragraph 4.4.b(3) of this chapter. This requirement does not alter the normal Casualty Reporting or DFS reporting requirements. In accordance with references (a) and (b), major deficiencies include, but are not limited to:

- a. Engine unable to maintain rated load.
- b. Automatic equipment inoperative or not functioning properly.
- c. Critical components exceed prescribed limits but do not meet the RBO criteria.
- d. Temperature and/or pressure between cylinders are not within specification.
- e. Either Remote or Local engine starting (one of two must be operational) or remote securing devices are inoperative.
- f. Excessive blower clearance readings.
- g. Air box exhaust belt/muffler is excessively dirty or oil laden.
- h. Clogged valves or ports.
- i. Malfunctioning fuel injection system.

- j. Jacket water treatment out of specification.

4.3.6.3 Minor Deficiency. Categorize all other deficiencies as minor.

4.3.6.4 Re-inspections. RBO deficiencies must be re-inspected prior to engine operation by a DEI. If possible, the original DEI should be used, if available. Re-inspection of major and minor deficiencies is not required unless stated in the engine's inspection report.

4.3.6.5 Recurring Discrepancies. A recurring discrepancy from a previous inspection will be so noted on the inspection report.

4.3.6.6 Component Certification (Aircraft Carriers only). With the exception of RBOs, deficiencies identified in the course of diesel engine inspections performed prior to or during a CNO availability do not necessarily affect component certification to support readiness conditions identified in reference (c) and reference (e). Evaluation of specific deficiencies by Ship's Force and Naval Supervisory Authority/project team personnel is necessary to determine system readiness conditions are met. An emergency diesel generator is considered certified for operation per reference (c) and reference (e) provided the diesel inspection and all required PMS are within periodicity, including completion of a satisfactory performance test.

#### 4.4 REPORTING REQUIREMENTS.

- a. Casualty Reporting (**submarines only**).

- (1) Purpose. To provide guidance for Casualty Reporting (CASREP) requirements for submarine diesel generators. CASREPs are in addition to, and do not replace the reporting requirements of other documents (e.g., Naval Reactors Technical Bulletins, Operational Orders, Mishap Reports, etc.).
- (2) Background. The significance of a submarine's emergency and backup power supplies cannot be overstated. Reference (f) defines the CASREP types, requirements and format. CASREP requirements of Out of Commission power generating or storage equipment require additional clarification.
- (3) SSBN/SSGN Class Submarine EDGs. Report EDG casualties by message as allowed by operational constraints.

- b. The ship's Commanding Officer shall:

- (1) Ensure that each inspection/assessment is entered in the applicable machinery history with a brief description of any RBO conditions found at the conclusion of the assessment/inspection.
- (2) All maintenance actions and parts usage as the result of the inspection/assessment are properly documented in accordance with reference (g).
- (3) Send a Naval message listing the status of all discrepancies listed in the inspection/assessment report within 30 days of receipt of the serialized report and every quarter thereafter until all deficiencies are corrected/resolved or brokered by the Maintenance Manager. The message must contain the engine number, date of inspection, type of inspection conducted, and the status of deficiencies not previously reported as corrected or a listing of what has been brokered. All deficiencies not corrected during or immediately after the inspection must have a Job Control Number assigned and be listed in the message. The ISIC/Fleet Maintenance Managers shall ensure that the deficiencies listed in the inspection/assessment message are corrected at the earliest opportunity in the unit's maintenance cycle.

- c. The DEI shall:

- (1) The DEI shall ensure a maintenance ready 2-Kilo for every discrepancy found during the inspection is entered into the Current Ship's Maintenance Project. The DEI shall also make a verbal report to the ship's Commanding Officer or his designated representative. The verbal report should discuss the findings of the inspection/assessment, with special note of recurring discrepancies from previous inspections/assessments.

- (2) Prepare the inspection report in accordance with reference (b) within 30 days following completion of the inspection. The write up shall further detail the cause or conditions that lead to the discrepancy noted on the 2-Kilo or in the report. The report shall identify what was accomplished during the inspection/assessment to correct any discrepancies and any actions required to correct outstanding discrepancies.
- (3) Utilize the Diesel Inspection Management Information System using the DEI report generator for classes of ships that are currently in use. For classes of ships that are not yet in the system, use the current guidance that is in reference (b). This inspection shall be reviewed by the RMC prior to forwarding the report to the Commanding Officer of the inspected ship, with information copies to the ISIC, TYCOM, Fleet Maintenance Managers, the cognizant Shipyard (Code 260) and Supervisors of ShipBuilding/NAVSEA Shipyard Representative's Office (Pre-Availability and during Availability Inspections only) and In Service Engineering Agent.

4.5 OPERATION AND MAINTENANCE. This section does not supersede existing engine, ship or ship class specific guidance and is only meant to provide guidance where currently none exists.

- a. Per reference (d), the light loading of a diesel engine (less than 60 percent) should be avoided. Consistently light loading a diesel engine will cause one or more undesirable conditions, depending on specific engine design:
  - (1) A loss of cylinder compression due to glazed cylinder walls, leading to an unnecessary premature engine overhaul.
  - (2) Carryover of engine lube oil into the exhaust, causing excessive exhaust smoke and creating conditions for a possible exhaust stack fire.
  - (3) Fuel oil dilution of lube oil, leading to frequent oil changes.
  - (4) Carbon formation on exhaust valves, leading to valve failure.

In situations where light loading of a diesel engine is unavoidable, arrangements should be made to operate the engine at 60-80 percent rated load capacity for a minimum of thirty minutes, preferably three hours, unless other guidance exists specific to the engine's application. This can help offset the detrimental effects of light loading; however, it is not to be considered a suitable alternative to the avoidance of light loading. Further details are provided for LSD-41/49 Class MPDE in Appendix A.

- b. Per reference (h), diesel engines that have online purification capability shall operate the purifier continuously while the diesel engine is operating. On installations where multiple engines are serviced by one purifier, the purifier alignment should be shifted periodically within a 24 hour period to ensure all engines receive adequate oil purification and maintain satisfactory oil condition. Each engine's operating hours and oil condition should be considered when scheduling purification of several engines on a rotational basis.
- c. Per reference (i) and PMS, diesel engine jacket water treatment must be tested and maintained to ensure proper corrosion control and freeze protection, as applicable.
- d. Diesel engine operating hours since engine commissioning, engine overhaul and lifecycle maintenance requirement completions (PMS/Class Maintenance Plan requirements), at a minimum, shall be maintained on all MPDEs, SSDGs, and EDGs. The hours shall be documented and recorded in the appropriate machinery history records in order to assist with scheduling of overhauls and lifecycle maintenance requirements. An overhaul typically includes rebuilding/replacing, as complete sets to new criteria the following components: cylinder heads, piston rings, cylinder liners, main and connecting rod bearings. If one of these sets is not rebuilt/replaced, the repair is generally not considered an overhaul and engine operating hours since overhaul shall not be zeroed, however, machinery history will be updated and lifecycle operating hours since the significant repairs shall be tracked. A certified DEI shall make the final determination if the extent of the work accomplished constitutes an engine overhaul for a particular engine or not during execution of the Post Overhaul/Repair Inspection detailed in paragraph 4.3.2(c) of this chapter.

#### 4.6 COMPLIANCE.

- a. All ships, submarines and craft shall comply with the procedures herein for the operation, maintenance and inspection of installed diesel engines.
- b. Ship's Commanding Officers shall ensure all diesel records are readily available for the inspector's review and Ship's Force use, including:
  - (1) Engine operating logs.
  - (2) Navy Oil Analysis Program test results, or, for submarines, the applicable oil analysis results.
  - (3) Onboard lube oil testing logs.
  - (4) Diesel Maintenance/history records to include all maintenance and significant items accomplished on the engine since last engine overhaul.
  - (5) Diesel operating and maintenance documents, including Engineering **Operational** Sequencing System, Steam Plant Manual, Ship System Manual (Submarines only), PMS, Engineering Standing Orders, etc., as appropriate.
  - (6) Engine hours log.
  - (7) Diesel inspection reports since last overhaul and associated Naval message on the status of discrepancies.
  - (8) Fuel Oil Quality Management records.
  - (9) Diesel Engine Technical Manuals.
  - (10) References (d), (h) and (i).
  - (11) Appropriate diesel-related Training records.
- c. The TYCOM/ISIC shall ensure that assigned ships operate and maintain diesel engines in accordance with the procedures in references (a), (b), (d), (h) and (i). Specifically, they shall:
  - (1) Ensure ships are complying with all required instructions by observation of diesel engine operations during shipboard visits.
  - (2) Conduct follow-up action to ensure that any unsatisfactory conditions found are correct at the earliest possible date.
  - (3) Maintain a library of technical material and appropriate visual aids for use by assigned ships in training diesel operations.
- d. (Submarines only) Ensure the induction and exhaust systems are inspected in accordance with the appropriate Maintenance Requirement, and/or Maintenance Requirements for continued Unrestricted Operation.

**4.7 SUBJECT MATTER EXPERT IN THE REPAIR AND MAINTENANCE OF DIESEL ENGINES.** The SME provides technical oversight on all scheduled and emergent work performed by the RMC personnel, and contractor, as required. The SME ensures work packages include proper repair procedures and are used with maintenance standards and appropriate technical documentation related to the diesel engine assessment/inspection. The SME shall have direct communication with the RMC Engineering Department regarding resolutions of repairs that do not meet Original Equipment Manufacturer specifications.

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## APPENDIX A

### ASSESSMENT/INSPECTION MAIN PROPULSION DIESEL ENGINE AND SHIP SERVICE DIESEL GENERATORS FOR LSD-41/49 AND LPD-17 CLASS SHIPS

Purpose: To provide direction for assessment vice inspection of LSD-41/49 and LPD-17 Class ship engines.

1. **ROUTINE/PRE-AVAILABILITY DIESEL INSPECTION.** Per Commander Naval Surface Force policy and concurred by NAVSEA Technical Warrant, the Routine/Pre-Availability diesel inspection directed by reference (a) is replaced with this Appendix's diesel assessment process. Note that Paragraphs 4.3.2.(b) through 4.3.2.(e) of this chapter remain applicable for LSD-41/49 and LPD-17 class MPDE and SSDGs.
2. **OBJECTIVE.** Significant repairs and I/D-Level work packages shall be accomplished by directive maintenance. Condition based maintenance is defined as maintenance that is directed by the engine's condition. Engine condition shall be assessed by non-intrusive monitoring and analysis of operating data, supplemented by engine performance data. The goal is to avoid significant disassembly, which includes such things as removal of cylinder heads, bearings, vertical drive assemblies, etc. Significant disassembly does not include removal of covers, use of borescopes, conducting main bearing presses, or removal of fuel injection components.
3. **ASSESSMENT.** Assessment of engine condition shall be accomplished by two, interrelated processes: Continuous Assessment/Analysis of data and Formal Periodic Assessment/Analysis of equipment condition and on board documentation. This process is based on continuous assessment and continuous analysis, **is focused** on the integration of fluid management, measured engine performance, assessment, analysis, recommendations and feedback.
4. **CONTINUOUS ASSESSMENT/ANALYSIS.** Each engine's condition data shall be analyzed on a monthly basis to identify any abnormalities, downward trends or other issues. Results of each Continuous Assessment shall be reported, with recommendations for corrections of any problems/potential problems, to the Ship's Engineer Officer and ISIC and documented in the Shipboard Automated Maintenance Module (SAMM). Condition data assessed shall include, but not limited to:
  - a. Lube oil results from onboard oil test kits (Kittiwake).
  - b. Lube oil results from shore based oil testing lab (PREDICT).
  - c. Fuel oil log results.
  - d. Jacket water log results.
  - e. Engine hour data.
  - f. Engine repair data.
  - g. Electronic log review.
  - h. Engine performance data (DOCTOR).

If the ship is locally available, a visit shall be conducted to review the data with ship's personnel.

5. **FORMAL PERIODIC ASSESSMENT/ANALYSIS.** A Periodic Assessment will be accomplished with the same periodicity as non-LSD-41/49 and LPD-17 MPDE and SSDG diesel engine inspections. At the 18<sup>th</sup> month point, a formal data review of the previous 18 months of collected data will be completed to determine if the data supports continued engine operation without inspection. This analysis will also be used as the foundation for recommending directed inspection of specific engine components as required. A minor DFS is required to the TYCOM with recommendation from RMC to extend engine operation to 24 months without completion of the formal periodic assessment. Extension of the assessment beyond 24 months will require a major DFS granted by NAVSEA 05. The 18 month clock is either measured from the last Periodic Assessment, the last diesel inspection, or the one-time baseline assessment, or as directed by an approved DFS (see below), as applicable. The DEI shall perform everything in the Continuous Assessment plus Phase III – Operational Inspection (paragraph 4.3.4.c. of this chapter). The DEI will determine if a full Phase II (paragraph 4.3.4.b. of this chapter), a focused portion of Phase II, as required PMS MRCs related to a Phase II, or any other significant disassembly is warranted. If the DEI

concludes that all or part of Phase II, specific PMS MRCs, and/or significant disassembly is warranted, then the RMC shall recommend this to the TYCOM by Naval Message for TYCOM approval. If the DEI concludes that the diesel engine is in sound condition and does not warrant any part of Phase II, applicable MRCs, or significant disassembly, then the RMC shall recommend by Naval Message to the ship to submit a DFS extending their periodic assessment. TYCOM can extend the periodic assessment up to 24 months with a minor DFS; beyond 24 months will require a major DFS granted by NAVSEA 05. The DFS approval shall include when the next Periodic Assessment should be scheduled.

6. RESPONSIBILITIES.

- a. TYCOM. Review/approve RMC recommendations resulting from Formal Periodic Assessments/Analysis.
- b. ISIC. Ensure that the ship has available time in the schedule to execute the Formal Periodic Assessment/Analysis.
- c. RMC. Maintenance Team to schedule Formal Periodic Assessments/Analysis. The RMC shall provide the Formal Periodic Assessment/Analysis recommendations to TYCOM by Naval Message. Maintenance Team will schedule diesel engine repair work based on results of the Continuous Assessments, Formal Periodic Assessments, Current Ship's Maintenance Project, emergent repairs and Class Maintenance Plan.
- d. DEI. DEI will complete the appropriate sections of the DEI Report, defined by reference (b), for each Periodic Assessment and post them in SAMM. DEI will also post results of Continuous Assessments in SAMM. When performing steps 4.3.2.b through e of this chapter, DEIs shall utilize engine condition data to the fullest extent possible.
- e. SHIP. To submit oil samples, record DOCTOR data, Kittiwake results, engine operating hours, maintenance actions accomplished (including PMS), fuel oil, jacket water data and any abnormal conditions in SAMM. To follow the actions recommended by the shore based technical community's assessment and report the actions taken and the results in SAMM.
- f. IN-SERVICE ENGINEERING ACTIVITY. Monitor the Continuous Assessment/Analysis and Formal Periodic Assessment/Analysis process, utilizing SAMM.

7. FUEL OIL DILUTION. Additional guidance for fuel oil dilution of lube oil for LSD-41/49 MPDEs and SSDGs:

- a. Fuel dilution 1.0-2 percent is a cautionary condition and requires monitoring by daily sampling.
- b. Fuel dilution greater than 2 percent is a hazard condition and considered unacceptable for continued use.
- c. Fuel dilution greater than 5 percent is a RBO per paragraph 4.3.6.1 of this chapter.

Source of fuel shall be identified and repaired. Sump and lube oil filters and strainers shall be drained and refilled with new oil when operationally feasible and resample to confirm corrected condition. Engines with fuel dilution levels greater than 2 percent may be operated at the discretion of the Commanding Officer if operational circumstance dictates (e.g., restricted maneuvering) with a TYCOM DFS.

8. LIGHT LOADING. Additional guidance for light loading of LSD-41/49 MPDEs: Light loading of Pielstick PC2.5 MPDE is defined as operation below 60 percent of the engine rating. This translates to operation of the engine at below 24 mm fuel rack position. Light loading of MPDEs should be avoided. In situations where light loading of engines is unavoidable, arrangements should be made to operate the engines at above 80 percent rated load (31 mm fuel rack). Operation above 80 percent rated load shall be conducted for a minimum of one hour (after operating temperatures and pressures have stabilized) for every four hours of light load operation during a twenty-four hour period.

**VOLUME IV**  
**CHAPTER 5**  
**MARINE SANITATION DEVICES**

**REFERENCES.**

- (a) NAVSEAINST 9593.1 - Certification Program for Sewage Marine Sanitation Devices in U.S. Navy Surface Ships and Craft
- (b) OPNAVINST 5090.1 - Environmental and Natural Resources Program Manual
- (c) NAVSEA S9086-T8-STM-010 - NSTM Chapter 593 (Pollution Control)
- (d) NAVSEA S9086-CH-STM-030 - NSTM Chapter 074 V3 (Gas Free Engineering)
- (e) NWP 1-03.1 - Naval Warfare Publication Operational Report
- (f) NAVEDTRA 10500 - Catalog of Navy Training Courses

5.1 **PURPOSE.** To provide guidance in the operation, maintenance and certification of surface **force ship and aircraft carrier** Marine Sanitation Devices (MSD) and to specify the requirements, procedures and responsibilities applicable to those systems.

- a. Sewage systems must be properly operated and maintained or serious health hazards can result. References (a) and (b) require that all MSD systems being installed on naval ships and craft be inspected and certified. The prevention of health, sanitation and safety problems associated with the various sewage handling and disposal systems shall be a priority matter.
- b. Environmental considerations have made the operation of shipboard sanitation systems more restrictive with regard to the discharge of sewage to navigable waters. Local and State environmental laws are generally more restrictive than the requirements of reference (b). Senior Officer Present Afloat regulations are continually reviewed and revised to comply with the laws under which the Senior Officer Present Afloat is licensed to operate sanitation systems.

5.1.1 **Scope.** This chapter is applicable to all surface **force ships, aircraft carriers,** service craft and small boats on which pollution abatement sewage systems are installed, either during construction or by alteration. It includes all types of shipboard sewage handling and treatment systems or MSDs certified in accordance with reference (a) and described in Section 4 of reference (c). Reference (d) describes the procedures, equipment, and records to be used during maintenance of MSD system components where toxic and/or combustible gases may be present. The most common pollution abatement sewage system in use on ships and craft is the Collection, Holding and Transfer system. Other systems in use include the Pall Trinity, JERED, GATX MK1 and the Vacuum Collection, Holding and Transfer System.

5.2 **CERTIFICATION.** The purpose of MSD certification is to confirm that the system, as installed, meets established design requirements, that adequate logistic support is available onboard, and that major installation deficiencies are corrected. A single level certification program has been implemented by Naval Sea Systems Command to supersede the older two level system (provisional and full). Ships that presently hold a "Full" certification are considered to be certified and require no further certification inspections.

5.3 **RESPONSIBILITIES.** The cognizant Type Commander (TYCOM) will coordinate the operation, maintenance, and certification of MSD systems installed on all units in accordance with the procedures established by references (a) and (c).

5.3.1 **Type Commander/Immediate Superior In Command.** The TYCOM/Immediate Superior In Command shall:

- a. Ensure surface ships participate in the pollution abatement program to the maximum extent possible by utilizing their pollution control equipment when within U.S. territorial waters (three miles).
- b. Ensure MSD systems are properly installed, operated, and maintained and that shipboard personnel working with sewage systems are properly trained in health and sanitation procedures.

5.3.2 **Commanding Officer/Officer In Charge.** The Commanding Officer/Officer In Charge shall:

- a. Oversee the correction of discrepancies on MSD system installations in accordance with reference (a).

- b. Prevent food stuffs from being stored in areas adjacent to or below sanitation system valves, flanges, or take down joints. Drip pans shall be installed beneath all sanitation system valves, flanges and take down joints in health sensitive areas.
- c. Log the time, duration and justification for each unavoidable discharge of prohibited sewage in restricted waters. Notify the TYCOM and Immediate Superior In Command of each occurrence. In a situation where holding sanitary wastes would present a health or safety hazard, the system shall be reported by Casualty Report in accordance with reference (e) and secured.

#### 5.4 SYSTEM MAINTENANCE AND INSPECTION.

##### 5.4.1 Fleet Maintenance Activity Maintenance.

- a. Ship-to-Shop Work. Fleet Maintenance Activities (FMA) are capable of accomplishing repair and overhaul of all MSD components on a ship-to-shop basis (specific MSD repair capabilities may differ among FMAs). When components are delivered to the FMA, their cleanliness will be certified in writing by the delivering ship's Medical Department representative.
- b. MSD Cleaning. The only authorized MSD pipe cleaning processes are hydroblast cleaning and acid cleaning. Acid cleaning may only be performed by qualified activities using the procedures of reference (c). Request cleaning for the removal of hard deposits which cannot be removed by ordinary shipboard means.
  - (1) Due to the extreme hazards involved in cleaning MSD systems, a high level of supervisory attention must be applied to all evolutions. An agreement on the procedures to be used by the FMA and Ship's Force shall be established by a locally prepared Memorandum Of Agreement which describes all aspects of the operation.
  - (2) Disposal of effluent must be accomplished in an environmentally safe manner. Depending on port availability, the following methods of disposal must be used in priority order:
    - (a) Discharge to pier side sewage system.
    - (b) Discharge to tank truck or barge.
    - (c) Discharge to sea (when hydroblasting while underway).
    - (d) If none of the above methods are available, and an emergency situation exists, refer to reference (b) for emergency disposal requirements.

#### 5.5 TECHNICAL SYSTEM ASSESSMENT.

- a. Technical System Assessments may be requested for training or, when necessary, to develop a work package.
- b. Technical assist visits and assessments are described in Volume VI, Chapter 42 of this manual.

#### 5.6 TRAINING.

- a. Training courses in the maintenance and operation of MSD systems are offered by Surface Warfare Officer Schools at various locations. Consult reference (f) for current course offerings and details.
- b. On ships with Collection, Holding and Transfer and JERED systems installed, the following school graduates are required:
  - (1) An Officer responsible for the operation and maintenance of the system.
  - (2) Senior enlisted personnel assigned the responsibility for operation and maintenance of the system.
  - (3) Other maintenance personnel; at least one in each inport duty section.

**VOLUME IV**  
**CHAPTER 6**  
**OXYGEN AND NITROGEN SYSTEMS**

**REFERENCES.**

- (a) NAVSEA S9086-SX-STM-010 - NSTM Chapter 550 (Industrial Gases; Generating, Handling, and Storage)
- (b) MIL-STD-1330 - Standard Practice for Precision Cleaning and Testing of Shipboard Oxygen, Helium, Helium-Oxygen, Nitrogen and Hydrogen Systems
- (c) NAVAIR A6-332AO-GYD-000 - Laboratory and Aviators Breathing Oxygen Field Guide

6.1 **PURPOSE.** Oxygen - Nitrogen (O<sub>2</sub>-N<sub>2</sub>) producing storage and transfer systems are installed onboard all Aircraft Carriers, Submarine Tenders and other surface **force** ships and shore stations to provide liquid and gaseous oxygen and nitrogen for use by Ship's Force and embarked air wings. Guidance for the proper operation and maintenance of these systems is provided by this chapter and references (a) and (b).

6.2 **PRECAUTIONS.**

- a. Oxygen is not flammable but supports and rapidly accelerates the combustion of all flammable materials. Any substance that burns in a normal atmosphere will burn much more rapidly in concentrated oxygen with a much higher flame temperature. Combustible material (e.g., dirt, dust, soap, oil, cloth, paper, wood, cork, carbon black and gasoline) should not be allowed to come in contact with an enriched oxygen environment. Oxygen can cause combustion of substances not normally considered burnable (notably steel wool, thin gauge metals and certain types of cloth).
- b. Gaseous nitrogen is an almost totally inert gas, does not burn, and does not support combustion or respiration. It is not poisonous but can displace oxygen from the air and cause asphyxia.
- c. Cryogenic fluids (liquid oxygen and liquid nitrogen) are extremely dangerous. They can cause severe burns or frostbite if they contact the skin. Prolonged exposure to the cold vapors can damage delicate tissues such as those of the eye, windpipe and lung. The cold surface of piping components, and vessels containing cryogenic fluid can burn or freeze bare flesh and cause it to stick to the cold metal. At the temperature of cryogenic fluids many metals and other materials become brittle. Ship structural steel can crack if contacted by cryogenic fluid. Liquid oxygen and nitrogen will produce a very large volume of gas when they vaporize. In a closed compartment with inadequate ventilation, vaporizing liquid can create a hazardously high concentration of oxygen or nitrogen. The cloudy vapor that appears from vaporizing liquid, or cold gas venting is condensed moisture, making the issuing gas visible. When handling liquid cryogenic products, personnel must utilize protective clothing in accordance with the requirements of reference (b) and comply with all safety rules.

6.3 **AVIATORS BREATHING OXYGEN TESTING.**

- a. Because of the severe consequences of liquid oxygen failing to meet the standards for Aviators Breathing Oxygen (ABO), stringent requirements for testing and ABO certifications have been established. Liquid oxygen/nitrogen is to be sampled and tested for production and stowage in accordance with reference (a) and Planned Maintenance System procedures.
- b. All Aircraft Carriers producing ABO have certified ABO test sites and are capable of certifying shipboard produced liquid oxygen. These ABO test sites are under the control of the shipboard Aviation Intermediate Maintenance Department. The testing and surveillance requirements of Aircraft Carrier shipboard O<sub>2</sub>-N<sub>2</sub> plant oxygen/nitrogen products must be accomplished in accordance with reference (a) and meet the spectrographic analysis requirements of reference (c).

- c. Aircraft Carrier O<sub>2</sub>-N<sub>2</sub> producers are known to experience high levels of methane (i.e., aircraft exhaust fumes, Collection, Holding and Transfer system discharge and boiler/Emergency Diesel Generator exhaust gases) which exceed the current established maximum limit of 25 parts per million per reference (c). The following direction is established for aircraft carrier O<sub>2</sub>-N<sub>2</sub> producer liquid samples as stated in reference (a).
  - (1) For shipboard produced liquid oxygen, the limit for methane, when sampled at the storage tank, is 75 parts per million. This limit shall not be exceeded.
  - (2) Liquid oxygen samples drawn from the storage tank are "customer/user" samples, for issuance in compliance with the ABO surveillance program. Samples from the O<sub>2</sub>-N<sub>2</sub> producer are Maintenance samples used for monitoring and contaminate analysis and correction.
- d. If at any time a liquid oxygen test sample or test method is found unsatisfactory, Ship's Force O<sub>2</sub>-N<sub>2</sub> Plant operators and Aviation Intermediate Maintenance Department ABO laboratory personnel shall work together to identify and correct the problem. Guidelines to follow for this are outlined in references (a), (b), and (c).
- e. Certification of high pressure gaseous storage flasks shall be performed in accordance with reference (b).

#### 6.4 OPERATIONS AND MAINTENANCE.

- a. In accordance with reference (a), only qualified personnel with full knowledge and understanding of the applicable safety requirements and hazards associated with oxygen production and handling shall be permitted to handle gaseous and liquid oxygen aboard ship. Equipment such as O<sub>2</sub>-N<sub>2</sub> producing plants, storage tanks, and pump-vaporizer units shall be operated only under the supervision of a Fleet Cryogenics School graduate that holds a current Navy Enlisted Classification (NEC)-4283 qualification. Ideally, all operating personnel, as well as supervisory personnel, will be graduates of the Cryogenics School; however, there may be cases where sufficient personnel with this formal training are not available. In this event, operators trained by a currently qualified NEC-4283 supervisor may be used if they have successfully completed the required Personnel Qualification Standard and are designated in writing by the Commanding Officer.
- b. Only qualified personnel will be authorized to perform oxygen clean maintenance and repairs to shipboard oxygen or nitrogen system components. The procedures and guidelines, as stated in reference (b), must be followed.
- c. High-Pressure O<sub>2</sub>-N<sub>2</sub> Producers onboard Aircraft Carriers are equipped with R-22 Refrigeration Units. When maintenance or repairs are being conducted on this equipment strict guidance must be followed to prevent the release of any ozone depleting substances (i.e., CFCs and HCFCs) to the atmosphere as mandated by the Environmental Protection Agency Clean Air Act. The Environmental Protection Agency Clean Air Act, Section 608 prohibits individuals from knowingly venting ozone depleting compounds, used as refrigerants, into the atmosphere while maintaining, servicing, repairing, or disposing of air-conditioning or refrigeration equipment. Only the following four types of ozone depleting substance venting releases are permitted under this section of the act.
  - (1) Absolute minimum quantities of refrigerant released in the course of making good faith attempts to recapture and recycle or safely dispose of refrigerants.
  - (2) Refrigerants emitted in the course of normal operation of air-conditioning and refrigeration equipment, (i.e., purging of air and non-condensable gases), as opposed to during the maintenance, servicing, repair or disposal of the equipment.
  - (3) Mixtures of nitrogen and R-22 that are used as holding charges or as leak test gases, because in these cases, the ozone depleting compound is not used as a refrigerant. However, a technician may not avoid recovering refrigerant by adding nitrogen to a charged system.
  - (4) Small releases of refrigerant which result from purging hoses or from connecting or disconnecting hoses to charge or service appliances. Additionally, refrigerant recovery and recycling equipment must be equipped with low-loss fittings.

**VOLUME IV**  
**CHAPTER 8**  
**WEAPONS AND CARGO ELEVATOR ASSESSMENTS**

8.1 PURPOSE. To provide guidance in the preparation for and execution of shipboard weapons and cargo elevator assessments and assist visits by the Elevator Support Unit (ESU).

8.1.1 Background. Shipboard weapons and cargo handling elevators are supported through the elevator assessment and repair program, which is executed by the ESU. The ESU program, formerly the Program to Assess and Repair Shipboard Elevators for the Atlantic Fleet, and Weapons Elevator Support Unit for the Pacific and Atlantic Fleets, provides direct fleet support for the maintenance and modernization of shipboard elevators. The program is executed by the ESU on a per ship cycle, as dictated by the individual ship's deployment and maintenance schedules. Although ESU scheduled milestones are based on the maintenance cycle, the primary focus of the program is to achieve peak system readiness at the time of deployment by evaluating and repairing elevators throughout the ship's cycle. Additionally, DDG-51 Class 5"/54 Ammunition Strike Down Equipment, which are similar to an elevator, are supported through the ESU program.

8.2 ELEVATOR SUPPORT UNIT. The Regional Maintenance Center ESU is composed of skilled technicians qualified in the operation, repair, testing and training of weapons and cargo elevator systems. The ESUs are responsible for periodic material assessments, repair, technical assistance, on board operator maintenance training, and verification of Integrated Logistics Support (ILS) elements under this program.

8.3 SHIP'S FORCE ASSESSMENT RESPONSIBILITIES.

- a. Ensure that the Current Ship's Maintenance Project (CSMP) is up to date.
- b. Ensure operators and maintenance personnel are available to assist the Assessment Team.
- c. Require operators and maintenance personnel to accompany the Assessment Team for on the job training to increase self-sufficiency.
- d. Prepare and submit an OPNAV 4790/2K for each deficiency not corrected prior to completion of the assessment. Provide a listing of Job Control Numbers to the ESU.

8.4 ELEVATOR SUPPORT UNIT EVOLUTIONS. The specific components of each ESU evolution are defined below. These evolutions are designed to ensure deficiencies are identified and repaired in a timely manner. Prior to commencement of any ESU evolution, a pre-brief will be conducted by the ESU representative and attended by the ship's Maintenance Manager and all applicable departmental representatives. The pre-brief will cover, but is not limited to, the following topics:

- a. Key evolution elements.
- b. Roles and responsibilities of:
  - (1) ESU technical personnel.
  - (2) Ship's Force personnel.
- c. Working relationship between ESU technical personnel and Ship's Force.
- d. Overall safety practices and precautions applicable to the evolution.

8.4.1 Material Condition Assessment Visit. A Material Condition Assessment visit will be used to determine a baseline and establish the scope of follow-on actions. This visit is accomplished once per **Fleet Readiness Training Plan**. The ESU uses assessment guidelines to determine the system's material condition, while ensuring the following is accomplished:

- a. The CSMP is validated to avoid redundancies during the assessment.
- b. The elevator system is assessed, repaired, groomed and operationally tested. The ESU will make every effort to correct all deficiencies prior to the end of the visit.
- c. On the Job Training (OJT) is conducted with Ship's Force to promote self-sufficiency.

- d. Working with the ship's cognizant Department(s) Maintenance Manager, and TYCOM coordinators, determine the preliminary level of effort required to correct the discrepancies.
- e. All discrepancies and corrected items have been documented in the ship's CSMP using the **appropriate IT** System.
- f. The Commanding Officer, or an officer designated by the Commanding Officer, is briefed on the elevator system material condition.
- g. A final report is issued to the ship, ISIC and TYCOM following the Material Condition Assessment visit. The report shall address the following:
  - (1) Safety of systems, including "safe to operate" conditions.
  - (2) Major discrepancies found during the visit.
  - (3) System Operability Test results.
  - (4) Training status of Ship's Force with respect to Personnel Qualification Standards (PQS) and practical elevator system maintenance and operation.
  - (5) Status of authorized, completed, and/or programmed Ship Alterations.
  - (6) Recommendations to the In-Service Engineering **Agent** for system changes.
  - (7) In-Service Engineering Agent.

8.4.2 **Repair Visit.** The Repair Visit is designed to correct discrepancies identified in the ship's CSMP that could not be repaired during the assessment visit.

- a. Conduct multiple visits, as receipt of material permits, to repair as-found conditions.
- b. Provide logistics assistance as necessary.
- c. Conduct OJT with Ship's Force.

8.4.3 **In Process Review.** This review will be conducted on a case-by-case basis, contingent on the scope of repairs programmed for the maintenance availability. When tasked, the ESU will review the elevator system work package prior to the start of an availability. During the availability the ESU will:

- a. Monitor the progress and Quality Assurance of the repair contractor, coordinating with Supervisor of Shipbuilding and industrial activity representatives, Naval Surface Warfare Center, Carderock Division, and TYCOM Maintenance Manager, as applicable.
- b. Provide technical and logistic support to Ship's Force.
- c. Monitor the CSMP status.
- d. Witness elevator tests, as tasked.

8.4.4 **On-Board Maintenance Training.** On-board maintenance training will be conducted at least once per **Fleet Readiness Training Plan** with each ship receiving training as a host ship or by having their personnel participate in training on another ship of the same class. It consists of operator and maintenance classroom instruction followed by hands-on training. The ship class on-board maintenance training documentation is tailored to be ship specific, giving the ship the most accurate and coherent training possible.

8.4.5 **Integrated Logistics Support.**

- a. A one-time ILS validation of elevator configuration, Allowance Parts Lists (APL), Coordinated Shipboard Allowance Lists (COSAL) and technical manuals will be conducted.
- b. Follow-on ILS visits will be accomplished at the TYCOM's request.

8.5 **VISIT SCHEDULING.** The ISIC will schedule all ESU visits through the TYCOM sponsored Quarterly Scheduling Conference. Visits shall not be authorized without prior approval by the cognizant TYCOM.

**VOLUME IV**  
**CHAPTER 10**

**WORK AUTHORIZATION AND CONTROL**

**REFERENCES.**

- (a) NAVSEA S9002-AK-CCM-010/6010 - Industrial Ship Safety Manual for Submarines
- (b) S0400-AD-URM-010/TUM - Tag-Out User's Manual
- (c) MIL-STD-1625 - Safety Certification Program for Drydocking Facilities and Shipbuilding Ways for U.S. Navy Ships
- (d) COMSUBFORINST 5400.38 - Standard Submarine Organization and Regulations Manual (SSBN)
- (e) COMSUBFORINST 5400.39 - Standard Submarine Organization and Regulations Manual (SSN)
- (f) COMSUBFORINST 5400.48 - Standard Submarine Organization and Regulations Manual (SSGN)
- (g) NAVSEA MS 6310-081-015 - Submarine Preservation
- (h) NAVSEA S9505-AF-MMA-010 - Submarine Non-Nuclear Piping Systems Test Manual
- (i) OPNAVINST 5100.19 - Navy Occupational Safety and Health (NAVOSH) Program Manual for Forces Afloat
- (j) OPNAVINST 5100.23 - Navy Occupational Safety and Health (NAVOSH) Program Manual
- (k) NAVSEA S9165-AC-HBK-010 - Submarine Sonar Dome Handbook
- (l) NAVSEA SE300-AZ-MMA-010 - Description, Operation and Maintenance SSN21 Class Sonar Bow Dome
- (m) NAVSEA SE300-MA-MMA-011 - Glass Reinforced Plastic (GRP) Bow Sonar Dome
- (n) COMSUBPACNOTE 9086 - COMSUBPAC Engineering Notes and Technical Notes

**LISTING OF APPENDICES.**

- A Work Authorization Form
- B Technical Work Document Record Sheet
- C Work Authorization Form Continuation and Revision Sheets
- D Barrier Criteria for Submarine Hull Penetrations
- E Safety of Ship Maintenance Item List Example
- F Safety of Ship Maintenance Item List
- G Procedures and Safety Precautions for Entering Submarine Spaces, Tanks and Voids
- H Close-out Inspection Check-off List

10.1 **PURPOSE.** To provide the procedures for authorization and control of shipboard work.

10.2 **WORK AUTHORIZATION.** Work on ship's systems and components, as defined in Volume I, Chapter 1, Appendix D of this manual, must be properly authorized and controlled in order to ensure rigorous personnel and ship safety standards are met at all times. All outside activity work on ship's systems and components, regardless of who performs the work, requires formal authorization through a Work Authorization Form (WAF) for the specific work to be accomplished. This applies to all U.S. Naval ships in all types of maintenance availabilities, public and private. The Work Authorization System and preparation of the WAF are discussed below.

10.3 **WORK AUTHORIZATION CONTROL.** Work on the Fleet's ships is conducted under positive Work Authorization Control in order to ensure rigorous personnel and ship safety standards are met at all times. The following considerations apply in meeting these standards:

- a. Work requiring formal authorization may include Planned Maintenance System (PMS), troubleshooting, corrective maintenance (repair) or alterations. It may also include removal of system components for repairs.
- b. As many ship systems, such as hydraulics and high-pressure air, are operationally interrelated, caution must be exercised in planning work so that other systems are not unintentionally disabled when setting work boundaries for the system to be worked.

10.4 WORK AUTHORIZATION SYSTEM. Work Authorization shall be controlled as follows:

- a. Designation of Work Requiring Formal Control. The WAF is the vehicle by which work requiring formal control is authorized for accomplishment and tracked to completion or otherwise no longer requiring isolation or authorization.
- b. A WAF, shown in Appendix A, is required to authorize the start of work on all ship systems and equipment by activities other than Ship's Force. Work includes all maintenance, repairs or modifications and installation or removal of temporary support systems and equipment. Repair activity non-intrusive work (e.g., painting, lagging, sheet metal work, deck plate, structural foundation) that does not affect ship or personnel safety does not normally require a WAF.
- c. For Ship's Force maintenance conducted in nuclear propulsion plants, the Engineering Department Manual contains the requirements regarding when a WAF is needed. For Ship's Force work conducted outside the nuclear propulsion plant, the cognizant department head shall determine the necessity for a WAF.
- d. For availabilities where a repair activity is assigned responsibilities for work authorization control by Memorandum of Agreement (MOA), the requirement regarding when Ship's Force must submit a WAF shall be specified in the MOA.

10.4.1 Administration. The following administrative process is to be used in executing Work Authorization Control:

10.4.1.1 Work Authorization Form. The WAF, shown in Appendix A, shall be filled out by the organization conducting the work, or Ship's Force, as determined by the MOA signed for the availability per Volume II, Part I, Chapters 3 and 4 of this manual.

10.4.1.2 Work Authorization Log. The Work Authorization Log(s) shall be maintained at the same location and administered by the same individuals as the ship's tagout logs or, when the repair activity is assigned responsibilities for work authorization control by MOA, the repair activity shall retain original WAFs with a copy of all WAFs (or as specified by local MOA) and the WAF index shall be provided to Ship's Force either by hard copy or electronically via a database that can be easily accessed by the Ship's Duty Officers.

**NOTE: FOR SHIP'S FORCE GENERATED WAFS, THE SERIAL NUMBER SHALL USE THE SAME PREFIXES USED FOR THE TAGOUTS THAT SET THE SYSTEM ISOLATION FOR THE WORK. WHEN A REPAIR ACTIVITY IS ASSIGNED RESPONSIBILITIES FOR WORK AUTHORIZATION CONTROL, THAT ACTIVITY WILL SPECIFY THE SERIALIZATION PROCESS USED BY ALL ACTIVITIES INCLUDING SHIP'S FORCE FOR THE AVAILABILITY.**

10.4.1.3 Technical Work Document Record Sheet. When the job description on the WAF covers multiple components and their associated Technical Work Documents (TWD), a TWD Record Sheet (Appendix B) in addition to the WAF may be used to document this work.

10.4.1.4 Work Authorization Form Continuation and Revision Sheets. If necessary, a WAF Continuation Sheet similar to the one shown in Appendix C may be used when information on the initial original WAF will not fit in the blocks provided in the WAF form in Appendix A. The WAF Continuation Sheet shown in Appendix C depicts the minimum blocks that must be filled out. Additional blocks may be utilized as deemed appropriate. Any changes necessary to the information on the WAF form after Block 14 is signed will be on the WAF Revision Sheet or changes to the existing WAF as described in paragraph 10.4.4 of this chapter. Existing WAF Continuation Sheets may be used until exhausted if desired. The WAF Revision Sheet, similar to the one shown in Appendix C, may be used to accomplish WAF revisions as permitted by paragraph 10.4.4 of this chapter. The WAF Revision Sheet shown in Appendix C depicts the minimum blocks that must be filled out. Additional blocks may be utilized as deemed appropriate.

10.4.1.5 Numbering Work Authorization Form Continuation and Revision Sheets. Revisions and continuation sheets generated by computer software may be numbered as determined by the software programming. Paper WAF continuation and revision sheets are to be numbered as follows:

- a. The WAF (Appendix A) will be identified as "Sheet 1".
- b. Continuation sheets will be identified as "Sheet 1A, Sheet 1B", etc.

- c. Revision sheets will be identified as “Sheet 2, Sheet 3”, etc.

10.4.2 Work Authorization Procedure. The following procedure is to be followed for properly authorizing work:

- a. The WAF is presented to the Watch/Duty Officer by the division/repair activity tasked with the work.
- b. (Submarines Only) For Safety of Ship items, as defined in paragraph 10.4.8 of this chapter and reference (a), the Watch/Duty Officer shall obtain the Commanding Officer’s permission prior to authorizing work. When assigned, the repair activity’s Ship Safety Officer signature is required.
- c. The Watch/Duty Officer will then determine if adequate isolation and plant/system conditions exist to safely and properly conduct the work including that the system is drained, deenergized and depressurized. The tagout is then established in accordance with reference (b). The work is not to be authorized if doubt exists on either of these points. For high energy systems (i.e., >200°F, >1000 psi) that could have the potential for trapped energies, the repair activity after consulting with Ship’s Force, may provide a written plan (i.e., valve lineup, procedure, marked up drawings) to Ship’s Force to ensure all parties are satisfied the system is properly drained and depressurized.
- d. When system isolation and plant conditions are satisfactory to conduct the work (e.g., tagout complete, system depressurized, drained and deenergized), the Watch/Duty Officer authorizes the work and signs the WAF. For repair activity generated WAFs, the Repair Activity Representative (RAR) also signs the WAF. The Watch/Duty Officer and RAR signature indicates that, based on personal observation, certified records or direct report from watchstanders or divisional personnel, that system isolation and plant/ship conditions are set and the division/repair activity is authorized to start work.

**NOTE: ELECTRICAL SAFETY CHECKS (E.G., VOLTAGE CHECKS TO ENSURE CIRCUITS ARE DE-ENERGIZED) ARE PART OF THE WORK PROCESS, NOT PART OF THE TAGOUT PROCESS, AND THEREFORE SHOULD BE PERFORMED AFTER BLOCK 14 OF THE WAF IS SIGNED. VOLTAGE CHECKS PERFORMED PRIOR TO SIGNING BLOCK 14 OF THE WAF MUST BE APPROVED BY THE COMMANDING OFFICER AND PERFORMED IN ACCORDANCE WITH NAVSEA S9086-KC-STM-010/CH-300.**

- e. Some component contractor personnel who perform work on ships are not knowledgeable of ship systems and are not qualified to determine if plant/ship conditions are satisfactory to conduct work. For such cases, the contractor’s signature will be based on a direct report or briefing they receive from Ship’s Force or the Lead Maintenance Activity (if assigned), unless another method of providing the information to the contractor is specified in a MOA. The contractor’s signature represents confirmation that the contractor understands the hazards presented by the ship’s systems on which he will be working, and that he/she has received assurances the work area has been appropriately isolated, depressurized, de-energized or drained. As an alternative, the contractor may specifically agree via their contract or MOA that all repair activity responsibilities as defined in this chapter will be assigned to a Lead Maintenance Activity per paragraph 10.4.5 of this chapter. In all cases, appropriate information should be provided to the contractor prior to initiating work to ensure the contractor understands the hazards involved.
- f. The original WAF is placed in the Work Authorization Log and a copy shall be maintained with the TWD until the work is completed.
- g. Once the work is completed, the WAF is signed by the repair activity as work complete and forwarded to Ship’s Force for clearing of Tagout Record Sheet line items in accordance with reference (b).
- h. Following completion of testing (if there is no formal test program) and setting of appropriate system status (e.g., clear tags and perform valve line-ups as appropriate for the situation), the WAF is signed as closed and forwarded to the cognizant department head for review.

10.4.3 Transfer of Non-Nuclear Systems and Nuclear Instrumentation and Control Systems (Depot availabilities only). During depot availabilities, large amounts of work will be performed on ship’s systems. Formal work control practices in place by a shipyard enable Ship’s Force to transfer non-nuclear systems and Nuclear Instrumentation and Control systems to the shipyard. Transfer of systems is the process by which Ship’s Force transfers the authority to approve all actions within a system or portion of a system to a shipyard and subsequent return of systems back to Ship’s Force prior to major events. Systems, or portions of systems, are transferred with or without transferring the ability to operate ship’s equipment. By transferring a system or portion of a system to the shipyard,

the shipyard is responsible for authorizing all work, testing and equipment operation within the boundary transferred. Transfer of systems does not diminish a Commanding Officer's overall responsibility for the safety of personnel, equipment and the ship. Although other activities may perform work within the boundaries and Ship's Force normally retains responsibility for operating ship's equipment, all actions (i.e., work, testing, equipment operations, etc.) within the boundary must be approved by the shipyard.

- a. The MOA between the shipyard and ship for the availability shall include the following minimum attributes regarding transfers:
  - (1) Clearly state that all actions performed within the boundary being transferred must be approved by the shipyard.
  - (2) Normally, Ship's Force retains responsibility for operating ship's equipment. If any transfers with operations are planned, the MOA shall define the extent to which the shipyard will operate ship's equipment within the boundaries.
  - (3) Normally, Ship's Force retains responsibility for PMS, unless otherwise specified in the MOA.
  - (4) Delineate who is responsible to maintain system status within the boundary.
  - (5) Identify the process (e.g., Joint Fleet Maintenance Manual Volume IV, Chapter 10, paragraphs 10.2 through 10.4.5) by which work control shall be administered, including interface between the shipyard, Ship's Force and other applicable activities.
- b. A WAF shall be used to transfer a system or portion of a system to the shipyard. Block 7 of the WAF shall clearly state this intent (i.e., specify "transfer" or "transfer including operations"). Ship's Force formally transfers a system or portion of a system to the shipyard by signing Block 14 of the WAF. Unless Block 7 of the WAF states the transfer is "including operations", the shipyard is not authorized to operate ship's equipment within the transferred boundary.
- c. The shipyard returns a system or portion of a system back to Ship's Force by completing all authorized work and testing specified on the WAF and signing Blocks 16, 17 and 18 of the WAF. Ship's Force indicates acceptance of the work and testing and, if applicable, operation by signing Block 18 of the WAF. For nuclear powered ships, the Engineering Department Manual contains requirements for accepting operational control from the shipyard.
- d. When the shipyard is responsible for operating ship's equipment as specified in the transfer MOA, operation of ship's equipment shall be in accordance with shipyard or Naval Sea Systems Command (NAVSEA) procedures (e.g., test procedures, ship's operating instructions, Steam and Electric Plant Manual, etc.).
- e. When waterborne, Ship's Force shall retain operation of hull and back-up valves.
- f. When portions of a system are required to be operational to support propulsion plant key events in accordance with NAVSEA Instruction 4730.1 and 4730.2 series, those portions of the system shall be transferred back to Ship's Force.
- g. Ship's Force shall have the capability to isolate the transferred area from components and systems under Ship's Force control. The valves, switches, breakers, fuses, blanks, etc., that provide this capability shall remain under Ship's Force control.
- h. Any ship system which could directly affect the reactor plant or conduct of reactor plant testing shall not be transferred to a shipyard until required nuclear temporary support systems are installed and the system is isolated from the reactor plant.
- i. Within the boundaries transferred to the shipyard, Ship's Force shall be notified prior to commencing testing and when testing is interrupted and completed.
- j. All transfers on submarines shall be consistent with ship's safety requirements and reference (a).
- k. In order to minimize subsequent changes to the WAF and ensure that Ship's Force is aware of the work scope, the WAF which transfers systems or portions of systems should include all known customer authorized work within the specified job description.

- l. This authority applies to all work performed by or sub-contracted by the shipyard.
- m. Within the boundaries approved by the WAF, the shipyard can add additional work to the WAF without Ship's Force approval by adding additional TWDs to a TWD Record Sheet (Appendix B) provided the additional work is within the original description of work and tagout boundaries (i.e., no additional tags are required). This method is applicable only when two independent reviews of the additional work by the shipyard confirms that the existing WAF and its associated tagout(s) provide adequate isolation and conditions for the work (see paragraph 10.4.5 of this chapter). TWDs (Task Group Instructions (TGI), Deficiency Logs, Deficiency Reports, etc.) that meet this criteria and require work control per paragraph 10.3 of this chapter will be added to the TWD Record Sheet. To ensure Ship's Force remains informed of all work being performed on ship's systems, the shipyard shall verbally notify Ship's Force at the time work is added to the TWD Record Sheet and subsequently provide a hard copy of the changed TWD Record Sheet if it cannot be printed by the Ship's Duty Officer from an electronic database. Work added to the TWD Record Sheet does not need to be added to the associated Tagout Record Sheet.
- n. When other activities perform work and testing within boundaries transferred to a shipyard and the shipyard is acting as their RAR, the shipyard may add the other repair activity's work to the TWD Record Sheet. Otherwise, a separate WAF shall be generated and a new line item shall be added to the existing Tagout Record Sheet.
- o. Ship's Force performing work, testing or equipment operations within boundaries transferred to a shipyard shall prepare a separate WAF processed as described in paragraph 10.4.2 of this chapter, add a new line item to the existing Tagout Record Sheet and obtain shipyard concurrence in Block 12 of the WAF. RAR signature is not required on the Tagout Record Sheet.
- p. For small depot availabilities (e.g., conventional surface ship availabilities less than six months in duration, submarine Selected Restricted Availabilities and Extended Refit Periods, Aircraft Carrier upkeeps), the above provisions may be applied on a case basis where the amount of work on a system is extensive and warrants transferring a portion of a system. These exceptions require Type Commander approval.

10.4.4 Work Authorization Form Revisions. Changes to the scope of the existing job description or system transfer boundary shall be authorized by a formal revision to the existing WAF. Except as noted below for minor administrative changes, changes to conditions (i.e., Blocks 7, 8, 11, 13 and/or 14) established by an authorized WAF, including the associated tagout(s), also require a formal revision to the existing WAF. A formal revision to a WAF can be accomplished by either preparing a new WAF with the same number or revising the existing WAF.

- a. Prepare a new WAF. A new WAF with the same number will be used primarily for major changes to Block 7, Job Description or other major changes which warrant reverification of all aspects of the work authorization.
  - (1) A new WAF with the same number will be generated with changes included.
  - (2) In Block 9, enter revision (REV A, REV B, REV C, etc.) and reason for and description of the change.
  - (3) Authorize the new WAF in accordance with the requirements of this chapter.
  - (4) Mark superseded WAF(s) "SUPERSEDED" and retain with the new WAF.
- b. Revise Existing WAF. The revised existing WAF will be used primarily for tag shifts or other minor changes.
  - (1) Enter all required changes. Include initials, date and revision with each entry.
  - (2) Line-out all changed or invalidated information. Include initials, date and revision with each line-out.
  - (3) Remake all affected signatures.
  - (4) In Block 9, enter reason for and description of the change. Sign and date the entry.

- (5) Obtain authorization including verification of "Plant/Ship Conditions Set" by resigning Blocks 13 and 14 of the WAF.
- c. Revise existing WAF using the WAF Revision Sheet.
  - (1) Fill in the information required by the WAF Revision Sheet, including the revision (REV A, REV B, REV C, etc.). Add additional blocks as deemed appropriate.
  - (2) Enter the reason for and description of the change. Sign and date the entry.
  - (3) Obtain all required signatures.
  - (4) Once the WAF Revision Sheet has been completed, it must be maintained with the original WAF in the WAF log.
- d. Minor Administrative Changes to Existing WAFs. The Watch/Duty Officer or the RAR may make pen and ink changes that are editorial and/or administrative in nature to the original WAF without processing a new or revised WAF. These changes must not affect the scope or sequence of shipboard work, and include items such as obvious typographical errors, erroneous job order numbers or spelling errors. Either the Watch/Duty Officer or Repair Activity may make these changes on the original WAF without resigning Blocks 13 and 14. The changes shall be initialed and dated by the person entering the changes.
- e. Iterative Tagouts. When using the reference (b) Iterative Tagout procedure, a revision to the WAF is not required provided the specific tests or maintenance evolutions are controlled by a formal process. This process is to be defined and concurred with by a MOA established between Ship's Force and the Lead Maintenance Activity. The process shall ensure that isolation is re-established and system conditions verified prior to recommencing work.

10.4.5 Centralized Work Control Procedures. It is the responsibility of the Lead Maintenance Activity to determine the need for centralized work control and to assign the responsibility for work authorization control. During depot availabilities, a centralized work control team will be established. For other availabilities, this decision is based on the number of repair activities performing work during the availability and the complexity of the work. When centralized work control procedures are invoked, the following process shall be used:

- a. Work by all repair activities is processed by the centralized work control team including work covered by paragraph 10.4.3 of this chapter. Ship's Force involvement will be defined by MOA.
- b. The Lead Maintenance Activity will specify participation and supervision of the centralized work control team by MOA. Ship's Force is an integral part of the centralized work control team and should man the team with experienced officers or senior petty officers.
- c. The repair activity performing the work shall prepare the WAF, sign as RAR on the Tagout Record Sheet and sign the WAF, Blocks 10, 14, 16 and 17 if applicable, unless specified otherwise by MOA (e.g., repair activity does not maintain qualified personnel). The Lead Maintenance Activity assigned responsibility for centralized work control is responsible for processing the WAF and signing all other repair activity blocks on the WAF.
- d. For work covered by paragraph 10.4.3 of this chapter, the Ship's Force member(s) of the centralized work control team would notify the responsible Division or Work Center Supervisor and Duty Officer of added work to a TWD Record Sheet to ensure that Ship's Force remains informed of all work being performed on ship's systems.

10.4.6 Equipment Tagout Procedures. Tagouts shall be accomplished in accordance with the requirements of reference (b).

10.4.7 Barrier Criteria.

- a. Barrier criteria for maintenance is located in reference (b) and applicable Reactor Plant and Steam and Electric Plant manuals.

**NOTE: BARRIER CRITERIA REQUIRED BY REACTOR PLANT AND STEAM AND ELECTRIC PLANT MANUALS HAVE PRECEDENCE OVER REFERENCE (b) CRITERIA.**

- b. (Submarines only) Specific guidance for submarine hull penetrations is located in Appendix D.

10.4.8 Safety of Ship Maintenance Item Identification, Listing and Control (Submarines only).

- a. Safety of Ship Maintenance Item List (SOSMIL). Safety of Ship maintenance items are those evolutions having significant potential to impact the ship's watertight integrity, damage control capability or which require special attention to ensure ship safety.

**NOTE: DESIGNATION OF SAFETY OF SHIP MAINTENANCE ITEMS FOR BOTH SHIP'S FORCE AND ANY OUTSIDE ORGANIZATION IS REQUIRED WHEN FLEET MAINTENANCE ACTIVITY (FMA), INDUSTRIAL ACTIVITIES AND CONTRACTOR PRODUCTION WORK IS IN PROGRESS. REQUIREMENTS OF PARAGRAPH 10.4.8 OF THIS CHAPTER OR A SHIP'S PLAN OF THE DAY WILL BE IMPLEMENTED ANY TIME WORK AFFECTING SAFETY OF SHIP ITEMS IS PERFORMED REGARDLESS OF AVAILABILITY STATUS.**

- b. Safety of Ship Maintenance Items. The ship's Commanding Officer's permission is required prior to authorizing the maintenance evolution. The following, as a minimum, shall be scheduled on the SOSMIL:
- (1) All maintenance involving single closure isolation from sea.
  - (2) All maintenance which removes a means of blowing main ballast tanks.
  - (3) All maintenance requiring the use of flat patches, hull blanks or cofferdams, with specific entries identifying the actual installation and removal of these items.
  - (4) All maintenance which removes the capability to dewater the ship using either the trim or the main drain systems.
  - (5) All maintenance which removes the ship's installed firefighting capability (e.g., maintenance which prevents pressurization of the trim system).
  - (6) Bleeding or charging oxygen banks.
  - (7) Handling or loading of explosives or weapons.
  - (8) All maintenance which removes portions of, or the entire Emergency Air Breathing system.
  - (9) Fueling or defueling.
  - (10) Diver operations.
  - (11) Pumping or flooding the sonar dome.
  - (12) Battery charges.
  - (13) Nitrogen load.
  - (14) Refrigerant on/off load.
  - (15) Evolutions with an expected draft change of >3 inches (e.g., ballasting, lead load, etc.).
  - (16) Securing the Emergency Diesel Generator.
  - (17) Other maintenance or evolutions which require special coordination between Ship's Force and maintenance providers to ensure safe accomplishment of authorized work (i.e., Sail Safety, Loading Vertical Launch System Platform).
  - (18) All maintenance that violates the integrity of the pressure hull, watertight bulkhead or watertight doors, excluding the routine operations of access hatches.
  - (19) All maintenance that disables any bilge alarm or any portion of an emergency announcing circuit when temporary alarms or indications are not installed.
  - (20) All maintenance that secures normal or emergency lighting circuits in a compartment or space such that damage control response would be significantly impacted.

**NOTE: USE OF TEMPORARY SYSTEMS TO REPLACE FUNCTIONS OF SHIP'S INSTALLED SYSTEMS SHOULD BE CONSIDERED WHEN DEEMED NECESSARY. CLASS SUBMARINE ORGANIZATION AND REGULATIONS MANUALS AND SHIP SYSTEM MANUALS MAY PROVIDE FURTHER GUIDANCE.**

- c. SOSMIL Preparation. The SOSMIL will be prepared by a person designated by the ship's Commanding Officer using written input provided by Ship's Force divisions and the FMA representative. A new SOSMIL will be prepared prior to the FMA Daily Production Meeting of Volume II, Part I, Chapter 4, paragraph 4.4.11 of this manual. Appendix E of this chapter is provided as an example and depicts the minimum attributes that must be documented on the SOSMIL. Appendix F of this chapter may be reproduced locally for use. Prepare the SOSMIL as follows:
- (1) Indicate ship's name, hull number, upkeep number, calculated maximum expected draft, actual morning draft and date prepared.
  - (2) For each job, list the Job Control Number/WAF number (as applicable) (operating instruction, PMS item, operating procedure), job description, scheduled end date and any remarks.
  - (3) The SOSMIL should indicate planned work for the next seven days. A thick black line shall be used on the left side of the current day to indicate the current days work.
  - (4) In the job description block, indicate in parentheses a number that corresponds to the list at the bottom of the sheet as to why the job requires a SOSMIL entry.
  - (5) Items shall remain listed on the SOSMIL until work has been verified complete and associated WAF has been completed or Block 11 of the WAF revised as no longer affects Safety of Ship.
- d. Maximum Expected Draft. For those items which will have an affect on ship's draft, expected draft changes greater than three (3) inches will be calculated fore and aft for that evolution and indicated in the remarks section. Draft calculations will be made by a Diving Officer of the Watch qualified individual. Additionally, for all ballasting evolutions, a second independent calculation will be performed and provided by a second Diving Officer of the Watch qualified individual. The worst-case draft change for each item will be totaled to arrive at a "maximum draft" and a maximum one foot buffer added to arrive at the "maximum expected draft". (The ship's Commanding Officer can decide to reduce the buffer as he desires. If Safety Draft Marks are in use, the bottom edge of the mark shall match the "maximum expected draft".) The "maximum expected draft" is listed at the top of the SOSMIL. Calculation sheets will be retained until the job is no longer carried on the SOSMIL. If the ship exceeds the "maximum expected draft", the Duty Officer will stop the evolution, place the ship in a safe condition and notify all parties who signed the SOSMIL and the ship's Commanding Officer.

**NOTE: THIS SHALL IN NO WAY BE CONSTRUED AS LIMITING ACTIONS BY THE DUTY OFFICER OR NOTIFICATION OF THE SHIP'S COMMANDING OFFICER OF SMALLER DRAFT CHANGES. ANY UNEXPECTED DRAFT CHANGE SHOULD BE THOROUGHLY INVESTIGATED AND UNDERSTOOD.**

- e. Morning Actual Draft. The actual ship's draft recorded each morning prior to the Daily Production Meeting. This draft will serve as a baseline value for draft changes that occur throughout the day.
- f. The Ship's Force Availability Coordinator will present the SOSMIL at the FMA daily production meeting for review and signatures. The SOSMIL will be signed by:
- (1) Ship's Force (signed by a department head). Signature indicates that all evolutions that affect ballast have been identified, the form has been completed in accordance with this instruction and the correct drafts have been calculated and at least four feet of freeboard is available to all hull openings.
  - (2) Immediate Superior In Command (ISIC) (signed by an ISIC representative). Signature indicates that all maintenance has been identified, the form has been completed in accordance with this instruction and the draft measurements are noted.

- (3) Maintenance Organization (signed by appropriate senior level person of the repair activity, normally the Production Officer, as he leads the FMA Daily Production Meeting). Signature indicates all authorized Safety of Ship work items are listed. If any additional items are to be worked, a formal change to the SOSMIL will be required.
- g. Following review and signature, the Ship's Force Availability Coordinator will provide the original copy to the ship's Duty Officer. Reproduced copies for distribution shall be made from the "original document" only. Copies will be provided to:
- (1) Each Production Meeting attendee listed below:
    - (a) FMA Division Officers
    - (b) FMA Repair Duty Officer/Repair Duty Chief Petty Officer
    - (c) FMA Regional Maintenance Team Leader. He/she shall receive enough copies to make further distribution to the FMA Duty Officers and each FMA Division Officer having work listed on the SOSMIL.
    - (d) Supply Repair Other Vessel Officer
    - (e) Ship's Force Availability Coordinator
    - (f) ISIC Material/Squadron Representative
    - (g) FMA Availability Coordinator
  - (2) The ship's Engineering Duty Officer.
  - (3) The ship's Below Decks Watch.
  - (4) The ship's Petty Officer of the Deck.
  - (5) Naval Submarine Support Center Representative.
- h. SOSMIL Use and Pre-Job Briefs. None of the evolutions or maintenance specified in paragraph 10.4.8.b of this chapter shall commence unless it is scheduled on the current SOSMIL. The activity performing any maintenance or evolutions listed on the SOSMIL is responsible for a pre-job brief prior to commencing work. A pre-job brief is required for all items listed on the SOSMIL and will be attended by all parties involved as desired by the Ship's Duty Officer.

#### 10.4.9 Ship in Dry Dock (Submarines Under Joint Fleet Maintenance Manual Controls).

- a. When the ship is in dry dock, Chapter 0872 of Navy Regulations requires the closing of all valves and other openings in the ship at the end of working hours when such closing is practical. In situations where there is extensive disruption of watertight integrity, making daily closing impracticable, it is prudent to protect the dry dock, rather than the ship, from inadvertent flooding. To this end, shipyards shall maintain dry docks in accordance with reference (c).
- b. Temporary fluid systems shall be considered a controlled constant fluid supply provided the following conditions exist:
  - (1) The temporary fluid supply contains two in-line isolation valves external to the ship between the source and the ship.
  - (2) The two isolation valves shall be located to facilitate rapid isolation (e.g., close to the ship).
  - (3) The temporary fluid system, including both off hull isolations, shall be formally transferred to, including operation of, Ship's Force.
  - (4) The supplied ship system shall be tested to the temporary system operating pressure.
- c. Dry dock simulated waterborne conditions exist when water is introduced to the dry dock and kept at a level below that necessary to lift the vessel off the blocks. During this condition the following minimum requirements shall apply:

- (1) The event shall be authorized on the SOSMIL, contained in section 10.4.8 of this chapter (Submarines only).
  - (2) Hull openings shall be maintained in accordance with reference (a).
  - (3) Seawater valves should normally be operated using ship's systems. A temporary system may be used to operate seawater valves after obtaining Commanding Officer's permission.
  - (4) Ship's dewatering capability meets the requirements of references (d) through (f).
- d. Dewatering capability. Each compartment shall be capable of being dewatered at a rate of at least 200 GPM with pumping started within three minutes of the flooding being called away. Ship's Force will demonstrate adequate dewatering capability by planning and scheduling flooding drills to be observed by the ISIC and Lead Maintenance Activity Representative at the following times:
- (1) Within seven days of docking and temporary systems being delivered.
  - (2) Every 90 days while in dock.
  - (3) Just prior to undocking, normally within one week.

#### 10.5 FINAL CERTIFICATION, CLOSE-OUT AND RE-ENTRY OF SUBMARINE SPACES, TANKS AND VOIDS.

10.5.1 Purpose. To establish procedures for the final certification, close-out and re-entry of submarine spaces, tanks and voids.

10.5.2 Discussion. Historically during space, tank or void close-out, a large number of diverse and inconspicuous items have been overlooked. These items have, at times, seriously degraded both material readiness and acoustic signature of submarines. This section establishes a procedure to ensure a thorough certification of all spaces prior to final close-out and provides a check-off list when re-entry is required. The check-off list/sheet is not all inclusive. Common sense and effective use of personnel experience and knowledge must be used to ensure complete and thorough inspections. Non-steel damping and acoustic restraining covers are not required to be painted. Accidental overspray is acceptable. Full paintout of damping restraining covers and acoustic tile covers is not the intent. If damping and acoustic tiles are painted they must be checked to ensure that the paint will not bridge the gap between the rubber and the restraining cover more than 75% over an area. Degradation of the performance of tiles is possible. A suggested way to repair the area is to score the gap between the restraining cover and the damping tile and between the acoustic tile covers and the rubber. Previously painted serviceable tiles may remain in service. Reference (g) allows paint on piping.

**NOTE APPENDIX G MAY BE USED AS AN AID FOR ENTERING SUBMARINE SPACES, TANKS AND VOIDS.**

#### 10.5.3 Action.

- a. The Damage Control Assistant (DCA) is designated the coordinator for the close-out of all spaces. As such he is responsible for the following:
  - (1) Assigning responsible personnel to close-out or assist in closing out specific spaces, tanks and voids.
  - (2) Providing personnel designated to conduct tank, void, or space close-outs with a copy of Appendices G or H as applicable.
  - (3) Ensuring personnel performing close-outs are aware of their responsibilities and are adequately trained. He shall provide, by periodic notice, a list of personnel qualified to perform close-out inspections.
  - (4) Maintaining a folder for completed copies of Appendix H. This folder will serve as a space, tank and void close-out certification record. Only the most recent copies of these Appendices are required to be retained. This folder should also include an index of all spaces, tanks and voids applicable to close-out certification and their status.

- (5) Keeping the Commanding Officer and the Engineer Officer informed as to the status of close-outs and significant deficiencies noted.
- b. Personnel performing tank, void and space close-out or entry are responsible for:
  - (1) Obtaining a copy of Appendix G and Appendix H.
  - (2) Forwarding to the DCA completed copies of Appendix H.
- c. Responsibility for Re-Entry Controls (REC) and final certification is as follows:
  - (1) In cases where entry is required to be made for production work by both Ship's Force and FMA personnel, the FMA will be responsible for REC and Ship's Force will be responsible for final certification close-out.
  - (2) For cases where only FMA work is anticipated, the FMA will be responsible for REC and Ship's Force will be responsible for final certification close-out. For the cases in which only the maintenance activity has access (e.g., waterborne entry into mud tanks or ballast tanks by divers) the maintenance activity will be responsible for final certification close-out.
  - (3) For cases where only Ship's Force work is anticipated, Ship's Force will be responsible for REC and final certification close-out.

10.5.4 Applicability. All SSN and SSBN/SSGN Class submarines and FMAs.

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## APPENDIX D

### BARRIER CRITERIA FOR SUBMARINE HULL PENETRATIONS

1. SYSTEMS WHICH PENETRATE THE HULL. Commanding Officers will review tag-outs and work procedures for systems which penetrate the hull to the detail considered necessary for safety. Any required work or testing which violates the requirements below should not commence without prior specific approval of the Commanding Officer.
2. HULL PENETRATIONS BELOW THE WATERLINE. The principle of double closure applies to all hull penetrations except for those mechanical and electrical penetrations (such as the secondary propulsion motor shaft and cable penetrations) which are designed for single closure. Double closure is accomplished by using installed valves, blank flanges, outside closure plates or shaft seals. Positive control shall be exercised by Ship's Force to maintain closure through the use of danger tags and interlocks, gagging devices, chains, mechanical locks, hydraulic locks, blanks etc., until the work, including the required testing, on the associated system has been completed.
  - a. Single closure can be used only with the specific permission of the Commanding Officer. If single closure is approved, the barrier must be verified by a satisfactory leak check of the single closure before opening the system for maintenance as follows:
    - (1) The system should be isolated using the single closure barrier.
    - (2) If the system has not been drained, open the closest system high-point vent to conduct a controlled leak check of the single closure.
    - (3) If the system has been drained, open the closest low-point drain to conduct a controlled leak check of the single closure.
  - b. Prior to undocking:
    - (1) If undocking becomes necessary prior to completing all sea connected system maintenance and testing, obtain double closure through reassembly, then satisfactorily hydrostatic test all pressure boundary joints outboard of the backup valve seat and verify the integrity of the hull and backup valve seats by performing a hydrostatic seat leakage check of both valves.
    - (2) Where schedule, resources or other constraints prevent accomplishment of the above at the time of undocking, a blank flange(s) shall be installed, tested and identified external to the hull penetration to provide double closure. This condition shall be identified both internally and externally to prevent inadvertent removal. The installation of the blank flange shall be approved by the Commanding Officer. Removal of these blank flange(s) shall not commence until the required valve(s) and associated local Valve Position Indicator(s) have been reinstalled and tested to support removal of the blank and blank removal has been approved by the Commanding Officer.
3. HULL PENETRATIONS ABOVE THE WATERLINE. These penetrations/openings will also be protected by double closure or as follows:
  - a. Hull penetrations less than four feet above the waterline.
    - (1) Cofferdams shall be installed around all open hull access openings, including temporary hull cuts, which have less than four feet of freeboard at the opening. Cofferdams shall be constructed and tested in accordance with reference (a) to maintain watertight integrity to at least four feet above the waterline. A hull opening such as an electrical cable penetration need not have a cofferdam installed if it is adequately blanked or plugged while the system is under repair. Cofferdams will be designed to permit personnel access, temporary services and equipment shipping, as applicable, without violating the required watertight integrity. The ship's topside freeflood structure may be used to achieve the four foot requirement, however, the opening must be controlled in the same manner as a cofferdam. Positive control to maintain closure through the use of danger tags, and gagging devices, mechanical locks and/or blanks must be exercised for all hull access openings not in an as-built condition. Removal or changes in status shall be approved by the Commanding Officer.

- (2) Other penetrations/openings which do not meet the above criteria or which cannot be isolated by some type of single closure will be attended at all times by personnel with access to equipment capable of securing flooding, should it ever occur. Exceptions require specific permission of the Commanding Officer. Single closure may be affected by any suitable temporary watertight closure.

- b. Hull penetrations greater than four feet above the waterline. Penetrations/openings not in their normal as-built condition are not required to be watertight but should be provided with protection against unwanted fluid entry.

4. INADVERTENT OPERATION OF HYDRAULIC ACTUATORS. For those conditions when the ship is waterborne with a hull and/or backup valve below the waterline installed but the associated inboard piping is not complete and the hull and/or backup valve hydraulic actuator lines are disconnected, the following guidance is provided for reconnecting the hydraulic actuators (which may cause valve movement):

- a. If an external blank flange is installed, any additional precautions should be determined by the Commanding Officer.
- b. If an external blank flange is not installed, then the hull and backup valves should be installed, hydrostatically tested and local valve position indication proven correct and reliable. Additional safety precautions such as not working the actuators for a particular hull/backup combination concurrently, shutting and danger tagging both valves at all times, isolating and danger tagging the hydraulic pressure source to the control valve for the specific actuator being worked and not pressurizing or operationally testing the actuators until the seawater system integrity has been reestablished, should be employed to provide the additional assurance required to preclude the need for an external blank.

5. INSTALLATION OF HULL FITTINGS/FLANGES. When maintenance is to be performed which requires a hull fitting/flange to be installed, the following actions will be taken:

- a. Ship's Force will identify the hull opening by noun name, docking plan number, frame number, side and distance **off centerline and item number** (as obtained from the ship's docking plan) and provide this information to the FMA.
- b. The FMA planning division will verify the data provided by Ship's Force **and calculate the circumferential distance from the centerline.**
- c. The FMA LWC will provide the verified data and the fitting/flange, including the required installation hardware, to the diving supervisor.
- d. Ship's Force shall mark the fitting location using a weighted and marked line, referenced from frame marks topside.
- e. The Ship's Duty Officer shall authorize the installation of the fitting/flange and coordinate the pre-brief for the installation evolution. As a minimum, the brief shall be attended by the Ship's Duty Officer, LWC Supervisor and Diving Supervisor. The mechanism for authorizing the hull blank installation shall be the Work Authorization Form (Appendix A), in accordance with this chapter.
- f. The divers, in conjunction with Ship's Force and the LWC Supervisor shall verify the location of the hull opening and weighted/weighted line prior to the divers entering the water.
- g. A diver accompanied by Ship's Force shall tap on the internal hull opening until the in-water diver acknowledges the location by returning the signal.
- h. After installation, the hull fitting/flange location and installation shall be independently verified by a second diver.
- i. Divers, assisted by the LWC and Ship's Force, shall verify the hull fitting/flange integrity with a 100 psig air test.
- j. Divers and the LWC Supervisor shall mark the hull fitting/flange by attaching a tether from the fitting/flange to topside. At the topside attachment point the tether shall be labeled "Hull Fitting (Noun Name) Installed".

- k. Positive verification from inboard of the hull fitting/flange placement and integrity must be achieved for each installed fitting/flange prior to proceeding with any maintenance. The verification shall be accomplished using the method for testing a single closure described in paragraph 2.a of this Appendix. If either of the leak check methods of paragraphs 2.a.(2) or (3) of this Appendix are not possible, the Commanding Officer shall be notified and give specific permission for continuing/conducting the maintenance.
- l. If internal verification of hull fitting/flange integrity is not possible due to system configuration, the fasteners shall not be fully removed from the pressure boundary being disassembled until the system is fully drained and hull fitting/flange integrity has been verified.
- m. If a hull fitting/flange is left installed for system and/or at sea operations, the guidance of Volume V, Part I, Chapter 8 of this manual concerning Departure From Specification shall be followed.

6. REMOVAL OF HULL FITTINGS/FLANGES. Prior to removal, divers, in conjunction with Ship's Force, shall verify the label of the tether of the fitting/flange to be removed and check for the presence of danger or caution tags. The divers shall then follow the tether to the fitting/flange to ensure the removal of the correct fitting/flange.

7. BULKHEAD VENTILATION VALVES. Bulkhead ventilation valves shall either be operational and capable of being shut or made water tight with a blank. Bulkhead penetrations shall either be in their normal condition or be rendered watertight if unattended. Temporary closures are permitted.

8. FABRICATION OF NON-NUCLEAR PIPING BLANKS. For fabrication of non-nuclear piping blanks to be used during hydrostatic testing and maintenance on submarine piping systems, the following general guidelines apply:

- a. The material must be the identical type, level and pedigree required for the system application in accordance with reference (h) or as required by NAVSEA drawings.
- b. Blanks must be constructed such that the design sealing surface dimensions and fitup characteristics of the system are maintained.
- c. Dimensions of blanks will be in accordance with reference (h).
- d. Applicable hydrostatic strength and porosity testing will be performed as required by system test pressure drawings.
- e. All blanks shall be marked in accordance with reference (h). Maximum allowable pressure will be the hydrostatic test pressure (e.g. 6750 psi for a 4500 psi application, 4500 psi for a 3000 psi application, etc.). Additionally, mark piece with nominal operating pressure and material used. Ensure pressure markings are annotated "MAX" and "NOM" as appropriate.
- f. Blanks installed for maintenance or testing will be identified by a plain tag stating the purpose of the blank. This tag will be in addition to any danger tags used.

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**APPENDIX E**

**SAFETY OF SHIP MAINTENANCE ITEM LIST EXAMPLE**

Ship name: USS Bigcity Hull #: SSN-799	Upkeep #: 802	Maximum expected draft: Fore: 32'0" aft: 34'6"	Actual Morning Draft: Fore: 32'0" aft: 32'0"	Date Wednesday prepared: 23 SEP 98
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NOTE: THE MAXIMUM EXPECTED DRAFT SHALL IN NO WAY BE CONSTRUED AS LIMITING ACTIONS BY THE DUTY OFFICER OR NOTIFICATION OF THE SHIP'S CO OF SMALLER DRAFT CHANGES. ANY UNEXPECTED DRAFT CHANGE SHOULD BE THOROUGHLY INVESTIGATED AND UNDERSTOOD.

JCN/ WAF #	Job Description Reason on SOSMIL	Days work planned							Scheduled end date	Remarks
		28 Mon	29 Tue	23 Wed	24 Thurs	25 Fri	26 Sat	27 Sun		
EA01-2345/ WAF #	TD-101 repair (1,3)			testing	Remove flange				24SEP98	Restoration in progress
EM01-3456/ WAF #	Divers: inspect screw for fouling (2,10)			Brief 0830					23SEP98	
WQ01-1986/ WAF #	Inspect sonar dome/ (11)			Pump down dome, brief 0830					23SEP98	Draft change expected: 1' up fore 1.5' down aft
EA01-3509/ WAF #	TD-1 ball/seat repair (4,5)	Trim system restored					Stage temp firefighting	Testing	28SEP98	Valve worked in place; temporary firefighting capability staged
WK01-4568/ WAF #	Off-loading countermeasures (7)					Off-load			25SEP98	through weapons shipping hatch
EA01-3525/ WAF #	LP Blower MRC M-2, change oil on LP Blower (2)	Down for 1 hour at 1300							28SEP98	

The following items are Safety of Ship:

- |   |   |  |
|---|---|--|
| 1. Single closure from sea              | 8. EAB system maintenance                 | 15. Refrigerant on/off load                                    |
| 2. MBT blow removed                     | 9. Fueling or defueling                   | 16. Ballasting evolutions with an expected change of >3 inches |
| 3. Belly bands, hull blanks, cofferdams | 10. Diver operations                      | 17. Securing the Emergency Diesel Generator                    |
| 4. Dewatering ability removed           | 11. Pumping or flooding sonar dome        | 18. Pressure hull watertight bulkhead/doors maintenance        |
| 5. Firefighting capability removed      | 12. Special coordination btwn S/F and FMA | 19. Bilge alarm/emergency announcing circuit maintenance       |
| 6. Bleeding charging Oxygen banks       | 13. Battery charges                       | 20. Normal/emergency lighting maintenance                      |
| 7. Weapons handling                     | 14. Nitrogen load                         |  |

Review and approval (all parties must sign):

ISIC Rep:	FMA Rep:	Ship's Force DH:
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**APPENDIX G****PROCEDURES AND SAFETY PRECAUTIONS FOR ENTERING  
SUBMARINE SPACES, TANKS AND VOIDS**

**NOTE: IN ADDITION TO THE PRECAUTIONS NOTED IN THE STEPS BELOW, SHIP'S FORCE SHALL COMPLY WITH SAFETY PRECAUTIONS IDENTIFIED IN REFERENCES (i) THROUGH (n).**

1. Prior to entry into any free-flood area or main ballast tank, check with the Engineering Duty Officer to ensure radiological surveys have been conducted to determine the radiological controls, if required.
2. Verify REC requirements, if any.
3. Obtain permission from the Duty Officer prior to entering any tank.
4. Ensure atmosphere surveys have been completed and adequate ventilation is available prior to entering the tank.
5. Obtain the necessary tools and equipment (i.e., rubber mallet, explosion proof flashlight or drop light, hardhat, wrenches, screwdrivers, etc.) required to enter or close-out the space, tank or void.
6. Wear a hard hat when entering any Main Ballast Tank or free-flood area.
7. Use the buddy system with one man external to the tank or void at all times.
8. No smoking in any tanks or voids. Do not carry any naked lights or sparking electrical apparatus. Ensure all drop lights are inspected and approved by the Electrical Division.
9. While inside the tank, make maximum use of ladders and walkways provided. Do not step on valves and piping.
10. Ensure positive measures are taken to identify the access to the tank or void to be opened (ship's plans, two-man check, label plate identification).
11. Ensure the tank or void is properly isolated with all sources of potential pressurization danger tagged out and the tank or void is vented to the atmosphere.
12. Ensure the tank or void fasteners are loosened to permit breaking the gasket seal. Remove fasteners only after the seal has been broken.
13. Use lanyards on tools and tethered sealable parts pouches.
14. Prior to entering a tank or void, remove all unnecessary items from your person (i.e., combs, lighters, wallets, etc.).
15. Take an inventory of all tools and materials with which you entered the tank or void. Have a second person verify the inventory before and after each entry.
16. A rubber mallet should be used to investigate for sound shorts, rattles, etc.

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**APPENDIX H**  
**CLOSE-OUT INSPECTION CHECK-OFF LIST**

Name of tank, void or space \_\_\_\_\_

	DESCRIPTION	PETTY OFFICER/ OFFICER INITIAL
1.	<b>PAINT</b>	
	a. Painted items and structures are completely covered.	
	b. No cracking or bubbling.	
	c. No evidence of rust under paint.	
	d. Zincs, transducers and hydrophones are not painted.	
2.	<b>FRAMEWORK AND FOUNDATIONS</b>	
	a. Inspect space framing and shell welds for visual defects.	
	b. Ensure nuts are lock-tight type or lockwired and screw engagement allows for at least one thread protrusion.	
3.	<b>PIPING</b>	
	a. Inspect all pipes for visual weld or sil-brazed joint defects. Ensure pipe walls have not been cut by grinding, denting, or struck or burned by welding equipment.	
	b. Check pipe penetrations for properly installed sleeves and weld fillets.	
	c. Pipe hangers should:	
	- prevent vibration when pipe is struck with mallet.	
	- have studs and nuts painted.	
	- have proper insulation between pipe and hanger.	
	- have stud nuts lockwired/locking cabled or have self-locking nuts used as required.	
	d. Ensure that piping has no installed blanks.	
4.	<b>TRANSDUCERS, HYDROPHONES, CABLES AND CABLE WAYS</b>	
	a. Ensure all rubber elements are not gouged, cut, scraped or painted.	
	b. Ensure all sonar transducers and hydrophones and corresponding cables are installed in accordance with ship's plans.	
	c. Ensure only CRES banding and rubber channel insulation is used on cableways.	
	d. Ensure cableways and cable are properly supported.	
	e. Ensure electrical coamings are made and tight.	
	f. Ensure cable loop boxing covers (at hull fittings) are installed with appropriate plastic spacers such that vibration does not occur when struck with a mallet.	
	g. Ensure electrical hull penetrations are properly labeled.	
5.	<b>BAFFLE PLATES AND SOUND DAMPENING TILES</b>	
	a. Sound dampening tiles are the proper type in accordance with reference (k).	
	b. Tiles are not cut, gouged or loosely secured.	
	c. Baffle plates are properly bolted such that they are free from vibration when struck with a mallet.	
6.	<b>MECHANISMS</b>	
	a. Dynamic mechanisms are installed, hooked up, and unpainted, with no evidence of damage or scraping of components.	
	b. Tank level floats, if applicable, are free to operate and have no visual defects.	
	c. Grease lines, if applicable, are installed properly with mechanical fittings tight and no evidence of leakage.	

	DESCRIPTION	PETTY OFFICER/ OFFICER INITIAL
7.	<b>VENTS AND DRAINS</b>	
	a. Adequate draining exists from each bay.	
	b. Vents are clear of loose gear and rags.	
	c. Ensure that vents/drains have no installed blanks.	
8.	<b>GALVANIC PROTECTION</b>	
	a. Zincs are properly located and installed such that vibration does not occur when struck with a rubber mallet.	
	b. Mounting straps and bolts are painted.	
	c. Surfaces behind zincs are properly painted.	
9.	<b>CLEANLINESS</b>	
	a. Check space clear of loose gear and rags.	
	b. Check space clean and free of dirt.	
10.	<b>COMPLETION</b>	
	a. All interior inspection items are clear of any discrepancies.	
	b. Take an inventory of all tools and materials with which you entered the tank or void. Verify all items carried into the tank or void have been removed.	
	c. All personnel are clear of the tank or void.	
	d. Tank or void cover gasket and gasket seat areas are in acceptable condition.	
	e. Tank or void cover studs and nuts are torqued to the specified values required and the lock tabs are properly engaged or spot welded.	
	f. Inspect the exterior for incomplete work that would require a reinspection.	
	g. Ensure that all temporary services are removed from tank.	

\_\_\_\_\_  
Signature of Senior Enlisted Inspector

\_\_\_\_\_  
Date

\_\_\_\_\_  
Signature of Officer Inspector

\_\_\_\_\_  
Date

\_\_\_\_\_  
Reviewed by DCA

\_\_\_\_\_  
Date

## VOLUME IV

## CHAPTER 11

## TECHNICAL DATA AND INFORMATION MANAGEMENT

REFERENCES.

- (a) TL130-A1-HBK-010 MSC Procedures Manual - Maintenance Support Center Library Procedures Manual
- (b) COMNAVAIRFORINST 4700.23 - Aircraft Carrier Maintenance Support Centers (MSC) Policy and Procedures
- (c) NAVSUP P2003 - Navy Stock List of Forms and Publications
- (d) SECNAVINST 5510.36 - Department of the Navy Information Security Program Regulation
- (e) NAVSEA S8800-00-GIP-000 - **NAVSEA Guidance Handbook for Intermediate** Maintenance Activity Technical Library Personnel
- (f) NAVSEA S0005-AA-GYD-030 **Technical Manual Users Quick Reference Guide**
- (g) SECNAVINST 5510.30 - Department of the Navy Personnel Security Program
- (h) NAVSEA SL720-AA-MAN-030 - **Navy Modernization Program**
- (i) NAVSEA S9040-AC-IDX-010 - Ships 3-M Reference Information CD
- (j) NAVAIR 00-25-100 - Naval Air System Command Technical Manual Program
- (k) NAVSEAINST 4160.3 - Technical Manual Management Program
- (l) NAVSEA S0005-AA-PRO-010/TMMP - **NAVSEA Technical Manual Management Program Operations and Life Cycle Support Procedures**
- (m) NAVSEAINST 9210.29 - **Nuclear Powered Ships and Prototypes - Responsibilities of Holders of Reactor Plant and Related Manuals**
- (n) NAVSEA S9086-CV-STM-010 - **Naval Ship's Technical Manual Chapter 086 Command Technical Manual Management**

11.1 PURPOSE. This chapter defines the responsibilities with respect to the management of technical documentation and data and requires the establishment and operation of technical libraries. **Unless otherwise noted, Aircraft Carriers are governed by references (a) and (b).**

11.1.1 Discussion. Technical data and information are critical for the proper operation, maintenance, troubleshooting and repair of all plant equipment. Improper maintenance or equipment remaining not repaired and inoperative can result from a lack of proper documentation in the form of technical manuals, ship's drawings and blueprints, Military Specifications and standards, etc.

11.2 Shipboard Technical Document Management. Ships shall maintain the Advanced Technical Information Support (ATIS) System up to date. ATIS updates are mailed out to the ship on Compact Disks (CD/DVD). An additional system available for use is the Technical Data Knowledge Management (TDKM) system. Ship technical document distribution is based on configuration and therefore relies upon the Configuration Data Managers Database - Open Architecture being maintained up to date to accurately assign documents to the ship. To ensure ships maintain up to date technical documents, the following requirements shall be met:

- a. The ship shall assign a senior Petty Officer (E-6 or above) as the Technical Librarian who will maintain the ATIS and TDKM systems up to date under the supervision of the 3M Systems Coordinator. Assignments as a Technical Librarian should be for a minimum of 12 months. Technical Librarians on Aircraft Carriers are assigned for 18 months in accordance with reference (b). For Aircraft Carriers, the point of contact is the Maintenance Support Center (MSC) Officer and the Maintenance Officer.
- b. The Technical Librarian shall promptly apply ATIS changes within one week of being received on board.
- c. If TDKM is activated, the Technical Librarian shall synchronize and index TDKM once per week and report completion with received changes to the 3M Systems Coordinator. For Aircraft Carriers the point of contact is the MSC Officer and the Maintenance Officer.

- d. **3M System Coordinator shall report completion of ATIS and/or TDKM updates to the Executive Officer. For Aircraft Carriers the point of contact is the MSC Officer and the Maintenance Officer.**

11.3 **TECHNICAL LIBRARIES.** Technical Library personnel maintain a complete master technical library including technical manuals, drawing/aperture cards, Coordinated Shipboard Allowance Lists, provisioning Allowance Parts Lists (APL), computerized databases and any other technical documents or aids which support maintenance functions. The **appropriate IT** system computer programs will be used to maintain the library. In general, the technical library serves the following basic functions:

- a. Acquisition of new documents and data and the updating of existing materials.
- b. Cataloging, indexing and filing all documents, data and information materials to allow for effective use of library technical information.
- c. Accountability and control to ensure continuous integrity of the library collection and to enhance periodic inventories.
- d. Central control point for all technical documents received, held, used, transferred or disposed of by the repair department (Fleet Maintenance Activity (FMA) only) or command. For FMAs having a Nuclear Support Facility (NSF), all Naval Sea Systems Command Nuclear Propulsion Directorate (NAVSEA 08) controlled documents shall be controlled by the NSF. For MSCs aboard aircraft carriers, all NAVSEA 08 controlled documents shall be controlled by the Reactor Department Technical Publication Library. **All aircraft maintenance related documents shall be controlled by the Aircraft Intermediate Maintenance Department.**
- e. Maintain access to the following computer networks/websites whenever possible.
  - (1) Technical Data Management Information System (TDMIS).  
<https://mercury.tdmis.navy.mil/default.cfm>
  - (2) Military Engineering Drawing Asset Locator System.  
<https://www.dlis.dla.mil/medals>
  - (3) Naval Surface Forces, Atlantic Planning and Execution of Alterations and Repair (FMA and COMNAVSURFLANT and COMNAVSURFPAC commands only)  
<https://www.spear.navy.mil> click on SPEAR info.
  - (4) **Maintenance and Modernization IT Systems.**
  - (5) Monthly Advance Change Notice Report.  
<https://nsdsa.nmci.navy.mil>
  - (6) Department of Defense Index for Military Specifications, Standards and Related Publications (DODSSP) <http://dodssp.daps.dla.mil>
  - (7) <https://assist.daps.dla.mil>

11.3.1 **Technical Library Supervisor.** The Technical Library Supervisor is responsible for keeping current plans, prints, specifications, manuals and all other technical documents and information needed by ship and FMA departments and for managing the daily operation of the library. The Technical Library Supervisor shall:

- a. Have a sufficient understanding of technical library organization requirements in references (a) through (n) (as applicable) to supply the necessary technical information.
- b. Have a **minimum** security clearance **equal to the highest security classification of any document held within the library.**
- c. Supervise personnel assigned to library.
- d. Operate the technical library in the following manner:

- (1) Schedule and carry out a frequent and recurring on the job training program for all personnel assigned to the technical library staff or to satellite librarian positions. As a minimum, training shall include topics that provide guidance for performing each library or satellite library function. Satellite librarian training may be tailored to cover only those areas applicable to satellite libraries. Lesson plans shall be developed for each topic.
- (2) Maintain and provide applicable and current plans, prints, specification, manuals and all other technical documents and information needed by the cognizant department. FMAs will also provide technical documents to tended units, other FMAs, non-FMA government activities or qualified Department of Defense contractor personnel.
- (3) Maintain an inventory of technical publications/manuals and manufacturer instruction books and other technical/repair documents available in the technical library and/or any satellite libraries (Work Centers/division offices, etc.).
- (4) Develop a system for checking out/in and recall of library technical publications issued to individuals in order to maintain the integrity of the library and ensure revisions/changes are made as received and also to minimize lost materials due to unaccountability. The system should include a recall capability that would allow for the location and recall/reissue of materials after 90 days. FMAs issuing technical publications/documents to tended units should establish a 90-day or end of fleet maintenance availability recall whichever comes first.
- (5) Requisition technical documentation needed for maintenance and repair procedures but not already available on board. Maintain a separate file of material on order. Track the status of requisitioned documents until received. Initiate follow-up action for those documents where supply status has not been received for a 30-day period, unless previous supply status indicates no follow-up is required.
- (6) Ensure proper security for the contents of the technical library.
- (7) Exercise positive control over access to the Library Management or TDMIS database functions using locally generated procedures.
- (8) Maintain written procedures which describe how to perform each function carried out by the technical library (i.e., check-out/check-in of technical documents, updating library document files, operating reproduction equipment, performing updates, requisitioning, inventories and audits of library documents, etc.).
- (9) Ensure maintenance calls/contracts are made for all viewing, reproduction, computer and powered document retrieval systems/equipment used to carry out library functions. The program shall include devices associated with this equipment.
- (10) Perform an inventory of technical publications/manuals and manufacturer's instruction books.
  - (a) Ships are to perform an annual inventory of technical publications/manuals and manufacturer's instruction books and other maintenance/repair documents available in the technical library and satellite libraries (work center/division offices).
  - (b) Shore facilities and submarine tenders are to perform an inventory of technical publications/manuals and manufacturer's instruction books and other maintenance/repair documents available in the technical library and satellite libraries (work center/division offices) every 12 months.
- (11) Ensure manuals within library's inventory contain applicable Advance Change Notices (ACN), or **Interim Rapid Action Changes (IRAC)**. Verify each manual against the ACN report available from Naval Systems Data Support Activity (NSDSA), Port Hueneme, CA, and the NATEC IRAC Tracker Report.
- (12) Perform an annual data verification (configuration audit) of technical manuals and other repair documents available in the technical library and satellite libraries. Afloat libraries should perform verifications as often as operational constraints permit, within 6 months of major deployments, is recommended if verifications are not conducted annually.

- (a) Verify each NAVSEA/Space and Naval Warfare Systems Command technical manual held with the data listed in TDMIS using LMD for manual or automated verification. Verify Naval Supply Systems Command (NAVSUP) manuals with the modem Internet access.
  - (b) Verify NAVSUP manuals against reference (c) (i.e., NAVSUP 600 CD) or by performing a process verification file with LMD/TDMIS.
  - (c) Compare each technical manual held with the ACN Report provided from NSDSA, Port Hueneme, CA. This should be performed monthly.
  - (d) Compare each technical manual held with TDMIS (Index of Technical Publications) to ensure library is receiving the technical manual automatically.
  - (e) Compare each technical manual held with the Technical Manual Deficiency Evaluation Report file to make sure information received from Technical Manual Deficiency Evaluation Report submissions is reflected in applicable technical manuals.
  - (f) Make sure each technical manual is in good material condition (i.e., does not have loose or unrepaired torn pages, is readable and has an outside cover).
  - (g) For Naval Air Systems Command manuals, submit an Automatic Distribution Requirements List annually to NATEC to update distribution and verify manuals in accordance with reference (a).
- (13) Keep a record of annual inventories for 24 months. The annual inventories should include an assessment of recorded deficiencies in the technical data management program to determine areas that require improvement.
- (14) Establish procedures to incorporate changes/revisions to technical documents held within library or satellite libraries as soon as practical after receipt. Updates involving the safety of personnel or equipment (ACNs) shall be entered within 48 hours of receipt. Routine changes shall be installed before publication use or within 30 days of receipt, whichever occurs first.
- (15) Establish procedures that assure positive control of all technical documents held by the library. If Process Instructions or documents listed in <http://dodssp.daps.dla.mil> or any alteration text documents are held in Satellite library inventories, verify that these documents are up-to-date at least semiannually.
- (16) Establish procedures for issuing technical documents to Department of Defense contractor personnel using guidance provided in references (d) (FMA only).
- (17) Be the department point-of-contact for the Integrated Logistics Overhaul team with respect to technical documentation.
- (18) Ensure all superseded technical documentation is removed and disposed of in accordance with local procedures.

11.3.1.1 Technical Library Non-Supervisory Personnel. The Technical Library non-supervisory personnel will carry out the daily operations of the technical library as directed by the Technical Library Supervisor. The Technical Library non-supervisory personnel shall:

- a. Be a reliable and motivated petty officer (E5 or above for FMA/MSC or full time civilian equivalent).
- b. Military should be assigned for at least 12 months. On Aircraft Carriers they are assigned for 18 months in accordance with reference (b).
- c. Personnel assigned as satellite librarians will be reliable and motivated petty officers appointed in writing and assigned for at least 9 months. Satellite librarians will have a minimum security clearance equal to the highest security classification of any document held within the library in accordance with reference (n).

11.3.2 Technical Library Materials. The technical library has a wide variety of technical information and data in many different forms and formats. For FMA Technical Libraries eight broad categories of information exist which are described in reference (e).

11.3.2.1 Indices. Indices serve as reference or information sources that name systems, supplies and other information sources. Examples of indices include:

- a. Ships Drawing Index (SDI).
- b. Index of Technical Publications (ITP).
- c. TDMIS.
- d. Navy publications, forms and instructions (Reference (c)).
- e. DODSSP/ASSIST <https://assist.daps.dla.mil/quicksearch>
- f. ATIS Systems

11.3.2.2 Technical Manuals. Technical manuals outline inspection and repair procedures for shipboard systems. Examples of technical manuals include:

- a. Ship's Information Books.
- b. General Information Books.
- c. Naval Ships' Technical Manual (NSTM).
- d. Propulsion Operating Guide.
- e. General Specifications for Overhaul.
- f. Equipment Technical Manuals.
- g. Organizational Maintenance and Management System - Next Generation (OMMS-NG).
- h. Ordnance Publications.
- i. Ordnance Data.

11.3.2.3 Drawings. Drawings have engineering and design requirements needed to repair equipment to original specifications. Drawings are also used to find the location of shipboard systems and system equipment and components. Drawings stored in technical libraries include:

- a. Ship's construction drawings.
- b. Ship Alteration installation drawings.
- c. Selected Record Drawings.
- d. Ship's Equipment Drawings.
- e. Vendor/Manufacturer's Drawings.
- f. Booklet of General Drawings.

11.3.2.4 Handbooks and Cataloging. Handbooks have detailed information about specific systems or equipment and may also list equipment repair procedures. Examples of handbooks include the following:

- a. Micro-Electronic Device Date Handbook.
- b. Identification Markings for Fasteners.
- c. Gasket Material (Non-metallic).
- d. Guide for Sampling Inspections.
- e. Shipyard welding procedures.

11.3.2.5 Military Specifications and Standards. Military specifications and standards are specific, detailed requirements for equipment or material. DODSSP/ASSIST <https://assist.daps.dla.mil/quicksearch>

11.3.2.6 Documents and Lists. Documents and lists are catalogs of parts, equipment or publications and alteration records. The following are examples of documents and lists typically found in technical libraries:

- a. Navy Management Data List (NAVSUP Publication 4100).
- b. Navy Directive List.
- c. Introduction to Federal Supply Catalogs and Related Publications (NAVSUP Publication 4400).
- d. Ship **Changes**.
- e. Planning Yard Work Instructions.

11.3.2.7 Instructions, Technical Publications and Bulletins. These publications give guidelines for the operation of equipment, introduce new equipment and may have lists of available items. Instructions, technical publications and bulletins commonly stocked in technical libraries include:

- a. General Services Administration Supply Catalog.
- b. Electronics Information Bulletins.
- c. Field Change Bulletins.
- d. N AVSEA Instructions.
- e. Type Commander Instructions.
- f. Technical Directives.

11.3.2.8 Repair Standards. These standards are detailed repair procedures for the troubleshooting and overhaul of specific equipment and guidance for standard processes. Examples of repair standards include:

- a. Technical Repair Standard.
- b. Maintenance Standard.
- c. Intermediate Maintenance Standard.
- d. **Unified** Industrial Process Instruction.

11.4 INDEX OF TECHNICAL PUBLICATIONS AND SHIP'S DRAWING INDEX. Due to the wide variety of types of materials that may be included in a technical library, it may be confusing as to what are the minimum titles and requirements needed for a particular ship. The ITP and SDI have been developed for each ship and list the titles and drawings applicable to the ship.

11.4.1 Index of Technical Publications. The ITP is a guide to facilitate the identification of technical manuals used on board a ship. The ITP is tailored to the configuration of a specific ship and lists technical manuals needed to operate, maintain and repair ship systems and equipment. It also lists any other general and ship related manuals needed by Ship's Force. The ITP will:

- a. Contain a list of the technical manuals needed on board a ship.
- b. Identify technical manuals for specific systems and equipment.
- c. List the systems and equipment supported by a specific technical manual.
- d. Include information about each technical manual.
- e. Be in electronic (EXCEL) format and sorted by APL/Repairable Identification Code and Hierarchical Structure Code.

11.4.2 Ship's Drawing Index. The SDI is a list of ship drawings and related design reference information that shows the actual current configuration of the ship. SDIs are required by General Specifications for Shipbuilding for all ships over 200 feet in length.

- a. The original SDI is prepared by the shipbuilder and approved by Supervisor of Shipbuilding. After acceptance of the ship by the Navy, the SDI is sent to the selected planning yard which is assigned as custodian of the index.
- b. Corrections to the SDI are submitted by the industrial activity to reflect work performed during Chief of Naval Operations maintenance availabilities and Fleet maintenance availabilities. Original SDIs are to be corrected by the planning yard to reflect changes reported by the ship or other activities when changes are made between regular overhauls.
- c. SDI information includes:
  - (1) Drawing title.
  - (2) NAVSEA drawing number and revision.
  - (3) Builder or contractor drawing numbers of Hull Mechanical and Electrical drawings applicable to the individual ship.

#### 11.5 MAINTENANCE SUPPORT CENTERS (AIRCRAFT CARRIERS ONLY).

- a. MSCs provide a centralized support facility to aid work center technicians in Integrated Logistics Support processing and problem resolution services. The MSC provides shipboard management of technical documentation and libraries in support of ship's maintenance and material requirements. The MSC will function within the policy and procedural guidelines of references (a) and (b).
- b. The MSC manages and maintains an accurate equipment/component configuration database, identification of required technical support (e.g., repair part APLs, drawings, technical manuals, test equipment, Planned Maintenance System, etc.), and facilitates resolution of repair part support problems.

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**VOLUME IV**  
**CHAPTER 12**  
**HULL INSPECTION OF SHIPS AND CRAFT**

**REFERENCES.**

- (a) NAVSEA S9086-DA-STM-000 - NSTM Chapter 100 (Hull Structures)
- (b) ABS Guide for Building and Classing High Speed Naval Craft (2007)
- (c) NAVSEA T9074-AS-GIB-010/271 - Requirements for Nondestructive Testing Methods

**LISTING OF APPENDICES.**

- A Sample Layout of Inspection Areas
- B Hull Reporting Format

12.1 **PURPOSE.** To provide **general** guidance for the inspection of ship's hulls to detect structural defects or hull thickness degradation and to establish supplemental procedures and periodicities for the conduct of hull inspections of thin hulled ships and craft for the timely detection of corrosion or erosion.

12.1.1 **Scope.** Thin hull ships are defined as those ships and craft with hull plating less than 1/2 inch design thickness at any location below the waterline. Hull Inspections and repair for wooden hulled ships and craft are addressed in Chapter 24 of this volume. Guidance contained in this chapter applies to all thin steel hull ships and craft.

- a. **Detailed direction for thin hull assessment can be found in reference (a) for the following classes of surface force ships:**
  - (1) DDG 51
  - (2) FFG 7
  - (3) CG 47
  - (4) LPD 17
- b. **The following classes of surface force ships were built to reference (b), therefore reference (a) does not apply:**
  - (1) LCS
  - (2) PC

12.1.2 **Discussion.**

- a. All ship's hulls must be inspected in accordance with Planned Maintenance System (PMS). Reference (a) contains additional guidance and check lists for conducting a thorough internal and external visual hull inspection. Should visual hull inspections reveal suspect areas, these areas should be ultrasonically tested to determine the need for repairs.
- b. Hull inspections will reveal the ship's hull condition through self-inspection of inner shell structure by Forces Afloat. These inspections will permit detection of structural defects and hull thickness degradation resulting from the cumulative effects of unarrested corrosion, and identify any areas in need of repair and/or preservation. Shell plating areas which are inaccessible can be measured ultrasonically by divers from outside the hull.
- c. Besides verbal descriptions of damage, graphical layouts of hull structure for some ship classes are available for use in the inspection. These schematics are for the purpose of plotting damage locations, as well as assisting the inspector in orientation and report analysis in assessing damage effects.

- d. Main machinery spaces are most prone to corrosion due to the severe environmental extremes of temperature and humidity arising from continuous operation of the propulsion machinery and supporting systems. This alternate wetting and drying of the interior hull surfaces resulting from normal ship's operations and shutdowns over a long period produces oxidation cycles which lead to corrosion.
- e. Inspections should take place inport during a period when the machinery plant will be secured for at least one week. During the work definition period, prior to a scheduled dry-dock availability, an inspection should be scheduled so that it precedes the availability in enough time to permit the identification of all hull structure in need of repair (i.e., approximately nine to ten months prior to the scheduled availability). The ISIC/TYCOM will coordinate and schedule the inspections as requested by the ship's Commanding Officer.
- f. The inspection is primarily intended for areas which are subject to both high stress and heavy corrosion, namely, bottom shell structure in the main machinery spaces of the ship. Accordingly, all fire rooms and engine rooms must be surveyed for structural deterioration, with emphasis on the following areas:
  - (1) Under boilers and turbines, where access is difficult and environmental extremes are most severe.
  - (2) Around boiler feedwater tanks, which are continuously wet from "sweating".
  - (3) Around the various overboard intakes and discharges, where external turbulence often produces erosion.
  - (4) Along the interior of the side shell in way of the exterior waterline. Here the design thickness of the shell plating is thinnest, and exterior corrosion from wave action is always present.
  - (5) Around "wet" equipment, which continuously operate with steam/water emission (e.g., pumps, condensers, evaporator, etc.).
  - (6) Areas of the bottom shell which are subject to the corrosive action of bilge water.
- g. Items such as deck plating in way of uptake spaces, pump rooms, refrigeration spaces, heads, etc., are omitted from this inspection. These "wet" areas are considered to be "housekeeping" items and will be surveyed during the pre-overhaul hull inspection. All tank and void spaces, which are in proximity to the machinery spaces being surveyed, are also omitted from this inspection, as these compartments do not meet the above criteria. The interiors of these spaces are inspected during industrial availabilities.
- h. Procedures regarding hull inspections which are associated with Pre-CNO Maintenance Availability planning, are issued separately for each availability as determined by the requirements for each ship.

12.2 **ACTION.** Both internal and external hull inspections shall be accomplished in accordance with reference (a) and (c) on all ships and craft identified in paragraph 12.1.1 of this chapter. Periodicities shall be as specified by the TYCOM or as required by PMS.

- a. At the beginning of any dry-docking period, (regular overhaul, Docking Selected Restricted Availability, interim dry-docking, etc.) an extensive hull survey will be conducted using the ship's plans and a sampling plan similar to that shown in Appendix A of this chapter. The inspection shall be conducted using ultrasonic techniques, drill testing or caliper method as appropriate.
- b. A pre-overhaul inspection of the hull should be conducted prior to a dry-docking availability to ensure known hull repairs are included in the planned work package and to ensure unexpected costs are kept to a minimum. Dry-docking is not required for a pre-overhaul inspection; however, maximum use should be made of available tools and techniques to accurately determine the condition of the hull.
- c. A minimum of one hull reading every other frame, and every other strake (as shown in Appendix A of this chapter) up to the waterline, shall be taken and the results recorded in the inspection report of Appendix B of this chapter. Suspect areas, as determined by visual inspection, shall have several readings taken and the least thickness recorded. Any area showing a reading less than the minimum allowable shall have additional readings taken in an expanding fashion to determine the actual extent of the excessive deterioration.

- d. In locations where there is an inner hull, such as bilge area tank tops, inside readings shall be taken in addition to those readings taken on the hull. These readings shall be taken every other frame, port and starboard, recorded in the format of Appendix B of this chapter, and submitted with the hull inspection report.
- e. In general, hull sections and structures which have suffered 25 percent or greater reduction in cross-sectional area from their original thickness, should be cut out and replaced. Scattered pits of depth at least 25 percent, but not greater than 45 percent of the original thickness, may be repaired by clad welding.
- f. An engineering analysis considering current and probable future corrosion may be performed to determine if the corroded structure is within allowable stress levels, rather than performing an automatic repair when corrosion has resulted in a 25 percent or greater reduction of cross sectional area. The repair criteria shall be based on the applicable General Specifications for Overhaul.

12.3 REPORTS. The results of all hull inspections shall be forwarded to the ship, with an information copy to the TYCOM/ISIC, using the format of Appendix B of this chapter. Areas having unsatisfactory results shall be superficially noted in the report cover letter. Unsatisfactory areas shall be defined by size in feet and inches and location in relation to strake and frames.

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**CHAPTER 13**

**WEIGHT HANDLING EQUIPMENT TESTING AND INSPECTION**

**REFERENCES.**

- (a) NAVFAC P-307 - Management of Weight Handling Equipment
- (b) NAVSEA 0989-LP-043-0000 - Commissioned Surface Ship General Reactor Plant Overhaul and Repair Specification
- (c) NAVSEA 0989-LP-037-2000 - Commissioned Submarine General Reactor Plant Overhaul and Repair Specifications
- (d) NAVSEA 0989-LP-058-0000 - AS/AD Tender Nuclear Support Facilities Preventive Maintenance Index
- (e) NAVSEA S9086-XG-STM-010 - NSTM Chapter 700 (Shipboard Ammunition Handling and Stowage)
- (f) NAVSEA S9086-TX-STM-010 - NSTM Chapter 583 (Boats and Small Craft)
- (g) NAVSEA S9086-T4-STM-010 - NSTM Chapter 589 (Cranes)
- (h) NAVSEA S9086-T3-STM-010 - NSTM Chapter 588 (Aircraft Elevators)
- (i) NAVSEA STD DWG 803-5959209 - Aircraft Deck Tiedown Fittings
- (j) NAVSEA STD DWG 805-1916300 - Aircraft Securing and Engine Run-up Fittings
- (k) NAVSEA S9086-TV-STM-010 - NSTM Chapter 581 (Anchoring)
- (l) NAVSEA SG420-AP-MMA-010 - Periodic Testing Arrangements for Ordnance Handling Equipment
- (m) NAVAIR 17-1-127 - Periodic Proofload Testing of Weapons Support Equipment W/IPB
- (n) NAVSEA OP 4098 - Handling Ammunition, Explosives and Hazardous Material with Industrial Materials Handling Equipment
- (o) NAVSEA OP 3347 - Ordnance Safety Precautions, U.S. Navy
- (p) NAVORD OP 4 - Ammunition Afloat
- (q) NAVSEA S9086-TM-STM-000 - NSTM Chapter 573 (Booms)
- (r) NAVSEA S9086-ZN-STM-000 - NSTM Chapter 772 (Cargo and Weapons Elevators)
- (s) NAVSEA STD DWG 805-2276338 - Cleats
- (t) NAVSEA STD DWG 803-5000902 - Safety Net, Deck Edge, Steel Frame and Nets
- (u) NAVSEA STD DWG 803-5184097 - Safety Net, Deck Edge, Aluminum Frame and Nylon Nets
- (v) NAVSEA STD DWG 805-1639000 - Deck Screw Reversible Eyebolts
- (w) NAVSEA S9086-TL-STM-000 - NSTM Chapter 572 (Shipboard Stores and Provision Handling)
- (x) NAVSEA S9086-UF-STM-010 - NSTM Chapter 600 (Structural Closures)
- (y) NAVSEA STD DWG 805-1645271 - Portable Davits
- (z) NAVSEA S9AA0-AB-GOS-010/020 - General Specifications for Overhaul of Surface Ships (GSO)
- (aa) NAVSEA STD DWG 804-5184163 - Trunk Safety Nets
- (ab) NAVSEA S9086-TK-STM-010 - NSTM Chapter 571 (Underway Replenishment)
- (ac) NAVSEA STD DWG 804-1213717 - Vehicle Tiedown Deck Fittings
- (ad) NAVSEA STD DWG 709-5549373 - Weapons Handling Equipment SSN 688 Class Test Loads/Methods and Inspection Procedures
- (ae) NAVSEA STD DWG 709-6633924 - Vertical Launch System Weapons Handling Equipment SSN 688 Class Test Loads/Methods and Inspection Procedures
- (af) NAVSEA STD DWG 709-5549374 - Weapons Handling Equipment SSN 726 Class Test Loads/Methods and Inspection Procedures
- (ag) NAVSEA STD DWG 709-6726350 - Weapons Handling Equipment SSN 21 Class Test Loads/Methods and Inspection Procedures
- (ah) NAVSEA S9086-UU-STM-010 - NSTM Chapter 613 (Wire and Fiber Rope and Rigging)
- (ai) NAVSEA 0989-LP-030-7000 - Lifting Standard

13.1 **PURPOSE.** To ensure Weight Handling Equipment (WHE) is capable of continued reliable and safe operation.

- a. WHE shall be of sufficient rated capacity to safely handle the calculated load; including, all slings, shackles, turnbuckles, strongbacks and chain hoists.

- b. The WHE selected shall be inspected before each use for obvious material deficiencies, equipment capacity markings, and load test expiration date (as applicable).

13.1.1 Scope. The following guidance has been utilized to incorporate both Naval Sea Systems Command (NAVSEA) and Naval Facilities Engineering Command requirements:

- a. For shipboard WHE used both afloat and ashore, including Floating Drydocks, NAVSEA technical requirements are cited and invoked as the top-level guidance.
- b. For shore based WHE used only ashore, Naval Facilities Engineering Command and the Code of Federal Regulations technical requirements are cited and invoked as the top-level guidance.
- c. For general purpose lifting and rigging, shore based rigging gear and portable hoists meeting the requirements of reference (a) may be used aboard ship when the ship is pierside.
- d. For Reactor Plant Lifting and Handling Equipment and lifts of major reactor plant components, additional guidance is provided in Section 9400-0 of reference (b) and in reference (c). Reference (d) provides guidance for lifting radioactive material or reactor plant components when NAVSEA approved lifting equipment is not available (i.e., use of the B & M crane to lift portable effluent tanks or radioactive waste). These requirements apply to all commissioned ships, shipyards and Naval shore-based activities.

### 13.2 NAVAL SEA SYSTEMS COMMAND AFLOAT REQUIREMENTS.

#### 13.2.1 Definitions.

- a. **Dynamic Load Test.** An operational overload test conducted to verify the ability of the lifting equipment to operate with rated load while being subjected to dynamic conditions associated with ship motions.
- b. **Load Bearing Members.** Those members of the lifting and handling equipment which support the load and upon failure could cause dropping, uncontrolled shifting, or movement of the load.
- c. **No-Load Test.** A test which verifies equipment functional performance without a load.
- d. **Rated Load.** The maximum permissible load carried during use (also called "Safe Working Load" (SWL)). The weights of handling gear; such as slings, strongbacks, handling dolly, which are not an integral part of the equipment being tested, shall be considered as part of the rated load.
- e. **Rated Load Test.** A load test at 100 percent of the rated load, conducted at rated speed through the complete range of operating limits. The test is performed to determine the proper operation of the equipment, repeatability of functions and heat dissipation ability.
- f. **SWL.** See Rated Load.
- g. **Factor of Safety.** The ratio of the yield stress load on a structure to the estimated maximum load in ordinary use.

$$\text{Factor of Safety} = \frac{\text{Actual Yield Strength}}{\text{Required Strength}}$$

- h. **Static Load Test.** A stationary overload test conducted to verify the structural and mechanical integrity of the lifting equipment. The lifting equipment holds the test load for a short period of time while the test inspector checks the equipment for signs of brake slippage or damage.

13.2.2 Procedure. Fabrication, repair and testing of Shipboard Weight Handling and/or Weapons Handling and Stowage Equipment will be conducted using a Controlled Work Package developed in accordance with Volume V, Part I, Chapter 2 of this manual. This requirement does not apply to periodic weight test of Shipboard Weight Handling and/or Weapons Handling and Stowage Equipment. Shipboard Weight Handling and/or Weapons Handling and Stowage Equipment requiring a weight test based on Planned Maintenance System (PMS) or other periodic testing requirements, excluding tests in conjunction with repair or manufacture, will be inspected and tested using Technical Work Documents, such as a pre-existing maintenance procedure, test load methods drawing, technical manual or Formal Work **Package**. Periodic weight testing must be witnessed by a qualified inspector.

- a. **Testing Sequence.** Newly installed/overhauled equipment shall be tested in the following order:

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**CHAPTER 14**  
**MAGAZINE SPRINKLER INSPECTION REQUIREMENTS**

REFERENCES.

- (a) NAVSEA S9522-AA-HBK-010 - Description, Operation and Maintenance Handbook for Magazine Sprinkler Systems
- (b) NAVSEAINST 4790.8/OPNAVINST 4790.4 - Ships' Maintenance and Material Management (3-M) Manual

14.1 PURPOSE. To provide guidance for the performance of magazine sprinkler inspections.

14.2 RESPONSIBILITIES.

14.2.1 Commanding Officers.

- a. Ensure that sprinkler systems are tested in accordance with Planned Maintenance System.
- b. Ensure that magazine temperatures are checked and recorded daily.
- c. Ensure that magazines are properly maintained.
- d. Ensure that prior to acceptance of a sprinkler system in new construction or when design changes (Ship Changes) are made to a sprinkler system during construction or overhaul, the cognizant industrial activity provides written verification that each system is completely operational. A certified magazine inspector will perform the verification of system operability in accordance with reference (a).
- e. Ensure that magazine sprinkler system inspection requirements are conducted in accordance with reference (a) and when directed by Planned Maintenance System. These inspection requirements apply to both the thermo-pneumatic and hydraulic control systems. All tests will be in accordance with reference (a) and will be followed by a complete operational test by Ship's Force using the appropriate Maintenance Requirement Card. A certified magazine inspector will conduct all thermo-pneumatic tests.
- f. Ensure that a magazine sprinkler system verification inspection is scheduled prior to ordnance on-load (if required by paragraph d. or e. above). A certified magazine sprinkler inspector shall conduct the inspection.
- g. Take necessary action to correct all discrepancies noted during magazine sprinkler inspections. Within 30 days following receipt of the magazine sprinkler discrepancy list, report the status to the Immediate Superior In Command (ISIC) with information copy to the Type Commander via message, identifying corrective action(s) taken and/or applicable Plan of Action and Milestones.
- h. Ensure that design discrepancies are reported to the Type Commander and submitted into the Current Ships' Maintenance Project. Procedures for reporting discrepancies are included in reference (b) and Type Commander instructions.

14.2.2 Verification Activity.

- a. Ensure Magazine Sprinkler System Inspector has completed applicable qualifications of the Magazine Sprinkler Systems Inspector Course (Course Number: K041-2137).
- b. Provide a sprinkler system discrepancy list by the categories **SAFETY, MAJOR, MINOR** and **INSTALLATION** to the Ship's Commanding Officer and ISIC.
- c. Provide written recommendations to the Ship's Commanding Officer and ISIC to continue or discontinue thermo-pneumatic certification until correction of any discrepancies and completion of satisfactory sprinkler system operational tests.

14.2.3 Immediate Superior In Command.

- a. Ensure that Shipboard Explosive Safety Inspection is scheduled in accordance with reference (a).
- b. Follow-up on all discrepancies reported by the verification activity. Those items that are discrepancies as a result of design problems should be reviewed by the cognizant Naval Engineering Agency and recommended corrective actions should be performed at the earliest convenient availability.
- c. Shall act as sole grantor of all magazine sprinkler systems re-certification via message. Re-certification is based on verifying activity's recommendation.

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**CHAPTER 16**

**AIRCRAFT LAUNCH AND RECOVERY SYSTEMS FOR AIRCRAFT CARRIERS ONLY**

REFERENCES.

- (a) NAVSEAINST 4790.8/OPNAVINST 4790.4 - Ships' Maintenance and Material Management (3-M) Manual
- (b) OPNAVINST 4790.15 - Aircraft Launch and Recovery Equipment Maintenance Program (ALREMP)
- (c) COMNAVAIRLANTINST 4790.40/COMNAVAIRPACINST 4790.39 - Aircraft Launch and Recovery Equipment Maintenance Program (ALREMP) Management Teams
- (d) OPNAVINST 3120.28 - Certification of the Aviation Capability of Naval Ships Operating Aircraft
- (e) COMLANTFLTINST 3500.18 - Certification and Readiness of Aviation Facilities in Naval Ships Operating Aircraft
- (f) NAVAIRINST 3120.1 - Lead Systems Command Procedures and Responsibilities for Certification of Aviation Facilities and Equipment in Naval Ships Operating Aircraft

16.1 PURPOSE. To provide guidance concerning the maintenance policies, procedures and responsibilities for Aircraft Launch and Recovery Equipment (ALRE) throughout the ship's operating cycle.

16.1.1 Scope. The Aircraft Launch and Recovery Equipment Maintenance Program (ALREMP) is sponsored and directed by the Chief of Naval Operations, and is administered through the chain of command to provide material and technical support by the cognizant Systems Command. The ALREMP provides an integrated system for performing maintenance and related support functions on ship's installed aircraft launching and recovery systems and associated peripheral support systems and equipment.

16.2 AIRCRAFT LAUNCH AND RECOVERY EQUIPMENT MAINTENANCE PROGRAM.

16.2.1 Applicability. The ALREMP encompasses all Navy activities concerned with the operation, rework, repair, production and support of Aircraft Carrier ALRE, including catapults, arresting gear, Visual Landing Aids (VLA), and associated deck gear and accessories.

16.2.2 Objectives. The ALREMP establishes standard procedures to control maintenance, provide quality assurance performance verification, and provide for a more effective ship's Maintenance and Material Management system in compliance with reference (a).

16.2.3 Responsibilities.

- a. Naval Air Systems Command (NAVAIR) shall provide overall ALREMP management through the ALRE Program Manager (PMA 251).
- b. The ALRE Program Manager, or his direct representative, shall establish and chair the ALREMP Working Committee.
- c. The Naval Air Warfare Center (NAVAIRWARCEN) Aircraft Division, Lakehurst will provide technical services and act as the technical manager for the ALREMP.
- d. The Type Commanders (TYCOM) shall provide ALRE Maintenance Management Teams to conduct assist visits and annual audits of all units, per the requirements of reference (b). These assist visits and annual audits will ensure operation and maintenance of ALRE is conducted within the guidelines of the ALREMP as directed by reference (b).

16.2.4 Management Team. The ALREMP Management Team consists of a qualified ALRE Maintenance Officer, and an experienced Senior/Master Chief Aviation Boatswains Mate (ABECS/ABCM), assigned to Commander Naval Air Force Atlantic (COMNAVAIRLANT) N433/Commander Naval Air Force Pacific (COMNAVAIRPAC) N435. Audit assistance may be provided to the TYCOMs by the ALRE Program Office (PMA 251) Fleet Programs Team. The ALREMP Management Team provides the following services.

- a. Pre-implementation training for the ALREMP.

- b. Assistance to ships during the ALREMP implementation phase.
- c. Assist visits during industrial availabilities.
- d. Assist visits following an industrial availability or during a ship's work-up cycle.
- e. Formal audits, in accordance with references (c), prior to or during mid-deployment.

16.2.5 Assist Visits. Assist visits will be advisory in nature and will normally be scheduled to follow a ship's Selected Restricted Availability or during the work-up cycle. Units visited are encouraged to discuss maintenance/material quality assurance problems with team members. Upon completion of the visit, the team will debrief the Air Department Officer and designated Air Department personnel. An informal report of noted problems and recommendations will be provided at the debrief. The Commanding Officer will be debriefed at the discretion of the team leader. The ALREMP Management Team may be requested for additional assist visits at the ship's discretion via the applicable TYCOM.

16.2.6 Audits.

- a. Formal audits will normally be conducted prior to or during mid-deployment, and will evaluate the overall ALREMP and quality assurance management procedures, including compliance with current OPNAV and TYCOM instructions.
  - (1) The Commanding Officer shall be debriefed by the ALREMP Team Leader at the completion of the audit.
  - (2) A formal report listing all discrepancies will be forwarded to the Commanding Officer within fifteen days of the audit completion. A report of corrective actions taken will be submitted to the TYCOM no later than thirty days after receiving the formal audit report. Updates will be submitted monthly until all discrepancies are corrected.
- b. Semi-annually, the TYCOMs will provide the ALRE Program Office PMA 251 with an ALREMP status report detailing their respective carrier's performance. Reports will be used to evaluate overall ALREMP program effectiveness.

16.3 AVIATION CERTIFICATION. Aviation Certification, including ALRE certification, responsibilities, procedures, and waiver guidance are provided in references (d), (e) and (f).

16.4 CARRIER AND FIELD SERVICE UNIT.

- a. Carrier And Field Service Unit (CAFSU) is a branch of the NAVAIRWARCEN Lakehurst, ALRE Fleet Technical Support Competency. The organization is comprised of civilian technicians highly skilled and thoroughly qualified in the operation, maintenance, repair, installation, and testing of both shipboard and shore based ALRE and VLA systems. They are geographically located in field offices to provide instant technical assistance to Fleet personnel and industrial activities throughout the Fleet operating areas. CAFSU Field Offices are located at:
  - Naval Aviation Depot, JAX, Norfolk, VA Voyage Repair Team (VRT) Detachment
  - Naval Station, Mayport, FL
  - Naval Aviation Depot North Island, CA
  - Puget Sound Naval Shipyard Bremerton, WA
  - Ship Repair Facility Yokosuka, Japan
  - Supervisor of Shipbuilding Newport News, VA
  - Norfolk Naval Shipyard Portsmouth, VA
- b. The CAFSU Supervisor is located at TYCOM headquarters. Technicians are under the operational control of the Ship Installation Officer, TYCOM (N433/N435). CAFSU functions as the technical representatives of NAVAIR, the TYCOM and NAVAIRWARCEN in all matters which concern launch, recovery, and VLA equipment. CAFSU is required to maintain technical liaison with the above commands and is responsible for the completion of work to the satisfaction of these commands and for providing all interested parties with timely information as required. CAFSU will provide technical assistance during Chief of Naval Operations Maintenance Availabilities and other availabilities, and to ships not in a repair status. All industrial activity repairs, modifications, and operational tests of

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**CHAPTER 20**

**DIVER LIFE SUPPORT SYSTEMS, SUBMARINE RESCUE CHAMBER AND  
DRY DECK SHELTER MAINTENANCE AND CERTIFICATION**

REFERENCES.

- (a) NAVSEA SS521-AA-MAN-010 - U.S. Navy Diving and Manned Hyperbaric Systems Safety Certification Manual
- (b) NAVSEA SS800-AG-MAN-010/P-9290 - System Certification Procedures and Criteria Manual for Deep Submergence Systems
- (c) OPNAVINST 3150.27 - Navy Diving Program
- (d) NAVSEA SS750-AA-MMA-010 - Submarine Rescue Chamber (SRC), Modernized 850 Ft
- (e) NAVSEA S9592-B3-MAN-010 - Dry Deck Shelter Systems Scope of Certification Notebook Volume I

LISTING OF APPENDICES.

- A System Certification Requirements
- B Submarine Rescue Chamber Scope of Certification Items

20.1 PURPOSE. To provide guidance for the proper administration of a uniform maintenance program in support of the certification requirements for Diver Life Support Systems (DLSS), Submarine Rescue Chambers (SRC), Dry Deck Shelters (DDS), VIRGINIA Class Lock-Out Trunks, SSGN Lock-Out Chambers.

20.2 DIVER LIFE SUPPORT SYSTEM MAINTENANCE AND CERTIFICATION.

20.2.1 General. The DLSS maintenance program is split into two distinct categories. The first category consists of portable, surface ship afloat and shore-based surface supplied dive systems, recompression chamber systems and saturation dive systems which are certified by Naval Facilities Engineering Command (NAVFAC) Code 07F and Naval Sea Systems Command (NAVSEA) 00C4 in accordance with reference (a). The second category consists of submarine and Deep Submergence System based DLSS such as the DDS, VIRGINIA Class Lock-Out Trunks and SSGN Lock-Out Chambers which are certified in accordance with reference (b) by NAVSEA 07Q.

20.2.2 Objective. The objective of the certification process is to verify that all dive systems provide acceptable levels of personnel safety throughout the specified operating range when used with approved operating and maintenance procedures. This chapter provides procedures by which repairs, maintenance, and alterations can be accomplished to those systems within the Scope Of Certification (SOC) and in compliance with reference (a).

20.2.3 United States Navy Diving and Manned Hyperbaric Systems Safety Certification. The requirements, procedures, and guidance for the administration of the certification program for all portable, surface ship afloat and shore-based DLSS shall be in accordance with references (a), (c) and (d). Reference (a) provides a single document which:

- a. Identifies the administrative and technical requirements leading to the initial dive system material and system certification.
- b. Documents the requirements for maintaining satisfactory material and operability conditions to support continued Unrestricted Operation to design depth.
- c. Identifies the responsibilities for implementing and executing the certification program policies and procedures.
- d. Provides procedures for requesting waivers to approved operating and maintenance procedures, and for departures from approved system design.

20.2.4 System Certification.

- a. System certification is required for all U.S. Navy diving systems in accordance with reference (c). System certification is a procedure for ensuring the adequacy of the dive system to safely operate over its intended mission range. System certification is accomplished through technical reviews and periodic on-site inspections. Quality Assurance (QA) procedures are used to provide support for System certification through documented maintenance and repair procedures, on-site surveys and material audits.
- b. System certification is required for all dive systems used by the U.S. Navy, except SCUBA. System certification procedures and criteria shall be in accordance with reference (a) or (b), depending on the type of system. Appendix A of this chapter provides a listing of system certification requirements for diving systems and equipment.
- c. The SOC contains a list of all primary, secondary and emergency systems that are required to ensure diver safety. The SOC also includes documentation such as system drawings, operating and emergency procedures, maintenance procedures, and various quality assurance documents required to repair and maintain the DLSS.

20.2.5 Maintenance Guidelines.

- a. Appendix I of reference (a) contains the technical and administrative QA requirements for maintenance of SOC components, performed by Forces Afloat, and shall be used when planning all maintenance.
- b. Technical specifications shall be complied with at all times. For example, when new fasteners are being installed in a system and the applicable plan requires monel fasteners, then substituting stainless steel or any other material type fasteners is not authorized. Temporary repairs with substituted material shall be documented through an approved Departure From Specification (DFS) in accordance with Appendix I of reference (a), and promptly restored to plan specifications.
- c. The following areas of the QA Program are applicable to all dive systems:
  - (1) In-process control of fabrication and/or repair.
  - (2) Procedure preparation.
  - (3) Testing, including retesting.
  - (4) Calibration.
  - (5) DFS.
  - (6) Waivers and deviations.
  - (7) Audits and deficiency corrective action.
  - (8) QA forms and records.

20.2.6 Formal System Surveys.

- a. As the System Certification Authority (SCA) for afloat and portable DLSS, NAVSEA (Code 00C4) shall issue a DLSS certification letter specifying the parameters under which the system shall be operated and maintained. For permanently installed shore-based DLSS, NAVFAC, Code 07F performs this function. The certification letter is renewed periodically after NAVSEA has conducted a formal survey of the system, including; a review of operating and emergency procedures, maintenance records, Re-Entry Control procedures and documentation, Planned Maintenance System (PMS) records, system plans, and on station observation of diving and recompression chamber evolutions. Upon completion of this survey, the NAVSEA/NAVFAC SCA representative will document all identified deficiencies on System Certification Survey Cards (SCSC). These deficiencies require completed corrective action prior to:
  - (1) Category IA Manned use.
  - (2) Category IB System certification.

**VOLUME IV**  
**CHAPTER 21**  
**SUBMARINE OXYGEN GENERATING**  
**PLANTS**

**REFERENCES.**

- (a) NAVSEA S9515-AA-MMO-010/021/022/030/040 - 6L16 Electrolytic Oxygen Generator (EOG) Technical Manual, Volumes 1 through 4
- (b) NAVSEA S9515-A1-MMO-010/020/030 - Automated Electrolytic Oxygen Generator (AEOG) Treadwell Corporation Preliminary Technical Manual, Volumes 1, 2 and 3
- (c) NAVSEA S9553-BS-OMP-010 - Oxygen Generating Plant (OGP) Preliminary Technical Manual, Volumes 1 and 2
- (d) NAVSEA S9515-AL-MMA-010/020 - Integrated Low Pressure Electrolyzer (ILPE) Preliminary Technical Manual, Volumes 1 and 2
- (e) NAVPERS 18068 - Manual of Navy Enlisted Manpower and Personnel Classifications and Occupational Standards
- (f) COMNAVSUBFORINST 5400.25 - Standard Submarine Supply Department Organization and Regulations Manual
- (g) COMNAVSUBFORINST 5400.29 - Standard Submarine Navigation/Operations Department Organization and Regulations Manual
- (h) COMNAVSUBFORINST 5400.40 - Standard Submarine Combat Systems Department Organization and Regulations Manual (SSN)
- (i) COMNAVSUBFORINST 5400.41 - Standard Submarine SSBN 726 Class Weapons Department Organization and Regulations Manual
- (j) COMNAVSUBFORINST 5400.47 - Standard Submarine Combat Systems Department Organization and Regulations Manual (SSGN)

21.1 **PURPOSE.** To establish the prerequisites and procedures for qualification of personnel, operation and maintenance of shipboard submarine oxygen generating plants designated 6L16 Electrolytic Oxygen Generators (EOG), 6L16 Automated Electrolytic Oxygen Generators (AEOG), Oxygen Generating Plants (OGP) and Integrated Low Pressure Electrolyzers (ILPE).

21.1.1 **Policy.** **Type Commander (TYCOM)** policy regarding the operation and maintenance is:

- a. All current technical documentation shall be available at the oxygen generator for operator use. As a minimum, the on hand documentation will include reference (a), (b), (c) or (d), as required, and the MRCs that support the installed unit.
- b. Planned Maintenance System (PMS) shall be maintained current to the latest Periodic Force Revision and all scheduled/situational planned maintenance requirements must be accomplished.

**NOTE: OXYGEN GENERATOR OPERATORS AND MAINTENANCE TECHNICIANS SHALL BE LIMITED TO THOSE INDIVIDUALS HOLDING THE NAVY ENLISTED CLASSIFICATIONS (NEC) REQUIRED BY REFERENCE (e) FOR THE TYPE OF OXYGEN GENERATOR PLANT OPERATED AND/OR MAINTAINED. REFERENCE (e) REFERS.**

- c. At least two qualified operators and one qualified technician shall be onboard during oxygen generator operation. Two qualified operators meet this requirement if at least one of the operators is also a qualified maintenance technician.
- d. **Safety related deficiencies must be corrected prior to oxygen generator operation.**
- e. There shall be a minimum of two qualified Oxygen Clean Workers on board to conduct maintenance on oxygen systems and the oxygen generator.

- f. For VIRGINIA Class submarines, the following hulls shall be required to maintain a minimum of two qualified Oxygen Clean Workers on board: SSN 776, SSN 777, SSN 778, SSN 799, SSN 782 and SSN 784 or as determined by TYCOM.

21.1.2 Background.

- a. Oxygen generator casualties result primarily from improper maintenance, operation or insufficient operator familiarization with current operating instructions and safety precautions. The recurring nature of these casualties necessitates that positive action be taken to ensure operating and maintenance personnel are properly trained and qualified. Additionally, technical documentation must be continuously updated for use by the ship's oxygen generator operating, maintenance and support personnel.
- b. Naval Sea Systems Command (NAVSEA) and TYCOM Technical Notices and Advance Change Notices (ACN) provide the Fleet with the latest technical information and operating instructions concerning oxygen generators. These Notices and ACNs will remain in effect until cancelled by a subsequent Notice or ACN, or are incorporated as a revision to the applicable technical manual.

21.2 RESPONSIBILITIES.

21.2.1 Immediate Superior In Command.

- a. Ensure assigned units are in compliance with the policy stated in paragraph 21.1.1 of this chapter.
- b. Conduct periodic inspections and audits to ensure that:
  - (1) Operating and maintenance personnel proficiency is being maintained.
  - (2) Technical manuals, operating and maintenance notices and PMS documentation are current.
  - (3) Operation and maintenance is in accordance with this chapter, reference (a), (b), (c) or (d), as required, and the supporting PMS.
- c. Ensure Performance Monitoring Team (PMT) inspectors perform material inspections of the ship's oxygen generators approximately 90 days prior to entry and departure from a Chief of Naval Operations (CNO) Maintenance Availability. The material inspection, prior to the availability, will identify material deficiency corrective actions which must be corrected prior to completion of the availability.

21.2.2 Performance Monitoring Team.

- a. Conduct periodic and pre/post-CNO Maintenance Availability material inspections. Ensure a review of the inspected units Material Maintenance Log is part of the material inspection.
- b. Initiate a quarterly monitoring program for those units receiving an unsatisfactory grade during the material inspection. Maintain the units on the quarterly monitoring program until two consecutive satisfactory evaluations, with no safety related deficiencies noted.
- c. Provide copies of all reports following material inspections, monitoring periods and On Site Analysis Reports to the TYCOM and the ISIC.
- d. Ensure appropriate TYCOM personnel are contacted regarding safety related issues.
- e. Conduct an operational inspection in accordance with the applicable PMS prior to Fast Cruise during a CNO Maintenance Availability. Conduct oral interviews with all oxygen generator qualified personnel to determine individual knowledge levels and training effectiveness. The operational inspection will include:
  - (1) Start up checks.
  - (2) Power-Off maintenance check out.
  - (3) Start up.
  - (4) Operation to maximum allowable amperage.
  - (5) Performance of operational PMS.

- (6) Shutdown.
- (7) Placement in a static condition and restarted.
- (8) Shutdown and purge complete.

### 21.2.3 Commanding Officer.

- a. Report reduced status in accordance with established procedures any time the personnel requirements stated in paragraphs 21.1.1.c and 21.1.1.e of this chapter cannot be met.
- b. Implement and execute a shipboard training program to qualify and maintain oxygen generator personnel qualifications.
- c. Prohibit operation of the oxygen generators if shipboard procedures are not in compliance with this chapter and reference (a), (b), (c) or (d), as required.
- d. Ensure the Oxygen Generator Material Maintenance Log is maintained and correctly reflects **all** corrective and planned maintenance performed.
- e. Ensure periodic reviews of the Oxygen Generator Material Maintenance Logs are conducted by the Division Leading Petty Officer, Division Officer and Engineer Officer.
- f. Ensure all safety related deficiencies are promptly entered into the Equipment Status Log.
- g. Prior to a CNO Maintenance Availability, ensure the PMT conducts a material inspection of the oxygen generators. Ensure oxygen generators are placed into Lay Up and adequately protected in accordance with Inactive Equipment Maintenance requirements.
- h. Ensure PMT conducts a Post-CNO Maintenance Availability material inspection prior to placing the oxygen generators in electrolysis.
- i. Ensure the PMT conducts an operational inspection in accordance with paragraph 21.2.2.e of this chapter prior to commencing Fast Cruise during a CNO Maintenance Availability. Oxygen generators will be operated by Ship's Force qualified operators as described in paragraph 21.1.1 of this chapter. The oxygen generators will be in a static shutdown condition, pressurized with nitrogen and meet the 3000 PSIG testing requirements of reference (a), (b), (c) or (d), as required.
- j. Ensure electrolysis is secured and units are placed in a safe condition prior to commencing any training drill which may cause a "loss of power" casualty (either normal or alternate power). If the oxygen generators are to be placed in a static condition for the duration of the training drill, ensure normal power will be restored to restart electrolysis, or alternate power will be available to conduct a complete purge, prior to the expiration of the 45 minute hold limitations of reference (a), (b), (c) or (d), as required.

### 21.3 REQUIREMENTS FOR SHIPBOARD PERSONNEL QUALIFICATION.

21.3.1 Training. Oxygen generator operators and maintenance technicians must be graduates of the training courses required for the appropriate NEC in accordance with the requirements of reference (e).

**NOTE: PERSONNEL QUALIFIED TO PERFORM MAINTENANCE ON THE OXYGEN GENERATOR MUST ALSO BE GRADUATES OF OXYGEN CLEAN WORKER SCHOOL.**

- a. The NECs required for EOG installations:
  - (1) NEC 4252: An individual certified to this NEC will have successfully completed EOG Operator/Maintenance Course A-852-0050.
  - (2) NEC 4752: An individual certified to this NEC will have successfully completed EOG Operator/Technician Course A-623-0039.
- b. The NECs required for AEOG installations:
  - (1) NEC 4208: An individual certified to this NEC will have successfully completed AEOG Operation and Mechanical Maintenance Course A-652-0087.

- (2) NEC 4708: An individual certified to this NEC will have successfully completed AEOG Electrical/Electronic Maintenance Course A-623-0008.
- c. The NECs required for OGP installations:
  - (1) NEC 4254: An individual certified to this NEC will have successfully completed OGP Operation and Mechanical Maintenance Course A-652-0592.
  - (2) NEC 4674: An individual certified to this NEC will have successfully completed OGP Electrical/Electronic Maintenance Course A-652-0593.
- d. The NECs and/or course completion required for ILPE installations:
  - (1) An individual certified by either holding NEC 4234 and/or successful completion of ILPE Operation and Mechanical Maintenance Course A-652-0093.
  - (2) NEC 4641: An individual certified to this NEC will have successfully completed ILPE Electrical/Electronic Maintenance Course A-623-0132.

21.3.2 Watchstanding Prerequisites. Prior to being certified as qualified for oxygen generator watches the following watchstander prerequisites must be met:

- a. For 6L16 NEC 4252: Stand watches, under instruction, for a minimum of three (3) six (6) hour watches underway, with the oxygen generator(s) in operation.
- b. For 6L16 NEC 4752: Stand watches, under instruction, for a minimum of one (1) start-up, one (1) shutdown and purge, and one (1) three (3) hour watch underway with the oxygen generator(s) in operation. For technicians, this is a familiarization watch only; technicians qualifying as operators, are governed by paragraph 21.3.2.a of this chapter.
- c. For AEOG NEC 4208: Stand watches, under instruction, for a minimum of three (3) six (6) hour watches underway with the oxygen generator(s) in operation.
- d. For AEOG NEC 4708: Stand watches, under instruction, for a minimum of one (1) start-up, one (1) shutdown and purge, and one (1) three (3) hour watch underway with the oxygen generator(s) in operation. For technicians, this is a familiarization watch only; technicians qualifying as operators are governed by paragraph 21.3.2c of this chapter.
- e. For OGP NEC 4254: Stand watches, under instruction, for a minimum of three (3) six (6) hour watches underway with the oxygen generator(s) in operation.
- f. For OGP NEC 4674: Stand watches, under instruction, for a minimum of one (1) start-up, one (1) shutdown and purge, and one (1) three (3) hour watch underway with the oxygen generator(s) in operation. For technicians, this is a familiarization watch only; technicians qualifying as operators are governed by paragraph 21.3.2e of this chapter.
- g. For ILPE NEC 4234 and/or successful completion of course A-652-0093: Stand watches, under instruction, for a minimum of three (3) six (6) hour watches underway with the oxygen generator(s) in operation.
- h. For ILPE NEC 4641: Stand watches, under instruction, for a minimum of one (1) start-up, one (1) shutdown and purge, and one (1) three (3) hour watch underway with the oxygen generator(s) in operation. For technicians, this is a familiarization watch only; technicians qualifying as operators are governed by paragraph 21.3.2g of this chapter.
- i. Demonstrate an understanding of the approved NAVSEA Oxygen Generator Log Sheets, including the significance of data recorded and operational limits.
- j. Demonstrate a knowledge of corrective action(s) to be taken in the event of sudden changes in equipment operating parameters.
- k. Successfully complete qualifications for the oxygen generator and support systems in accordance with references (f) through (j).

**VOLUME IV**  
**CHAPTER 23**

**GAS TURBINE ENGINE INSPECTION FOR SURFACE FORCE SHIPS**

REFERENCES.

- (a) OPNAVINST 9220.3 - Propulsion and Auxiliary Plant Inspection and Inspector Certification Program
- (b) NSWCCD-SSES 9332-GGTB 11 - General Gas Turbine Bulletin Number 11 (Gas Turbine Fleet Representatives)
- (c) NAVSEA S9086-HC-STM-000 - NSTM Chapter 234 (Marine Gas Turbines)
- (d) NSWCCD-SSES 9352-GGTB 0 - General Gas Turbine Bulletin Number 0 (Technical Directive Zero Index)
- (e) NSWCCD-SSES 933-GGTB 3 - General Gas Turbine Bulletin Number 3 (Marine Gas Turbine Logbook and Service Records)
- (f) OPNAVINST 3120.32 - Standard Organization and Regulations of the U.S. Navy

23.1 PURPOSE. The Marine Gas Turbine Inspector (MGTI) program is intended to provide for the timely identification of discrepancies prior to Planned Major Maintenance Availabilities, deployments, when mandated by operating hour requirements and to provide technical assistance to operational units when so directed by the Type Commander (TYCOM). This chapter provides the guidance for Marine Gas Turbine inspection requirements, including preparation, procedures, criteria and reporting and is applicable to all gas turbines on fleet surface, amphibious and auxiliary platforms and craft.

23.1.1 Discussion. It has long been the Navy's practice for Ship's Force to accomplish as many repairs as possible at the organizational or intermediate levels. This maintenance philosophy requires trained and experienced personnel, capable of identifying problems so that planned and corrective measures can be recommended, planned for and accomplished in a timely manner. To address the need for experienced personnel the MGTI program has been developed. Reference (a) provides the details for the MGTI program.

23.2 MARINE GAS TURBINE INSPECTOR.

23.2.1 Certification. MGTI inspector certification and recertification requirements outlined in reference (a) are amplified as follows:

- a. MGTI's function as the Naval Sea Systems Command (NAVSEA) Technical Representatives. All their technical decisions and recommendations are made in concert with and fully supported by their appropriate Regional Maintenance Center (RMC).
- b. Upon verification of competency, Naval Surface Warfare Center, Carderock Division – Ship System Engineering Station (NSWCCD-SSES) will issue a 36 month certification. Certification will remain valid provided the MGTI conducts at least two (any combination) of the following: Gas Turbine Readiness Reviews (GTRR), **Assessments**, pre-deployment inspection, pre-Planned Major Maintenance Availability inspection and attends one MGTI seminar during the previous 12 months.
- c. MGTI certifications will be extended in 18 month intervals. Requests for extension shall be submitted to NSWCCD-SSES with info to NAVSEA 05Z via the TYCOM. By endorsement, the Commanding Officer will certify that the MGTI meets the requirements of paragraph 23.2.1.b of this chapter. A MGTI whose certification has lapsed or been suspended will be required to recertify, under procedures established by NSWCCD-SSES, on a case-by-case basis.
- d. Commanding Officers will ensure MGTIs are afforded the opportunity to attend MGTI seminars and maintain certification. Commanding Officers are also encouraged to nominate to the TYCOM motivated and capable technicians for certification as MGTIs as outlined in reference (a).
- e. A MGTI assigned as ship's company cannot perform inspections as described in section 23.3 of this chapter on that ship. (No inspector will be permitted to inspect himself.)

23.2.2 Authorized Functions and Responsibilities.

23.2.2.1 Naval Sea Systems Command. NAVSEA shall provide technical authority oversight over all marine gas turbines and associated equipment. The designated NAVSEA Technical Warrant Holder shall:

- a. Assure safe and reliable system operation.
- b. Set and enforce all technical requirements.
- c. Approve all major Departures from Specifications (DFS).

23.2.2.2 Naval Surface Warfare Center, Carderock Division. NSWCCD shall:

- a. Provide support to NAVSEA for the MGTI programs. Ensure that the required technical documentation to support the MGTI Inspector programs is maintained current.
- b. Establish and monitor the requirements and standards for routine and industrial inspections of marine gas turbine systems.
- c. Develop, implement and maintain a program to train and certify MGTIs.
- d. Ensure that inspections of newly constructed ships and ships undergoing major overhaul and/or conversion are conducted in accordance with this instruction.
- e. Conduct periodic technical audits of the MGTI Training Course.
- f. Provide management of technical data, gas turbine history and the associated repair management information database system.
- g. Conduct the semi annual MGTI seminars.
- h. Maintain a roster of all certified MGTIs by name, rating, duty station, date of certification and expiration date of certification. Revoke inspector certification and initiate action to decertify inspectors who fail to comply with requirements of reference (a).
- i. Ensure that the requirements for MGTI certification, recertification and certification extensions are met prior to final approval.
- j. Provide technical oversight and management of the MGTI and NSWCCD Life Cycle Engineering Manager programs:
  - (1) Establish and enforce requirements for MGTI certification and recertification.
  - (2) Ensure periodic MGTI seminars are conducted.
  - (3) Ensure periodic technical audits of all Integrated Logistics Support documentation and Training.
  - (4) Maintain the Gas Turbine Management Information System WEBLOG.
  - (5) Routinely evaluate and ensure state of the art inspection, maintenance and repair tools and techniques are used.

23.2.2.3 Fleet Commander. The Fleet Commander shall:

- a. Identify and designate those fleet activities which have inspection responsibilities and maintain a base of certified MGTIs within those activities.
- b. Ensure the availability of "school ships" to support MGTI Inspector training.
- c. Host the semi-annual MGTI seminars on an alternating coast basis.

23.2.2.4 Regional Maintenance Center. The RMC shall:

- a. Provide certified MGTIs to perform inspection.
- b. Review the guidelines and inspection requirements for all gas turbine inspections required by this instruction and ensure that each inspection report is recorded and updated into the Gas Turbine Management Information System.

- c. Schedule and coordinate inspections of all marine gas turbine systems required by this instruction with the appropriate technical activities to avoid the unnecessary opening of gas turbines.
- d. Provide a qualified MGTI when requested by the ship, Immediate Superior In Command (ISIC) or TYCOM.

23.2.2.5 Regional Maintenance Center Commanding Officers. RMC Commanding Officers shall:

- a. Coordinate inspections in cognizant maintenance areas.
- b. Maintain an up-to-date status of required marine gas turbine system inspections which shall include the latest inspection for all ships assigned to RMCs in their respective area of responsibility.

23.2.2.6 Immediate Superior In Command. The ISIC shall:

- a. Monitor the follow-up action required to correct noted discrepancies by randomly sampling the ship's deferred maintenance action file and most recent gas turbine inspection report.
- b. Assist Commanding Officers in arranging for the corrective action of items beyond the capability of Ship's Force, when requested.

23.2.2.7 Ship Commanding Officer/Officer In Charge/Maintenance Team. Ship Commanding Officers/Officers In Charge/Maintenance Team shall:

- a. Request gas turbine inspections.
- b. Prepare for scheduled inspections to include required operational testing.
- c. Review inspection results and initiate corrective action for those items within Ship's Force capability. Initiate requests for the correction of items beyond Ship's Force capability. If any of the discrepancies cannot be corrected within 72 hours following completion of the inspection, or if said discrepancies will impact the ship's operational schedule, initiate a Casualty Report for the affected gas turbine(s).
- d. Assess the impact (if any) of corrective action on operating schedules and advise the operational commanders. Decide (with repair activities) the optimum timing of repair actions to minimize impact on operating schedules.
- e. Submit reports.
- f. Schedule gas turbine inspections as required by appropriate Planned Maintenance System (PMS)/Class Maintenance Plan item.

23.2.2.8 Marine Gas Turbine Inspectors. MGTIs are authorized and responsible for, but not limited to, performing the following:

- a. Perform periodic intermediate level inspections per Gas Turbine Bulletins (GTB) and Ancillary Equipment Bulletins.
- b. Perform GTRR, **Assessments**, post casualty investigations, pre-deployment inspections and pre-Planned Major Maintenance Availability inspections.
- c. Provide troubleshooting assistance to ships and Fleet Maintenance Activities (FMA).
- d. Oversee in-place gas turbine repairs if currently qualified for the specific repair.
- e. Oversee Gas Turbine Technical Directive installations.
- f. Monitor compliance with configuration status accounting and technical directive reporting requirements.
- g. Make engine changeout recommendations to NSWCCD-SSSES via the RMCs.
- h. Act as team leader (if currently qualified for specific repairs) for in-place gas turbine repairs and gas turbine changeout if attendant FMA does not have a team leader qualified for the specific repair.
- i. MGTIs are part of the technical authority chain-of-command and are accountable to the NAVSEA Technical Warrant Holder for the performance of their inspection duties.

**NOTE: THE SHIP'S FORCE MGTI CAN ONLY ACCOMPLISH SPECIAL INSPECTIONS AND OPERATIONAL ASSESSMENTS ON THEIR OWN SHIP. THE SHIP'S FORCE MGTI WILL ASSIST THE RMC MGTI DURING ROUTINE AND AVAILABILITY RELATED INSPECTIONS. THE SHIP'S FORCE MGTI MAY NOT INDEPENDENTLY CONDUCT ROUTINE, STRENGTH AND INTEGRITY INSPECTIONS ON THEIR OWN SHIP.**

**23.3 GAS TURBINE INSPECTIONS AND REQUIREMENTS.**

**23.3.1 Applicability.**

- a. All gas turbine engines on surface, amphibious or auxiliary platforms or craft of the force will be inspected as prescribed in this section.
- b. Frequency of inspections of gas turbine installations by a certified MGTI will be scheduled by the Commanding Officer and conducted in accordance with references (a), (b) and (c), established PMS and GTB Inspection requirements as listed in reference (d). ISIC/TYCOM guidance may be solicited to avoid scheduling conflicts.

**23.3.2 Pre-Planned Major Maintenance Availability.**

- a. Prior to planned Depot level maintenance availabilities, a routine inspection should be performed on all ship's gas turbine engines to determine maintenance or overhaul requirements. Where possible TYCOM/ISIC should ensure there is adequate time set aside in the ships employment schedule to support these inspections.
- b. Results of this inspection will be entered into the ship's Current Ship's Maintenance Project (CSMP) and will enable the ship to submit work requests for work accomplishment by FMAs/industrial activities during Planned Major Maintenance Availabilities.

**23.3.3 Pre-Deployment.**

- a. Gas turbine engines shall be inspected by a certified MGTI prior to deployment. A deployment is defined as scheduled operational commitments of 90 days or greater away from a ship's homeport.
- b. Discrepancies resulting from this inspection will be entered into the ship's CSMP. Noted discrepancies provide the basis for but do not limit the work to be accomplished by Ship's Force and/or FMAs prior to deployment. A follow-up inspection may be scheduled 30 to 60 days before deployment or as operational commitments dictate to verify the status of repairs. The requirement to conduct a follow-up inspection will be determined by the MGTI. Follow-up inspections will be conducted when possible by the same MGTI who conducted the initial inspection.

**23.3.4 Gas Turbine Bulletin Inspections.**

- a. GTB Inspections are determined by engine operating hours and require scheduling 60 days prior to the inspection. Operating hours updated monthly in the Marine Gas Turbine Information System WEBLOG via reference (e), are the engine hours used to determine inspections.
- b. Reference (d) lists all Technical Directives and their revisions/amendments.
- c. When GTB inspections are required coincidence with pre-availabilities or pre-deployments, they should be coordinated with pre-availability or pre-deployment inspections to minimize duplicate effort and optimize inspections.
- d. Any ship not able to complete required GTB Inspections within the required periodicity will request a DFS from the TYCOM.

**23.3.5 Casualties.** Ship's Force shall conduct the initial investigation after a casualty in accordance with current directives. If Ship's Force is unable to identify the cause of the casualty or repairs required, a certified MGTI or an RMC Technical Representative shall be requested to verify the nature of the casualty, investigate for cause and make recommendations for repairs. This may be a partial inspection covering failed areas only. However, the MGTI must ensure the inspection is sufficient in scope to determine the full extent of damage and necessary repairs.

#### 23.4 REQUESTING PROCEDURES.

- a. Gas turbine inspections are to be scheduled by the ship in accordance with PMS, GTBs or ISIC/TYCOM directives.
- b. Requests for scheduling of routine inspections shall be submitted utilizing Automated Work Requests with primary and alternate dates provided. Inspections normally take three to seven working days to complete. Requests for non-routine inspections may be submitted by naval message, Automated Work Request, or telephone, as the situation requires, to the ISIC or TYCOM.
- c. Scheduling requests should be submitted a minimum of 60 days prior to the desired dates of routine inspections.
- d. Gas turbine inspections may be conducted in conjunction with assessment programs scheduled by the ISIC or TYCOM.

23.5 PREPARATION FOR INSPECTION. The MGTI shall send out a preparation package 30 days prior to the inspection.

#### 23.6 INSPECTION PROCEDURES.

23.6.1 Post Casualty Inspections. For post casualty inspections, the Commanding Officer, Engineer Officer, Main Propulsion Assistant (MPA) and leading Gas Turbine Technician (GS) should meet with the inspector on his arrival and, where possible, the Engineer Officer, MPA and leading GS should accompany the MGTI during the inspection.

23.6.2 Pre-Availability Inspections. For pre-availability inspections, pre-deployment inspections, GTRR and **Assessments**, the MPA and the leading GS should meet and where possible, accompany the MGTI during the inspection.

23.7 INSPECTION CRITERIA. Deficiencies and out-of-specification readings or observances noted should be immediately corrected or recorded as specified in the applicable bulletin(s) and reinspections scheduled. Three categories of deficiencies shall be recorded as follows:

23.7.1 Repair Before Operating. A Repair Before Operating (RBO) is any condition existing that if left unattended, would definitely pose a hazard to personnel safety. Only a MGTI that is currently certified may issue a RBO. RBO deficiencies require reinspection by a MGTI that is currently certified after repairs and before the gas turbine engine is operated. DFS will not be approved for RBOs. If there is not an immediate or near future danger to personnel, the discrepancy shall be assigned as SEVERELY DEGRADED with major operational restrictions. Any condition which is designated as SEVERELY DEGRADED and is considered for a DFS submission, is a Major DFS and must be brought to the attention of the NAVSEA Gas Turbine Technical Warrant. A Major DFS must be forwarded for NAVSEA review and approval with accompanying engineering analysis recommendations from the originator. A gas turbine with a SEVERELY DEGRADED condition cannot be operated until it is corrected/repared and reinspected unless it has been properly approved as a Major DFS. The following items are examples of RBO items and **are not to be construed as a complete list.**

- a. Conditions existing that if left uncorrected would definitely result in an uncontained failure of the engine.
- b. Lube oil leaks that exceed maximum limits in GGTB 17.
- c. Exhaust duct crack(s) that may allow exhaust leaks into ship compartments.
- d. Fuel Oil leaks that pose risk of ignition.
- e. Loss of structural integrity in intake or exhaust ducts which may result in personnel injury.

23.7.2 Major Deficiencies. Conditions exist that if left unattended would result in significant damage to equipment. The following items are examples of major items and are not to be construed as a complete list.

- a. Bent/broken/binding VSV vane actuation arms.
- b. Improperly rigged or worn VSVs and bushings.
- c. Chafed fuel oil or lube oil lines. (Beyond serviceable limits of GGTB 6)

- d. Stall (tip clang)
- e. Bent or damaged blades.
- f. Loose/missing casing split line bolts.
- g. GTB inspection periodicity/time limits exceeded.
- h. Combustor liner out of specifications.
- i. Eroded turbine section beyond serviceable limits.
- j. Vertical and/or side mount out of specifications.
- k. Fuel nozzles not maintained in accordance with PMS.
- l. Broken cannon plugs.
- m. Foreign Object Damage screen with cracks or missing wires that are beyond serviceable limits.
- n. A Major DFS must be submitted for continued operation and discrepancies **must** be entered in CSMP and scheduled for correction at earliest opportunity.

23.7.3 Minor Deficiencies.

- a. Deficiencies exist which do not adversely effect reliability, performance or safety of the engine or operating personnel. These deficiencies, if not corrected, could result in gradual deterioration of the engine, reduced efficiency and eventually major repairs.
- b. Gas turbine engine can be operated with no restrictions. Discrepancies shall be entered in the CSMP and scheduled for correction at earliest opportunity.

23.8 INSPECTION RESULTS. Upon completion of inspections, the MGTI will brief the Commanding Officer, Engineer Officer, MPA and senior GS of the results. Provide information for inclusion into the ships CSMP.

- a. Any RBO will be noted in Block 35 of the OPNAV 4790/2K.
- b. The engine cannot be started until RBO repairs are complete and re-inspected by an MGTI.
- c. A formal GTRR report shall be submitted to the TYCOM Code N434 via the Navy Propulsion website (<https://propulsion.navsses.navy.mil>). All Gas Turbine GTRR reporting to be in compliance with the latest revision of reference (b).

**VOLUME IV**  
**CHAPTER 26**  
**BOARD OF INSPECTION AND SURVEY**  
**INSPECTIONS POLICY**

REFERENCES.

- (a) OPNAVINST 4730.5 - Trials and Material Inspection (MI) of Ships Conducted by the Board of Inspection and Survey
- (b) OPNAVINST 4770.5 - General Policy for the Inactivation, Retirement and Disposition of United States Naval Vessels
- (c) NAVSEAINST 4790.8/OPNAVINST 4790.4 - Ships' Maintenance and Material Management (3-M) Manual
- (d) NWP 1-03.1 - Naval Warfare Publication Operational Report
- (e) OPNAVINST 4700.8 - Trials, Acceptance, Commissioning, Fitting Out, Shakedown, and Post Shakedown Availability of U.S. Naval Ships Undergoing Construction or Conversion
- (f) INSURVINST 4730.2 - Trials and Material Inspections of Submarines
- (g) INSURVINST 4730.1 - Material Inspections (MI) of Surface Ships
- (h) INSURVINST 4730.11 - Preparation of Deficiency Forms
- (i) INSURVINST 4730.8 - Reports of Trials, Material Inspections and Survey Conducted by INSURV
- (j) INSURVINST 4730.3 - Trials of Surface Ships

LISTING OF APPENDICES.

- A INSURV Plan of Action and Milestones

26.1 PURPOSE. To define the responsibilities and provide guidance for the preparation and conduct of a Board of Inspection and Survey (INSURV) Inspection.

26.1.1 Scope. The policies and actions required by this chapter are applicable to all ships of the U.S. Navy.

26.1.2 Background. INSURV was established by Title 10, U.S. Code, Section 7304, as a board of Naval Officers to make recommendations to the Secretary of the Navy as to which vessels, if any, should be stricken from the Naval register. Additionally, per reference (a), INSURV has been tasked with providing assurance to the Chief of Naval Operations (CNO) regarding the ship's material readiness and command's self-assessment effectiveness.

26.1.3 Discussion.

- a. INSURV is charged with conducting four basic types of inspections.

**NOTE: COMBINED TRIALS AND GUARANTEE MATERIAL INSPECTIONS (MI) ARE CONDUCTED ON SUBMARINES ONLY. ACCEPTANCE TRIALS AND FINAL CONTRACT TRIALS ARE CONDUCTED ON ALL OTHER SHIPS.**

- (1) Combined Trials/Acceptance Trials for new construction or conversion ships. Details are discussed in Volume I, Chapter 4 of this manual.
- (2) Guarantee Material Inspection/Final Contract Trials for new construction or conversion ships. Details are discussed in Volume I, Chapter 4 of this manual.
- (3) MIs are conducted on U.S. Navy commissioned ships and submarines as discussed in this chapter and reference (a).
- (4) Surveys for ships scheduled for decommissioning, Retention/Mobilization or as a Foreign Military Sale. Refer to reference (b) for additional information.

- b. Detailed procedures for reporting MI deficiencies in the Maintenance and Material Management (3-M) system are contained in reference (c).
- c. Milestones for inspections are shown in Appendix A of this chapter.

26.1.4 Policy.

- a. As designated in reference (a), material inspections are to provide assurance to Commanding Officers and higher authority that mechanisms to identify, document and resolve material deficiencies are adequate. To this end the ship will establish a program to complete administrative and organizational preparations for the INSURV inspection commencing approximately 12 months prior to the scheduled inspection. Ships shall utilize the guidance shown in Appendix A of this chapter.
- b. Adequate preparation for an INSURV inspection does not imply that all deficiencies must be corrected. The goal is to present a ship that is fully aware of all existing deficiencies. All deficiencies must be properly documented and those which are considered to be mission degrading must be reported by Casualty Report (CASREP) in accordance with reference (d). Administrative preparations, in addition to deficiency documentation, must be complete and comprehensive.

26.2 RESPONSIBILITIES.

26.2.1 Type Commander. The Type Commander (TYCOM) shall:

- a. Act as the cognizant authority for the conduct of INSURV inspections for all ships of the force (including new construction ships and submarines) and maintain a schedule of inspections due.
- b. Nominate ships and submarines for inspections and surveys by INSURV. Promulgate schedules of inspections to be conducted by INSURV on ships of the force.
- c. Schedule accomplishment of Class Maintenance Plan maintenance assessments in accordance with Volume VI, Chapter 42 of this manual.
- d. Review Safety Survey results and corrective action status report provided by the ship's Commanding Officer.
- e. Track and work to resolve historical issues with systems, equipment and processes identified by INSURV.
- f. Coordinate with the Immediate Superior In Command (ISIC) to disseminate the best practices and lessons learned.

26.2.2 Immediate Superior In Command. The ISIC shall (TYCOM responsible if ISIC is not assigned):

- a. For Surface Force Ships only, if the ISIC is deployed, the ISIC will request the numbered fleet commander assign non-deployed local Squadron to assist with inspection preparations.
- b. Monitor Ship's Force preparation for the inspection.
- c. Send reports per Appendix A. Surface Ships ISIC will conduct an inspection readiness assessment prior to submitting. Develop and disseminate a standardized Schedule of Events for assigned ships.
- d. Ensure preparation for the sequence of accomplishing inspection underway demonstrations is conducted in advance of inspection.
- e. Ensure post inspection reporting procedures are followed.
- f. Attend post-INSURV inspection critiques.
- g. Ensure supporting subordinate commands are prepared for the scheduled INSURV.
- h. Ensure that the ship is prepared to discuss Current Ship's Maintenance Project (CSMP) deficiencies which have not been corrected, and those items which have been removed from the CSMP and passed to history.
- i. Monitor the reporting and correction of inspection deficiencies through the CSMP.

26.2.3 Ship Commanding Officer. The Commanding Officer shall:

- a. Ensure that the ship is prepared for the inspection.
- b. Promulgate a ship wide Plan of Action and Milestones (POAM) in preparation for INSURV.
- c. Be prepared to discuss with the senior member of the board any item from the previous INSURV Inspection which is still on the CSMP, all items which were determined to be not correctable and designated "pass to history", or those for which reporting had been deferred by the TYCOM, including supporting rationale and reference material.
- d. Designate an officer as INSURV Coordinator and a Chief Petty Officer, preferably the 3-M Coordinator, as his assistant.
- e. Assign a senior coordinator for each INSURV functional area as defined in paragraph 26.4.2.b of this chapter.
- f. (Surface Force Ships Only) Submit a letter of concern to INSURV/TYCOM/ISIC.

26.2.4 INSURV Coordinator. The INSURV Coordinator shall:

- a. Brief all Department Heads on the review of the CSMP, confirm existing Job Control Numbers as valid, and report any existing deficiencies which are not in the CSMP.
- b. Review the Automated Work Request (AWR)/CSMP package with the TYCOM/ISIC Maintenance Document Control Office to ensure quality (e.g., readability, proper printing and page-break by Work Center).
- c. Segregate the AWR originals by INSURV departmental designations for turnover to the INSURV team.
- d. Provide the original of the complete CSMP Report to the INSURV team.
- e. Retain a copy of the AWRs and the CSMP for use during the inspection.
- f. Distribute copies of the AWRs to Department Heads and Work Centers.
- g. Collect and track all INSURV deficiencies identified during the inspection.
- h. Coordinate Work Center updating of the CSMP and the processing of updated OPNAV 4790/2Ks or AWRs.

26.2.5 Regional Maintenance Centers. In support of the tasking and funding, the Regional Maintenance Centers (RMC) will:

- a. Provide RMC support coordination for INSURV in each home port.
- b. Upon TYCOM direction, provide a weekly or, if required, daily update for critical path inspection repairs.
- c. Provide or obtain subject matter experts with the experience and system knowledge for assessment to accomplish INSURV approved procedures based on the tasking, schedule and funding provided by INSURV.
- d. Provide documented subject matter experts findings to, and formatted for, INSURV.
- e. Utilize subject matter experts resources in the most cost effective manner to support the tasking.
- f. Develop annual INSURV budget estimate based on projected INSURV schedule. Norfolk Ship Support Activity INSURV Support Coordinator will correlate individual estimates for transmittal to INSURV.

26.3 INSPECTION SCHEDULING.

26.3.1 Combined Trial/Acceptance Trial Inspections. The scheduling of these trials for new construction or conversion ships will be coordinated by the TYCOM and Program Executive Officer (PEO) Submarines in accordance with Volume I, Chapter 4 of this manual and reference (e).

26.3.2 Guarantee Material Inspection/Final Contract Trials. The scheduling of the Guarantee Material Inspection or Final Contract Trials will be coordinated by the PEO Ships or PEO Aircraft Carriers in accordance with Volume I, Chapter 4 of this manual and reference (e).

26.3.3 Material Inspections. Scheduling the INSURV MI at a consistent time in the Fleet Response Training Plan will provide invaluable independent assessments of how well our maintenance processes perform.

- a. An INSURV MI will be included in a unit's five-year plan. The desired outcome is for INSURV's MIs to be conducted at a consistent time within the Fleet Response Training Plan, and in a manner not to interfere with carrier strike group or amphibious readiness group operations. In achieving this end state, TYCOMs will avoid scheduling INSURV MIs in the time frame between the numbered fleet commander deployment certification event (e.g., Composite Training Unit Exercise, Joint Warrior, etc.) and the end of post-deployment stand down.
  - (1) Surface **Force** Ships. The MI will optimally be conducted after the Unit Level Training phase and prior to the start of the Integrated Level Training phase, after every other deployment, not to exceed 54 months. With these scheduling considerations, the overall average time between examinations for surface ships will be about 48-54 months.
  - (2) Aircraft Carriers. The optimal time to conduct MIs is 60 to 90 days following the completion of the CNO maintenance availability. Avoid conducting MIs after the air wing is embarked for carrier qualification. With these scheduling considerations, the overall average time between examinations for carriers will be about 48-54 months, not to exceed 60 months.
  - (3) Submarines. INSURV MIs are integrated into the submarine engineered operating cycle per reference (f). MIs should be scheduled post major availability and at mid-cycle. With these scheduling considerations, the overall average time between examinations for submarines will be about 65-70 months, not to exceed 84 months.
- b. Conduct of INSURV MIs outside of these time frames requires approval from **Commander** US Fleet Forces **Command**/PACFLT (N43). Material inspections of surface ships and aircraft carriers that cannot be conducted within 60 months, and submarines that cannot be conducted within either 84 months or within 180 days of completion of a major CNO availability planned for greater than 180 days in duration require a formal waiver of periodicity requirements from CNO per reference (a).
- c. Scheduling the INSURV inspection at a consistent time in the Fleet Response Training Plan will provide invaluable independent audits of our maintenance processes. Coordinating these inspections with TYCOM assessment events reduces the burden on our Sailors and saves money.
- d. **Assessment planning shall be in accordance with Volume VI, Chapter 42, paragraph 42.5.4 of this manual.**

#### 26.4 PREPARATION FOR INSURV INSPECTION.

26.4.1 Active Preparation. Ships routinely must maintain their CSMP in accurate condition and continuously monitor and accurately report their own material readiness posture per reference (d). However, due to outside agency assessments/audits/inspections/certifications the scheduling of an inspection should occur at an optimum time when full material condition awareness is maximized. Active preparation for the INSURV inspection will commence upon receipt of the TYCOM approved proposed INSURV inspection schedule. The TYCOM will notify the Commanding Officer (via the ISIC if applicable) of the proposed dates with specific guidance for the preparation and execution of the inspection. Direct and early liaison with the INSURV is essential to ensure agenda approval, facilitate travel arrangements, berthing and other similar items. Ships shall make use of the information and data available at the INSURV website (<http://www.public.navy.mil/usff/INSURV/Pages/default.aspx>) to better understand and prepare for an inspection. Ships are strongly encouraged to liaison with INSURV regarding current material problem areas that may exist within the fleet and to actively resolve them as appropriate within their own command.

26.4.2 Ship's Internal Organization. The ship will establish an internal organization for the INSURV. While the details of such an organization will vary from ship to ship, two key elements must be addressed:

- a. Specific personnel assignments shall be made to ensure that all necessary logistic and support arrangements for the INSURV are adequately covered (e.g., transportation, berthing, laundry, clerical assistance).
- b. INSURV inspects by functional areas, which may not exactly correspond to the standard ship's organization. For purposes of the inspection, the ship will assign one-to-one correspondence for each inspector, with a senior coordinator for each INSURV functional area. Assigned individuals should be thoroughly familiar with each CSMP deficiency, show the inspector exactly where the deficiency is, be able to explain why it has not been corrected and answer questions about related items in the same category, etc. Knowledgeable ship's representatives are essential for a successful inspection.

#### 26.4.3 Updating the Current Ship's Maintenance Project.

- a. The CSMP must be reviewed, updated and purged of all completed maintenance actions. All outstanding corrective maintenance should be documented as a deferral. This evolution is important since the CSMP is the primary source of deficiencies that will be presented to INSURV. A vital part of the review is to ensure that deficiencies are properly assessed and documented.
- b. Any deficiencies noted during the pre-inspection audit will be entered in the CSMP and reissued for final INSURV documentation.

#### 26.5 BOARD OF INSPECTION AND SURVEY INSPECTION CONDUCT AND DOCUMENTATION.

26.5.1 Inspection Conduct. The inspection will be conducted as specified in reference (g) for surface ships and reference (f) for submarines.

- a. Flight operations (if applicable) and other ship evolutions will not be scheduled during the conduct of the inspection, except when scheduled in direct support of the inspection or when specifically requested by INSURV.
- b. A proposed "open and inspect" list will be submitted to the ship's assigned senior coordinator for each INSURV functional area no later than the start of the underway portion of the inspection. The senior INSURV member may modify the "open and inspect" list at any time.

#### 26.5.2 Deficiency Documentation.

- a. Preparation of INSURV deficiency forms will be in accordance with references (c), (h) and this instruction.
- b. INSURV will provide the ship with a copy of new deficiencies found during the inspection.
- c. The final forms generated by INSURV will be screened by the TYCOM following the inspection. Whenever an item is considered not cost-effective to correct or is inconsistent with reference (c), the TYCOM will authorize passing the item to the history file.
- d. Deficiencies corrected while INSURV is on board are still required to be properly documented.

#### 26.6 POST BOARD OF INSPECTION AND SURVEY INSPECTION ACTIONS.

##### 26.6.1 Deficiency Processing and Resolution.

- a. INSURV deficiencies will be reported by entering them into the ship's CSMP within 30 days following completion of the inspection (90 days for Naval Air Force ships).
- b. Upon completion of the INSURV inspection, Ship's Force shall take the following actions:
  - (1) With TYCOM assistance, screen all INSURV deficiencies. Identify those which are mission degrading or safety items.
  - (2) Initiate prompt action on all mission degrading and safety items. All Part I "Mission Degrading" items and any additional items that are deemed to significantly degrade the ability of the ship to carry out its assigned mission shall be documented by an appropriate CASREP in accordance with reference (d).

- (3) Correct all deficiencies within the capability of Ship's Force as soon as possible. Deficiencies corrected within seven days shall be documented as completed maintenance actions. All other outstanding deficiencies originated by INSURV shall be incorporated into the CSMP as soon as possible but no later than 30 days following the inspection.
- (4) Modify deficiencies previously identified and processed to include the assigned INSURV number and any modifications, in accordance with the requirements of reference (c).
- (5) Comply with the requirements of reference (c) if instances occur where INSURV enters multiple deficiencies under a single INSURV number.

26.6.2 Post INSURV Inspection Reports. INSURV will issue a final report in accordance with reference (i). The report will contain a recommendation on the material condition of the ship in accordance with reference (a).

26.6.3 Unsatisfactory Finding. Upon a finding of "Unsatisfactory" by the Board of Inspection and Survey:

- a. The ship shall submit by message to the ISIC/TYCOM, an analysis of the causes of the Part I deficiencies found during the INSURV inspection and a plan of corrective actions within one week after completion of the inspection. This plan should include estimated completion dates for the corrective actions that will be performed by the ship. For corrective actions that are deferred to a Fleet Maintenance Activity, the Naval Supervising Activity Lead Maintenance Activity shall provide to the ship and the TYCOM estimates or recommended dates for the corrective actions that will be performed by the Fleet Maintenance Activity.
- b. The TYCOM will coordinate and direct all actions associated with restoring the ship to operational readiness for those Part I deficiencies judged unsatisfactory or incomplete by INSURV. The TYCOM shall submit to the appropriate chain of command a POAM to correct these Part I deficiencies and restore the ship to operational readiness. In addition, the TYCOM shall:
  - (1) Evaluate the ship's and ISIC preparations for the INSURV inspection.
  - (2) Review corrective actions and training plans submitted by the ship. Ensure these plans not only correct the specific deficiencies noted by INSURV, but that they also address the fundamental underlying causes of the deficiencies.
  - (3) Take action as required to assist in correcting the Part I deficiencies (e.g., scheduling, outside technical assistance, training, etc.).
  - (4) Re-examine those areas that were judged unsatisfactory or incomplete within 60 days of the completion of the INSURV inspection. Report the results to the appropriate chain of the command and to INSURV.
  - (5) Report by message to the appropriate Fleet Commander when the ship is adequately restored to operational readiness.

**APPENDIX A**  
**INSURV PLAN OF ACTION AND MILESTONES**

<u>MILESTONE</u>	<u>DUE</u>	<u>RESPONSIBLE ACTIVITY</u>
Notify Ship of Scheduled INSURV	I-365 days	TYCOM
(Naval Surface Forces) Maintenance Team define and schedule assessments desired prior to INSURV	I-365 days	Ship/RMC
Develop Departmental/Ship's Plan of Action and Milestones (POAM) for INSURV Preparation	I-330 days	Ship
Begin Review and Update of Current Ship's Maintenance Project	I-180 days	Ship
(Naval Air Forces) Download applicable INSURV instructions and check sheets and distribute to Ship's Force	I-180 days	Ship
Review Previous Inspection Reports (INSURV, Initial Assessment/Underway Demonstration, etc.)	I-180 to I-90 days	ISIC/Ship
Update Ship's POAM verify on track	I-180 days	Ship
Identify Ship's INSURV Coordinator to INSURV	I-180 days	Ship
Develop program to conduct/practice INSURV material checks and identify/correct training deficiencies	I-180 days	Ship
Schedule INSURV pre-brief	I-120 days	Ship
Download applicable INSURV instructions and check sheets and distribute to Ship's Force	I-120 days	Ship
INSURV Package delivered to Ship	I-120 days	INSURV
(Naval Air Forces) Develop and send linked events request message from TYCOM to INSURV	I-120 days	TYCOM/Ship
Provide hull baseline tasking to RMC	I-90 days	INSURV
Update Ship's POAM verify on track	I-90 days	Ship
Conduct INSURV pre-brief	I-90 to I-60 days	INSURV/Ship
Conduct Pre-Trial Self Audit	I-60 days	(TYCOM/ISIC)/Ship
Update CSMP following Self Audit	I-60 to I-45 days	Ship

<u>MILESTONE</u>	<u>DUE</u>	<u>RESPONSIBLE ACTIVITY</u>
Send 45-DAY INSURV readiness status message to TYCOM. Message should describe the ship's level of preparedness for INSURV, significant issues and CASREPs, significant preparations and grooms, and the ISIC's determination of the ship's readiness for the inspection	I-45 days	ISIC/Ship
Utilizing INSURV proposed trial/inspection Summary of Events agenda listed in references (f) and (g) (reference (j) for new construction), submit trial/inspection Summary of Events agenda to INSURV/RMC	I-45 days	Ship
INSURV tasking requirements to RMC locked	I-45 days	INSURV/RMC
For all surface ships, complete and deliver CO letter of concerns to INSURV (copy to TYCOM)	I-45 days (Naval Surface Forces)I-30 days (For Naval Air Forces)	Ship
INSURV tasking requirements to RMC locked	I -45 days	INSURV/RMC
(Naval Air Forces) Develop and send readiness to conduct inspection message from TYCOM to INSURV including embarkation points, security clearance forwarding data, and other pertinent event notices such as time of check in for underway personnel.	I-30 days	TYCOM/Ship
Send update 14-DAY INSURV readiness status message to TYCOM N43. Message should describe the ship's level of preparedness for INSURV, significant issues and CASREPs, significant preparations and grooms, and the ISIC's determination of the ship's readiness for the inspection	I-14 days	ISIC
RMCs provide subject matter expert names to ship/INSURV	I-7 days	RMC
RMC ensure timely subject matter expert support	I-0	RMC
Submit CASREPs as appropriate; Enter all Mission Degrading and Safety Deficiencies into CSMP	I+1 day	Ship
Report the ship's return to port and any significant results to TYCOM N43	I+1 day	ISIC/TYCOM Rep