JOINT FLEET MAINTENANCE MANUAL

VOLUME IV

TESTS AND INSPECTIONS

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VOLUME IV

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WEIGHT HANDLING EQUIPMENT TESTING AND INSPECTION	PT 1 CH 30	IV Ch 13
MAINTENANCE AND MATERIAL MANAGEMENT	PT 1 CH 31	VI Ch 19
MAGAZINE SPRINKLER INSPECTION REQUIREMENTS	PT 1 CH 32	IV Ch 14
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AIRCRAFT LAUNCH AND RECOVERY SYSTEMS FOR AVIATION SHIPS	PT II CH 1	IV Ch 16
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SUBMARINE STORAGE BATTERIES	PT III CH 4	VI Ch 21
TRIDENT SYSTEM AND EQUIPMENT MAINTENANCE PLANS	PT III CH 5	VI Ch 22
SUBMARINE NOISE REDUCTION	PT III CH 6	VI Ch 23
PERIODIC MAINTENANCE REQUIREMENT PROGRAM	PT III CH 7	VI Ch 24
UNRESTRICTED OPERATIONS	PT III CH 8	VI Ch 25
OPERATING DEPTH POLICY	PT III CH 9	VI Ch 26
RETENTION OF MATERIAL DEFICIENCY REPORTS AND RECORDS OF EQUIPMENT CHARACTERISTICS AND TESTS	PT III CH 10	IV Ch 19
SCHEDULED PRESERVATION UPKEEP COORDINATED EFFORT	PT III CH 11	VI Ch 27
DIVER LIFE SUPPORT SYSTEMS, SUBMARINE RESCUE CHAMBER AND DRY DECK SHELTER MAINTENANCE AND CERTIFICATION	PT III CH 12	IV Ch 20
ELECTROLYTIC OXYGEN GENERATOR REQUIREMENTS	PT III CH 13	IV Ch 21
SUBMARINE ANTENNA TESTING	PT III CH 14	IV Ch 22
CABLEWAY ASSESSMENT	PT IV CH 1	VI Ch 28
GAS TURBINE ENGINE INSPECTION	PT IV CH 2	IV Ch 23
HEAT STRESS CONTROL AND REPAIR OF THERMAL INSULATION	PT IV CH 3	VI Ch 29
WOOD HULLED SHIPS AND CRAFT	PT IV CH 4	IV Ch 24
PORTABLE TOOL ASSISTANCE PROGRAM	PT IV CH 5	VI Ch 30

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 Naval Ships
(c) COMLANTFLTINST 5400.2 - U.S. Atlantic Fleet Regulations
(d) COMPACFLTINST 5400.3 - U.S. Pacific Fleet Regulations
(e) 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. Volume I 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 Force (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, Atlantic Fleet (COMLANTFLT), 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 COMLANTFLT 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 Project Office or Naval Sea Systems Command Nuclear Propulsion Directorate (NAVSEA 08) are maintained in accordance with Strategic Systems Project Office 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

ABC	Automatic Boiler Control
ABO	Aviators Breathing Oxygen
ACN	Advance Change Notice
AEL	Allowance Equipage List
AIMD	Aviation Intermediate Maintenance Department
ALRE	Aircraft Launch and Recovery Equipment
ALREMP	Aircraft Launch and Recovery Equipment Maintenance Program
APL	Allowance Parts List
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 - Read Only Memory
CHT	Collection, Holding and Transfer
CNO	Chief of Naval Operations
COI	Completion of Overhaul Inspection
COMLANTFLT	Commander, Atlantic Fleet
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
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
DLSS	Diver Life Support System
DMP	Depot Modernization Period
DO	Duty Officer
DODISS	Department of Defense Index of Specifications and Standards
DOP	Designated Overhaul Point
DSRV	Deep Submergence Rescue Vehicle
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
FMAV	Fleet Maintenance Activity Availability
FTSC	Fleet Technical Support Center
FTSCMA	Fleet Technical Support Center Maintenance Activity
FWP	Formal Work Procedure
GS	Gas Turbine Technician
GTB	Gas Turbine Bulletin
GTRR	Gas Turbine Readiness Review
HSC	Hierarchical Structure Code
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
LWC	Lead Work Center
MDS	Maintenance Data System
METCAL	Metrology and Calibration
MGTI	Marine Gas Turbine Inspector
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
NAVSEA	Naval Sea Systems Command
NAVSEA 08	Naval Sea Systems Command Nuclear Propulsion Directorate
NAVSUP	Naval Supply Systems Command
NEC	Navy Enlisted Classification
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_2-N_2	Oxygen - Nitrogen
OEM	Original Equipment Manufacturer
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
PQS	Personnel Qualification Standard
PSAI	Pre-Start of Availability Inspection
PSOI	Pre-Start of Overhaul Inspection
QA	Quality Assurance
QPL	Qualified Products List
RBO	Repair Before Operating
REC	Re-Entry Control
RMC	Regional Maintenance Coordinator
RMCSG	Regional Maintenance Center Support Group
RPM	Reactor Plant Manual
RSG	Regional Support Group
SAI	Start of Availability Inspection
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 Equipment
SEMAT	Systems and Equipment Material Assessment Team
SGPI	Steam Generating Plant Inspector
SOC	Scope Of Certification
SOI	Start of Overhaul Inspection
SOSMIL	Safety Of Ship Maintenance Item List
SRC	Submarine Rescue Chamber
SSES	Ship System Engineering Station
SUBSAFE	Submarine Safety
SWL	Safe Working Load
TDMIS	Technical Document Management Information System
TLMS	Technical Library Management 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

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VOLUME IV

CHAPTER 2

FLEET MAINTENANCE ACTIVITY ASSESSMENT

REFERENCES.

(a) NAVSEA S9810-AA-GTP-010 - Intermediate Maintenance Activity (IMA) Work Center Requirements Manual
(b) COMPACFLTINST 4700.5/COMLANTFLTINST 4700.1 - Navy Afloat Maintenance Training Strategy (NAMTS) Job Qualification Requirements (JQR) Management
(c) 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 0994-LP-001-9010 - U.S. Navy Diving Manual, Volume 1 (Air Diving)

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 an 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. Assessments of FMAs 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) in conjunction with the Quality Assurance assessment prescribed by Volume V, Part I, Chapter 9 of this manual. Assessments will be performed annually, not to exceed 18 months, to evaluate the ability of the FMA to execute maintenance in accordance with applicable technical directives and specifications. Battle Force FMA/Amphibious Ready Group FMA (CV/CVN, LHA, LHD) assessments will occur once during the inter-deployment training cycle, normally during the advanced phase. 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 Procedures (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 CWPs 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. The FMA will annotate in the corresponding assessment report enclosure, the corrective actions taken for each finding.

c. The Commanding Officer will also submit a findings status report to the TYCOM via the administrative chain of command within 60 days following the date of the official assessment report.

d. 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.

APPENDIX A

TYPICAL CORE CAPABILITIES ASSESSMENT AREAS

1. Safety/Navy Occupational Safety and Health.
2. Repair Training Effectiveness.
3. Maintenance Management.
4. Maintenance Data System Management.
5. Calibration - Production/WC Management.
6. FWPs (Volume V, Part I, Chapter 2 of this manual).
7. Tool/Equipment Control Programs.
8. Corrosion Control Program (as applicable).
9. Welding and Brazing Programs.
10. Quality Assurance Organization (Volume V of this manual).
11. Nondestructive Testing/Nondestructive Inspection (Volume V, Part I, Chapter 3 of this manual).
12. CWPs (Volume V, Part I, Chapter 2 of this manual).
13. Planning & Estimating.
14. Technical Library.
15. Hull Repair.
16. Machinery Repair.
17. Electrical Repair.
18. Electronics Repair.
19. Ordnance Repair (as applicable).
20. Weapon System Repair.
21. Weight Handling/Rigging.
22. Diving/Diver Life Support Systems (as applicable).
23. Regional Repair Center Capabilities (as applicable).

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APPENDIX B

TYPICAL CORE CAPABILITY ASSESSMENT PROJECTS

1. Butt Weld (pipe).
2. HY-80 Weld Process.
3. Weld Hardface.
4. Silver Braze.
5. Tube Bend.
6. Flex Hose Manufacture & Testing.
7. Electroplating.
8. Hydraulic Control Valve Repair.
9. Weight Handling Sling Manufacture and Weight Test.
10. Valve Lap and Hydrostatic Test.
11. Other projects as necessary.

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APPENDIX C

SAMPLE FMA ASSESSMENT REPORT

From: TYCOM (as appropriate)
To: Commanding Officer, FMA
Via: ISIC (as appropriate)

Subj: FMA ASSESSMENT

Ref: (a) COMFLTFORCOMINST 4790.3; Joint Fleet Maintenance Manual
(b) Precepts letter

Encl: (1) FMA Assessment Findings
(2) FMA Assessment Project Summary

1. Per Volume IV, Chapter 2 of reference (a) and reference (b), an FMA Assessment was conducted onboard FMA (Name of assessed command), during the period (Dates of Assessment).

2. The Assessment Team reviewed selected areas as prescribed in reference (a) and their findings and comments are contained in enclosures (1) and (2). Any required corrective actions should be initiated in accordance with Volume IV, Chapter 2, paragraph 2.5.1 and 2.5.2 of reference (a).

3. Overall Observation: (A brief summary of the results of the assessment including an overall evaluation of satisfactory/unsatisfactory).

4. (Subsequent paragraphs should briefly comment on major areas of concern found during the assessment).

SAMPLE

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APPENDIX D

FMA ASSESSMENT DEFICIENCY FORMAT

( ) IMMEDIATE CORRECTIVE ACTION REQUIRED

ITEM:

AREA:

ASSESSOR:

DISCUSSED WITH:

FINDING:

REFERENCE:

DISCUSSION:

CORRECTIVE ACTION:

A. ROOT CAUSES:

B. TEMPORARY CORRECTIVE ACTION:

C. PERMANENT CORRECTIVE ACTION:

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VOLUME IV

CHAPTER 3

BOILER INSPECTION

REFERENCES.

(a) OPNAVINST 9221.1 - U.S. Navy Steam Generating Plant Inspection and Inspector Training and Certification Program
(b) NWP 1-03.1 - Naval Warfare Publication Operational Report
(c) NAVSEA S9086-GY-STM-010 - NSTM Chapter 221 (Boilers)
(d) NAVSEA S9086-CH-STM-030 - NSTM Chapter 074 Volume 3 (Gas Free Engineering)
(e) NAVSEA S9221-D2-MMA-010 - Steam Generating Plant Inspection (Non-Nuclear)
(f) NAVSEA S9086-GX-STM-020 - NSTM Chapter 220 Volume 2, (Boiler Water/Feedwater Test and Treatment)
(g) OPNAVINST 9220.2 - U.S. Navy Boiler Water and Feedwater Test and Treatment Program (Nuclear Excluded)
(h) OPNAVINST 4100.11 - Navy Energy Usage Reporting System (NEURS)
(i) COMLANTFLTINST/COMPACFLTINST 4100.3 - Navy Energy Usage Reporting System (NEURS)

LISTING OF APPENDICES.

A Summary of Boiler Inspection Scheduling and Responsibilities
B Sample Boiler Inspection Report Cover Letter
C Sample Boiler Inspections - RBO Deficiencies Message
D Water Jet Machine and Cleaning Guidelines
E Waterside Cleaning Waiver

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

3.1.1 Policy. Periodic standardized inspections are required of all non-nuclear propulsion, auxiliary and waste heat 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 Overhaul Inspection (PSOI)/Pre-start of Availability Inspection (PSAI).

c. Start of Overhaul Inspection (SOI)/Start of Availability Inspection (SAI).

d. Strength and Integrity Inspection.

e. Industrial Support Visit (ISV).

f. Completion of Overhaul Inspection (COI)/Completion of Availability Inspection (CAI).

g. Newly Constructed Acceptance Ship Inspection.

h. Inactivation or Reactivation Inspection.

i. Engineer Officer Inspection.

j. Major Repair Inspection.

k. Special Inspection.

3.3 RESPONSIBILITIES.

3.3.1 Naval Sea Systems Command. NAVSEA shall:

a. Provide the overall management of the SGPI and NSWCCD LCEM Inspector programs.

b. Ensure that periodic SGPI Seminars are conducted at alternating coast locations.

c. Ensure that periodic technical audits are performed at the SGPI Training Course per reference (a).

d. Identify those industrial activities/Supervising Authorities which have inspection responsibilities, maintain a base of certified NSWCCD LCEM Inspectors within those activities and ensure that each NSWCCD LCEM Inspector report is recorded in the Boiler Inspection and Repair Maintenance Information System (BIRMIS).

e. Maintain rosters of all certified SGPIs by name, rating, command and date of certification.

f. Ensure that certified SGPIs maintain current certifications per reference (a). Revoke the certification of those SGPIs failing to comply with the requirements of certification per reference (a).

g. Ensure that the requirements for SGPI certification, recertification and certification extensions are met prior to final approval.

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

a. Provide technical management of the SGPI and NSWCCD LCEM Inspector programs. Ensure that the required technical documentation to support the SGPI/NSWCCD LCEM Inspector programs are maintained current.

b. Establish and monitor the requirements and standards for routine and industrial inspections of shipboard 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. Issue the NSWCCD LCEM Inspector course training plan, course material and training aids for all activities authorized to conduct NSWCCD LCEM Inspector training.

g. Provide technical management of BIRMIS.

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. Review the guidelines and inspection requirements for all boiler inspections required by this instruction and ensure that each inspection report is recorded and updated in 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. Ensure the availability of "school ships" to support SGPI/NSWCCD LCEM Inspector training. Student certification must be conducted on "D" type boilers with Automatic Boiler Controls (ABC).

e. Ensure that the certification of SGPIs who fail to comply with the requirements of certification per reference (a) are suspended.

f. Ensure administration and control of the Type Commander (TYCOM) administered pre-test program.

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

h. Provide a qualified SGPI when requested by the ship, Immediate Superior in Command (ISIC) or TYCOM.

3.3.4 Type Commander. The TYCOM shall:

a. Provide certified SGPIs to perform inspections per section 3.6 of this chapter.

NOTE: COMSUBLANT/COMSUBPAC SGPIs ARE PROVIDED BY COMNAVSURFLANT/ COMNAVSURFPAC RESPECTIVELY.

b. Administer an SGPI pre-test for SGPI training school candidates per reference (a).

3.3.5 Regional Maintenance Center Support Group/Fleet Technical Support Center Maintenance Activity Commanding Officers. Regional Maintenance Center Support Group (RMCSG)/Fleet Technical Support Center Maintenance Activity (FTSCMA) 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 the RMCSGs in their respective geographic area of responsibility.

c. Assign inspections to available SGPIs from local commands.

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 RMCSG/FTSCMA or TYCOM (as applicable).

c. Arrange for the availability of an SGPI during the COI/CAI in coordination with NSWCCD and the cognizant RMCSG/FTSCMA or TYCOM (as applicable).

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. Ship Commanding Officers/Officers In Charge shall:

a. Request boiler inspections and recommend to the ISIC desired dates for accomplishment of the inspections.

b. Prepare for scheduled inspections.

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 (b).

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. Conduct boiler inspections as required by appropriate Planned Maintenance System (PMS) item.

3.3.8 Senior Inspector. Senior Inspectors shall:

a. Maintain applicable SGPI certifications per reference (a).

b. Perform steam generating plant inspections per section 3.9 of this chapter, when directed.

c. Submit reports per paragraph 3.7.2 of this chapter.

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.

3.4 INSPECTION SCHEDULING. Commands will initiate routine boiler inspection requests in a timely manner to assist with inspection scheduling coordination. Ensure the inspection scheduling complies with the following:

a. Commanding Officers/Officers In Charge of ships/craft shall request routine boiler inspections by letter or message via the chain of command.

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.

d. The TYCOM may utilize PSAIs/PSOIs and CAIs or COIs, which are documented in BIRMIS, to satisfy the pressure vessel portion of a routine boiler inspection to reduce the number of boiler openings.

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 (c). Where conflicts occur, an EOSS feedback form should be submitted for resolution.

b. Do not enter any part of a boiler until it has been fully ventilated and certified by a gas free engineer as safe for entry in accordance with reference (d).

c. Ensure the idle boiler is tagged out (valves wired shut and danger tagged). Observe two valve protection per Chapter 10 of this volume where applicable.

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).

e. Ensure all precautions cited in Section 2.24 of reference (c) are followed before entering an idle boiler.

f. There shall be an attendant outside the boiler entrance to provide assistance when work is being performed inside a boiler (steam drum, mud drum, firebox).

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.

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 (c) are observed. Water washing of firesides is not authorized without TYCOM and 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.

3.6 BOILER INSPECTIONS AND REQUIREMENTS. Main propulsion and auxiliary steam boiler inspections conducted per the requirements of this chapter shall fulfill all other requirements for comprehensive inspections of propulsion, auxiliary and waste heat boilers. Where practical, various boiler inspections should be scheduled for coincidental performance. Appendix A 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 Inter-Deployment Training Cycle 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. Type Commanders may approve extensions beyond 18 months for ships on extended deployment (four months or more) to permit inspection upon their return. Such 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. Ships in industrial availabilities or Fleet Maintenance Activity Availabilities (FMAV) which are required by reference (a) to complete a COI/CAI should conduct a Routine Inspection in conjunction with the COI/CAI.

a. The boiler inspection will be scheduled by the cognizant ISIC.

b. The boiler inspection will be performed by the cognizant TYCOM SGPI.

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

a. The PSOI/PSAI will be scheduled by the ISIC, as approved by the cognizant TYCOM.

b. The PSOI/PSAI will be performed by the NSWCCD LCEM Inspector and the TYCOM SGPI.

3.6.3 Start of Overhaul/Availability Inspection. The SOI/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 SOI/SAI will be scheduled by the ISIC, as approved by the cognizant TYCOM.

b. The SOI/SAI will be performed by the NSWCCD LCEM Inspector and the TYCOM 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. Strength and Integrity Inspections **shall not** exceed 72 months since the last 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 TYCOM 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 TYCOM SGPI.

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

a. The COI/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 COI/CAI will be performed by an NSWCCD LCEM Inspector and the cognizant TYCOM SGPI.

3.6.7 Newly Constructed Ship Acceptance Inspection. The Newly Constructed Ship Acceptance Inspection shall be accomplished in conjunction with INSURV Acceptance Trials. This inspection starts the Routine Inspection requirements.

a. The Acceptance Inspection will be scheduled by the industrial activity or Supervising Authority as applicable.

b. The Acceptance Inspection will be performed by an NSWCCD LCEM Inspector and the cognizant TYCOM SGPI.

3.6.8 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 TYCOM SGPI.

3.6.9 Engineer Officer Inspection. The Engineer Officer Inspection shall be conducted per PMS and reference (c), and 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.

3.6.10 Major Repair Inspection. An inspection shall be conducted subsequent to major repairs as a result of chemical and/or mechanical casualty per the requirements of reference (c). This inspection is scheduled by the ISIC in coordination with the TYCOM and the RMCSG and performed by an NSWCCD LCEM Inspector and the cognizant TYCOM SGPI.

3.6.11 Special Inspection. Additional boiler inspection conducted when the TYCOM desires to assess the material condition of the boilers.

3.7 BOILER INSPECTION GUIDELINES AND REPORTS.

3.7.1 Guidelines.

a. Inspections conducted under paragraph 3.6.4 of this chapter normally encompass only the pressure vessel portion of the boiler and are conducted by NSWCCD LCEM Inspectors. Other areas, such as boiler water chemistry, ABCs, and boiler appurtenances, must be inspected as part of a Routine Inspection prior to boiler light-off by a certified SGPI, combined with the appropriate BIRMIS input.

b. Routine Inspections of boilers will be conducted by certified SGPIs.

c. All Repair Before Operating (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.

d. Whenever boilers are in a stand down status for routine maintenance or disassembly, an inspection should be conducted simultaneously. Prepare the boiler as described in section 3.8 of this chapter for inspection of the boiler firesides and watersides, ABCs, and boiler appurtenances. Boiler records and boiler/feedwater chemistry control for at least the past three months will be reviewed. Allow adequate time to prepare for these inspections.

e. All deficiencies should be corrected as soon as possible, consistent with good engineering practices.

3.7.2 Reports.

a. The SGPI shall provide the ship's Commanding Officer the results of the boiler inspection using specified forms with a cover letter per the sample shown in Appendix B of this chapter. The Senior Inspector will forward a copy to the TYCOM, ISIC, RMCSG/FTSCMA and NSWCCD no later than ten days after completion of the inspection for inclusion in the BIRMIS database.

b. The ship's Commanding Officer shall report RBO deficiencies discovered during the inspection to the TYCOM by message within 24 hours, using the message format of Appendix C of this chapter.

c. The ship's Commanding Officer shall submit a proposed Plan of Actions and Milestones for deficiency correction for TYCOM approval.

d. The ship's Commanding Officer shall report by message to the ISIC and TYCOM the correction and re-inspection of all RBO deficiencies prior to lighting off an inspected boiler.

e. The ship's Commanding Officer shall report corrected deficiencies, by message, to the ISIC and TYCOM within 30 days of the completed inspection, and at 90 day intervals thereafter until all deficiencies are corrected or deferred to a Chief of Naval Operations (CNO) Maintenance Availability. The TYCOM is the sole authority for deferral of deficiencies. Update messages shall list the BIRMIS item 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.

f. The ship's Commanding Officer will send a letter to the ISIC/TYCOM within 30 days of the inspection, with information copies to the RMCSG/FTSCMA and NSWCCD, stating that all corrective actions have been completed or that corrective action has been initiated. This letter will include:

(1) Boiler Identification.

(2) Inspection Date.

(3) Name of SGPI and/or NSWCCD LCEM Inspector.

(4) List of Discrepancies.

(5) Estimated Completion Dates for each discrepancy.

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 waiver request. State the reason why the inspection cannot be conducted and recommend a revised date.

3.8 BOILER INSPECTION PREPARATION.

a. Demonstrate the performance of the controls for auxiliary boilers having electromagnetic control devices to the SGPI assigned to conduct the inspection. Conduct this demonstration before disassembling the boiler for inspection.

b. Remove all boiler inspection panels and doors, open uptakes and smoke pipe, and notify the SGPI that the boiler watersides are available for inspection. The purpose of this inspection is to assess the effectiveness of the boiler water chemistry control procedures, including the identification of any signs of dissolved oxygen attack. Detailed waterside inspection will be conducted after completion of cleaning if determined by the inspector that a cleaning is necessary. Mechanically clean waterside surfaces to be inspected. Water jet cleaning is the preferred method. Appendix D of this chapter provides training information and restrictions for water jet cleaning. Appendix E of this chapter provides requirements for a waterside cleaning waiver.

c. Remove internal fittings from the steam drum. Open all manhole plates in steam and water drum. Remove all handhole plates from each header to permit inspection of the handhole seating surfaces and interior surfaces of the headers. Remove two handhole plates from each inlet and outlet economizer header, where applicable. Compressed air should be used to dry out such places as economizers and superheaters. Make sure that water does not stand in any portion of the boiler.

d. Keep air passages, including the air box beneath the boiler and uptake spaces, clean and dry.

e. Wire shut and danger tag all steam and water valves to the boiler per the ship's tag-out instruction.

f. On boilers with de-superheaters, remove the de-superheaters for inspection.

g. The ship's Engineer Officer shall conduct an inspection with the leading Boiler Technician Machinist Mate, using the applicable boiler inspection report forms found in reference (e).

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 and hull structural members beneath the boiler.

3.9.2 Boiler Inspection Areas. The following areas are closely inspected for possible RBO discrepancies. RBO discrepancies may include but are not limited to the following:

a. Active oxygen attacking the boiler watersides.

b. Hard scale in excess of 0.005" (600 psi boilers).

c. Baked sludge in excess of 0.005" (600 psi boilers).

d. Lube oil contamination of watersides.

e. Inoperative/misadjusted safety devices.

f. Refractory deterioration which allows heat penetration to casings or leads to improper combustion.

g. Improper treatment and care of boiler water. If a discrepancy exists between the data found in the boiler record sheet and the actual condition of the boiler watersides, the latter takes precedence in the grade assignment. Example: Good records displayed but active oxygen attack is present in boiler.

h. Excessively fouled firesides.

i. Frozen sliding feet.

j. Deteriorated boiler and hull structural members in the air casing beneath the boiler. This includes the boiler skirt plates and designed penetrations that are defective, allowing entry of bilge water into this area.

k. Lack of maintenance and preservation of the boiler, resulting in deterioration and weakening of boiler and hull structural members.

l. Lube oil contamination of ABC Systems.

m. Fire hazards (fuel/lube oil in the bilge, flange shields not installed per current directives), or other fire hazards.

n. ABC equipment inoperable in their automatic mode or failed cold checks.

o. Steam smothering system inoperable (plugged nozzles, deteriorated or improperly installed piping).

p. Deteriorated boiler smoke pipe and/or uptakes.

q. Hard fireside deposit build-up on the water drum.

r. Incorrectly adjusted burners or inoperative air registers.

s. Boiler that does not pass design hydrostatic test.

t. Deteriorated inner or outer casings.

u. Missing or incorrectly installed fasteners, clamps, or fittings.

v. Auxiliary boilers having non-functional or misadjusted automatic control devices.

w. Non-deferrable defects/indications in the pressure vessel boundary.

x. Defective tubes such as blistered, excessively warped or married tubes which prevent proper gas passage.

y. Fuel oil contamination of watersides.

z. Fuel leakage and/or fire hazard conditions in the fireroom.

aa. Ultrasonic test results on soot blower heads or pressure vessel piping that are below minimum requirements or out of periodicity.

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 ALIGNMENT VERIFICATION GUIDELINES.

a. ABC Systems, which include Automatic Combustion Controls, Boiler Feedwater Level Controls, and Automatic Feed Pump 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 watchstanders 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 in steam main propulsion plant type ships:

(1) Ships equipped with ABCs 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.

(3) Prior to boiler light off, all ABCs shall be tested in accordance with EOSS.

(4) Maintenance and calibration of the ABC Systems shall only be accomplished by qualified technicians in accordance with the direction provided in applicable PMS, reference (c) 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 or III are considered safe to steam and safe for the conduct of Engineering Casualty Control Exercises. Boilers which can not 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 (b).

3.12 SYSTEM CERTIFICATION REQUIREMENTS. Certain systems such as main propulsion steam generating plant (non-nuclear), 1200 PSI and 600 PSI steam propulsion plants, make up feedwater demineralizing systems and morpholine treatment systems have certification requirements imposed by directives, letters, messages and policy. A listing of those systems requiring certification are identified in reference (f).

3.13 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 (g).

3.14 OPERATING AND CASUALTY PROCEDURES. Each ship or craft with conventional 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 and immediate and supplementary actions.

e. Propulsion fuel economy per references (h) and (i).

f. JP-5 for use as boiler fuel.

g. Management of boiler water and feedwater.

h. Quality Assurance (QA) requirements for main propulsion boiler repairs.

i. Maintenance and storage of boiler burner atomizers.

APPENDIX A

SUMMARY OF BOILER INSPECTION SCHEDULING AND RESPONSIBILITIES

Type Inspection	Schedule Date	Scheduling Responsibility	Responsibility for Inspections
1. Routine*	Once every Inter-Deployment Training Cycle	ISIC	TYCOM SGPI
2. Pre-Start of Overhaul/ Availability Inspection	Schedule PSOI/PSAI in conjunction with Routine boiler appraisal 8-12 months prior to availability	ISIC	NSWCCD LCEM INSPECTOR and TYCOM SGPI
3. Start of Overhaul/Availability Inspection	At start of overhaul/with strength and integrity inspection	Naval Shipyard or Supervisor of Shipbuilding	NSWCCD LCEM INSPECTOR and TYCOM SGPI
4. Strength and Integrity Inspection	Once every 60 Months	ISIC (Coordinate with TYCOM, Regional Support Group (RSG))	NSWCCD LCEM INSPECTOR and TYCOM SGPI
5. ISV**	During availability	Industrial Activity or Supervising Authority	NSWCCD LCEM INSPECTOR and TYCOM SGPI
6. COI/CAI	To be conducted before reassembling boiler for final hydrostatic test	Industrial Activity or Supervising Authority	NSWCCD LCEM INSPECTOR and TYCOM SGPI
7. Newly Constructed Ship Acceptance	In conjunction with INSURV during Acceptance Trials; starts Routine Inspection requirements	Industrial Activity or Supervising Authority	NSWCCD LCEM INSPECTOR and TYCOM SGPI
8. Inactivation or Reactivation	Prior to final action	Industrial Activity, Supervising Authority or Inactive Ship Facility	NSWCCD LCEM INSPECTOR and TYCOM SGPI
9. Engineer Officer	Per PMS and reference (c)	Engineer Officer	Engineer Officer
10. Major Repair	Subsequent to major repairs following chemical and/or mechanical casualty per reference (c)	ISIC (Coordinate with TYCOM, RSG)	NSWCCD LCEM INSPECTOR and TYCOM SGPI
11. Special	When TYCOM desires to asses material condition of boilers	TYCOM	TYCOM SGPI

*Routine boiler inspections are performed by the TYCOM SGPI.
**The ISV inspection may be waived by the TYCOM for availabilities of short duration.

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APPENDIX B

SAMPLE BOILER INSPECTION REPORT COVER LETTER

From: Commander, U.S. (Atlantic/Pacific) Fleet
To: Commanding Officer, USS (Ship's Name and Hull No.)

Subj: (Routine, etc.) INSPECTION OF BOILER(S) NUMBER (1A, 1B, 2A, etc.) AND REVIEW OF BOILER WATER/FEEDWATER TEST AND TREATMENT IN USS (Ship's Name and Hull No.)

Ref: (a) COMFLTFORCOMINST 4790.3; Joint Fleet Maintenance Manual

Encl: (1) (TYCOM) Boiler Inspection Report of Boiler(s) Number (1A, 1B, 2A, etc.) and Report of (TYCOM) Inspection of Boiler Water/Feedwater Testing and Treatment Procedures

1. (Parent Command) Steam Generating Plant Inspector, (Inspector's Name) inspected Boiler(s) Number (1A, 1B, 2A, etc.) in USS (Ship's Name and Hull No.) on (Day, Month, Year).

2. Discrepancies which require corrective action are outlined in enclosure (1). All items listed in the Corrective Action Required Message which have been assigned as RBO items must be corrected and reinspected before steam generating plant light-off. Send deficiency corrective action letter in accordance with Volume IV, Chapter 3 of reference (a).

3. The Boiler Inspector reviewed Boiler Water/Feedwater Testing and Treatment procedures and found them to be (Sat/Unsat).

4. Boiler(s) Number (1A, 1B, 2A, etc.) has been inspected and found to be in a (Safe to Steam/Unsafe to Steam) condition as noted in BIRMIS.

5. Automatic combustion controls have been inspected and found (Sat/Unsat). Enclosure (1) notes conditions which require corrective action.

6. Advance copies of enclosure (1) have been delivered to the ship's Commanding Officer.

Copy to: (as appropriate)
TYCOM RMCSG
TYCOM (N434)
ISIC
FTSCMA
NSWCCD (Code 022E)

SAMPLE

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APPENDIX C

SAMPLE BOILER INSPECTION - RBO DEFICIENCIES MESSAGE

FM USS (SHIP'S NAME AND HULL NO.)//
TO TYCOM//(AS APPROPRIATE)
INFO ISIC//(AS APPROPRIATE)
NSWCCD//
RMCSG/FTSCMA// (AS APPROPRIATE)
BT
UNCLAS //N09221//
MSGID/GENADMIN/USS (SHIP'S NAME AND HULL NO.)//
SUBJ/USS (SHIP'S NAME AND HULL NO.) NR (1A, 1B, 2A, ETC.) ROUTINE BOILER INSPECTION//
REF/A/DOC/COMFLTFORCOMINST 4790.3//
REF/B/DOC/OPNAVINST 4790.4//
NARR/REF A IS JOINT FLEET MAINTENANCE MANUAL VOL IV PT I CH 5 AND PROVIDES GUIDANCE FOR BOILER INSPECTIONS. REF B IS 3-M MANUAL AND PROVIDES DIRECTION FOR CSMP DOCUMENTATION//
RMKS/1. BOILER NUMBER (1A, 1B, 2A, ETC.) ROUTINE INSPECTION CONDUCTED (DATE) BY (INSPECTOR'S NAME). RBO DEFICIENCIES AND PROPOSED CORRECTIVE ACTION ARE REPORTED IAW REF A AS FOLLOWS:

A. (BIRMIS ITEM NO, DEFICIENCY, REPAIR, ETC.)
B.
C.

2. BOILER NUMBER (1A, 1B, 2A, ETC.) SHALL NOT BE STEAMED UNTIL ABOVE LISTED DEFICIENCIES ARE CORRECTED AND A REINSPECTION IS CONDUCTED IAW REF A.
3. IAW REF A DEFICIENCIES COMPLETED SHALL BE REPORTED EVERY 30 DAYS REPORTING ONLY THE BIRMIS ITEM NUMBER COMPLETED. ALL DEFICIENCIES HAVE BEEN DOCUMENTED IN THE SHIPS CSMP FOR CORRECTIVE ACTION IAW REF B//
BT

NOTE: ENSURE MESSAGES ARE IN ACCORDANCE WITH NTP-3 FORMAT AND CURRENT PLAIN LANGUAGE ADDRESS DIRECTORY (PLAD) IS UTILIZED.

SAMPLE

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APPENDIX D

WATER JET MACHINE AND CLEANING GUIDELINES

1. The primary use of the water jet machine is boiler waterside cleaning. The machine may also be utilized for cleaning Sewage Collection, Holding, and Transfer (CHT) system piping. The Boiler Division will maintain responsibility for maintenance, repair and operator training on all CV's. These responsibilities may be transferred to the Repair Division on those CV's utilizing Ethylene Diamine Tetraacetate (EDTA)/Hydrazine boiler water chemistry treatment systems. On CVN's, the Repair Division will maintain these responsibilities. When using water jet machines for boiler cleaning, operators shall use water jet waste water recycling units.

2. Due to the high pressures involved, water jet machines shall be operated only by certified operators who are graduates of a water jet operator certification course. Quotas for training to certify machine operators are available through NSWCCD, info COMNAVSURFLANT (N43) or through Shore Intermediate Maintenance Activity San Diego, CA, info COMNAVSURFPAC (N43), COMNAVAIRPAC (N432).

3. Water jet machines shall be placed out of commission when any of the installed safety devices become inoperative. When a water jet machine is out of commission for more than 24 hours, the status shall be reported utilizing the CASREP procedures of reference (b). The decision to override normal safety precautions and operate water jet machines with inoperative installed safety devices shall rest with the Commanding Officer/Officer In Charge and shall be reported to the TYCOM by message.

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APPENDIX E

WATERSIDE CLEANING WAIVER

1. Emergent operational commitments may prevent inspection and cleaning of boiler watersides at the required intervals. When this situation cannot be avoided the ship must submit a waiver request to the TYCOM containing the following:

a. Number of waterside hours currently accumulated.

b. Anticipated waterside hours at time of the next cleaning.

c. Detailed description of any occasion in which the boiler has been steamed while out of chemical limits since the last waterside cleaning, including the duration and the maximum or minimum chemical readings observed.

d. Detailed description of any boiler tube problems experienced since the last waterside cleaning.

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VOLUME IV

CHAPTER 4

DIESEL ENGINES

REFERENCES.

(a) OPNAVINST 9233.1 - U.S. Navy Diesel Inspection and Inspector Training and 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) NWP 1-03.1 – Naval Warfare Publication Operational Report
(d) OPNAVINST 4790.4 - Ships' Maintenance and Material Management (3-M) Manual
(e) NAVSEA S9086-HB-STM-010 - NSTM Chapter 233 (Diesel Engines)
(f) NAVSEA S9086-H7-STM-010 - NSTM Chapter 262 (Lubricating Oil)
(g) NAVSEA S9086-GX-STM-020 - NSTM Chapter 220, V2 (Water Treatment)

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. Diesel Engine Inspector (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 Type Commander (TYCOM), if applicable, who will forward to the appropriate Fleet Technical Support Center (FTSC) their endorsement. 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. The FTSC will review the request and appropriate endorsements and forward an endorsement to the Program Manager to initiate the process of assigning the 4314 NEC. Initial qualification to perform diesel inspections will be for a period of 36 months.

c. 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.d of this chapter.

d. 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.

e. 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.d. of this chapter are met. To extend qualification, the DEI must:

(1) Submit a letter 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.

(2) Extension requests must be submitted to the Program Manager with a copy to FTSC, via the inspector's chain of command. The TYCOM may require endorsement on these extension requests.

f. Revoking Certification. If an inspector has not maintained the qualification requirements of paragraph 4.2. of this chapter, the FTSC may submit a request to the Program Manager to have the DEI NEC4314, removed from the inspector. The TYCOM may require endorsement on this action.

g. 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 with a copy to the FTSC. 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.

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. 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.

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 TYCOM may require that a specific DEI make these determinations. 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) will be 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 during the overhaul/repair. If there is evidence of poor workmanship, use of improper parts, discrepancies in reassembly/test documentation or missing information, the DEI will request from the ISIC/TYCOM/Regional Maintenance Coordinator (RMC) that the engine be opened for internal inspection. The ISIC/TYCOM/RMC will coordinate with the Supervising Authority to determine what actions are to be taken before the Post Overhaul/Repair Inspection is complete.

(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 should occur prior to delivery. The cognizant Supervisor of Shipbuilding should incorporate the DEI as part of the Government Test Plan/Acceptance Plan. The cognizant Supervisor of Shipbuilding should notify the DEI for new construction acceptance test prior to Ship's Force accepting responsibility of the diesel

engine. If not, the first Routine Inspection shall be accomplished prior to the Post Shakedown Availability. This will ensure that an inspection baseline is established and construction discrepancies are identified/corrected early in the life of the unit.

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 FTSC, via ISIC/TYCOM when appropriate, in accordance with reference (a) and the Planned Maintenance System (PMS). As part of this process, ships shall submit a work request (OPNAV 4790/2K) to the appropriate RMC a minimum of 45 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 RMC Port Engineers, as appropriate) to schedule the diesel inspection with FTSC 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. Sufficient time must be allowed for the performance of the operational phase of the inspection which requires specific load testing as defined by PMS. Ship's Service Diesel Generators normally have the operational phase performed inport, whereas Main Propulsion Diesel Engines (MPDE) require the ship to be underway for a minimum of one day. Ships 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 Inter Deployment Training Cycle underway schedule.

c. A Diesel Inspection shall be accomplished by a TYCOM/FTSC DEI. It is encouraged that a DEI assigned to the ship being inspected be part of this inspection.

4.3.3.1 Inspection Deferrals. With the flexibility to schedule a diesel inspection within a 24 month period, and in accordance with reference (a), requests to delay or cancel required inspections shall not be granted. It is therefore critical to ensuring the proper operation and maintenance of the diesel that the Ship and the Fleet Maintenance Managers schedule the diesel inspection/assessment with the appropriate FTSC well in advance of the 24 month date since the last inspection.

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:

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% 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. 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 Minor discrepancies concurrent with the inspection. Major discrepancies or those 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.

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 are available for use during the inspection.

(7) Ensure that all applicable MRCs 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.

4.3.6 Inspection Findings The inspection will report "as found" conditions.

4.3.6.1 Repair Before Operating. This finding is made when conditions indicate that continued operation could result in danger to personnel and/or serious damage to the engine or associated equipment. The engine may not be operated until the Repairs Before Operating (RBO) discrepancy(s) are corrected and the engine is re-inspected. The re-inspection need only include the affected area or condition. In accordance to references (a) and (b), an RBO finding is mandatory if any of the following discrepancies is found:

NOTE: THE BELOW LISTED ITEMS ARE NOT TO BE CONSIDERED AN ALL INCLUSIVE LISTING OF RBO DISCREPANCIES.

a. Malfunctioning overspeed governor or trip.

b. Inoperative alarms or safety devices.

c. All local stopping or any safety-securing devices are inoperative.

d. Readings exceeding the limits of PMS or the manufacturer's specifications which in the judgment of the DEI are unsafe.

e. Excessive fuel leaks.

f. Lube oil fuel dilution (five percent or greater) and/or lube oil unfit for further use.

g. Lube oil pressure below specification.

h. Uncontrollable oil leaks.

4.3.6.2 Major Deficiency. This finding is made when major problems exist, but the engine is still operable with restrictions. Any deficiency that has been noted as major shall require either immediate correction within 30 days of discovery or, if the major deficiency cannot be corrected within this 30 day period (due to parts delay, more cost effective to correct during an upcoming availability, etc.), a TYCOM approved DFS. This requirement does not alter the normal Casualty 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.

4.4 REPORTING REQUIREMENTS.

a. Casualty Reporting.

(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 (c) 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 Emergency Diesel Generators. Report emergency diesel generator 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 inspection.

(2) All maintenance actions and parts usage as the result of the inspection/assessment are properly documented in accordance with reference (d).

(3) Send a Corrective Actions Letter listing the status of all deficiencies 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. Forward these letters to the appropriate TYCOM via the ISIC with copies to the appropriate Fleet Maintenance Managers and Fleet Technical Support Center. The letter must contain the engine number, date of inspection, type of inspection conducted, and the status of deficiencies not previously reported as corrected. All deficiencies not corrected during or immediately after the inspection must have a JCN assigned and be listed in the letter. The ISIC/Fleet Maintenance Managers shall ensure that the deficiencies listed in the inspection/assessment report are corrected at the earliest opportunity in the ship's maintenance cycle.

c. The DEI shall:

(1) Make a verbal report to the ship's Commanding Officer or his designated representative upon completion of the inspection. The verbal report should discuss the findings of the inspection/assessment, with special note of recurring discrepancies from previous inspections/assessments. In addition, the DEI shall provide a draft copy of the inspection report at this time.

(2) Prepare the inspection report in accordance with reference (b) within 30 days following completion of the inspection. Report should be complete enough for Fleet Maintenance Managers and the ship to determine the as found condition of the engine, what was accomplished during the inspection/assessment to correct any discrepancies and what recommended actions are required to correct outstanding discrepancies.

(3) Utilize the Diesel Inspection Management Information System in the report preparation once it is operational.

d. The FTSC shall forward the inspection report to the Commanding Officer of the inspected ship, with information copies to the ISIC, TYCOM, Fleet Maintenance Managers and In Service Engineering Agent.

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

a. Per reference (e), the light loading of a diesel engine (less than 60%) 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% 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.

b. Per reference (f), 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 (g) and PMS, diesel engine jacket water treatment must be tested and maintained to ensure proper corrosion control and freeze protection, as applicable.

d. Engine Operation Hours since Overhaul and Engine Operating Hours since Commissioning shall be kept for all MPDEs, Ship's Service Diesel Generators, and EDGs. Engine Operating Hours since Overhaul is zeroed only when the engine is overhauled. An overhaul typically includes rebuilding/replacing, as sets to new criteria, cylinder heads, piston rings, liners, main and connecting rod bearings. If one of these sets is not rebuilt/replaced, the repair is generally not considered an overhaul. For example, a "top end overhaul" (replacing/rebuilding just cylinder

heads) and replacing piston rings/cylinder liners is not considered an engine overhaul (main bearings not replaced), and the Engine Operating Hours since Overhaul is not zeroed. Due to the large variety of engine configurations, a definitive description of what constitutes an engine overhaul for every engine is not possible. A certified DEI shall make the final determination of an engine overhaul for a particular engine.

4.6 COMPLIANCE.

a. All ships 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 since last engine overhaul.

(5) Diesel operating and maintenance documents, including Engineering Organization 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 Correction Action Letters.

(8) Fuel Oil Quality Management records.

(9) Diesel Engine Technical Manuals.

(10) References (e), (f) and (g).

(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) and (e) through (g). 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 Integrated Maintenance and Modernization Planning Maintenance Requirement, and/or Maintenance Requirements for continued Unrestricted Operation.

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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 Volume 3 (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 ship 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 ships, 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. All Fleet Maintenance Activities are capable of accomplishing repair and overhaul of all MSD components on a ship-to-shop basis. When components are delivered to the Fleet Maintenance Activity, their cleanliness will be certified in writing by the delivering ship's Medical Department representative.

b. Hydroblast Cleaning. The only authorized MSD pipe cleaning process is hydroblast cleaning. Request hydroblast cleaning for the removal of hard deposits which cannot be removed by ordinary shipboard means.

(1) Due to the extreme hazards involved in working with MSD systems, a high level of supervisory attention must be applied to all evolutions which require opening the system. An agreement on the procedures to be used by the Fleet Maintenance Activity and Ship's Force shall be established by a locally prepared Memorandum Of Agreement which describes all aspects of the operation.

(2) Disposal of hydroblast 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.

c. Acid Cleaning. Pipe sections which can be removed from the system may be acid cleaned using the procedures of reference (c).

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 5 of this manual.

5.6 TRAINING.

a. Training courses in the maintenance and operation of MSD systems are offered by Fleet Training Centers 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.

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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_2-N_2) producing storage and transfer systems are installed onboard all Aircraft Carriers, Submarine Tenders and other surface 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_2-N_2 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_2-N_2 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_2-N_2 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_2-N_2 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_2-N_2 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_2-N_2 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_2-N_2 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., CFC's and HCFC's) 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.

d. Personnel who perform maintenance or repairs to equipment that utilize ozone depleting substances, are required to successfully pass an Environmental Protection Agency approved technician certification test and be licensed before any commencement of work begins.

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VOLUME IV

CHAPTER 7

ACCOUNTABILITY AND CERTIFICATION OF NUCLEAR PROPULSION PLANT TEST AND SUPPORT EQUIPMENT

REFERENCES.

(a) NAVSEA 0989-LP-031-4000 - Reactor Instrumentation and Control Equipment Maintenance
(b) NAVSEA 0989-LP-064-3000 - Cleanliness Requirements for Nuclear Propulsion Plant Maintenance by Forces Afloat

LISTING OF APPENDICES.

A Nuclear Test Equipment Check-Out/Check-In Form
B Nuclear Support and Test Equipment Certification Record

7.1 PURPOSE. To promulgate requirements for the certification and accountability of Nuclear Propulsion Plant Test and Support Equipment as required by the applicable Reactor Plant Manual (RPM) and reference (a). Nuclear Propulsion Plant Test and Support Equipment is commonly referred to as Nuclear Test Equipment (NTE).

7.1.1 Discussion. NTE specified by the applicable RPM and reference (a) to support planned and corrective maintenance of Nuclear Propulsion Plant systems must be carefully controlled. Maintaining accountability and certifying accuracy, operability, and reliability per the most current Field Changes and technical specifications is an essential element of reactor safety. The basic elements of the NTE program are certification and verification.

a. Certification is the detailed technical evaluation of the equipment to conclude that the item conforms to the required specification. Certification is conducted prior to initial issue and after any event that invalidates the certification, such as repair, Field Change installation or a revision to the equipment reference drawing/figure and is recorded on a NTE Certification Record. Equipment will normally be maintained in a Ready for Issue, certified condition, requiring verification prior to each issue.

b. Verification is the validation that the equipment is certified based on a review of records and is in a physically acceptable condition for issue and use. Verification is conducted prior to each issue and is recorded on a NTE Check-out/Check-in Form contained in Appendix A of this chapter.

7.2 NUCLEAR TEST EQUIPMENT CATEGORIES. For purposes of this chapter, NTE is divided into three categories.

a. General Purpose Electronic Test Equipment.

b. Electronic/Electrical Test Equipment, non-General Purpose Electronic Test Equipment (e.g., switchboard test equipment, scram breaker time response equipment, etc.).

c. Mechanical Test Equipment.

7.3 ACTION. The Repair Officer shall implement the requirements of this chapter. The Nuclear Repair Officer is designated as the custodian of NTE and shall ensure that assigned personnel carry out the requirements of this chapter.

7.4 PROCUREMENT. Only test equipment meeting the specifications of the applicable RPM and reference (a) may be used to conduct testing on Nuclear Propulsion Plant Systems. Requisitions for new equipment shall contain sufficient detail to ensure the correct item is purchased. Allowance Equipage Lists for required NTE are provided in the tender Coordinated Shipboard Allowance List or Q-Coordinated Shipboard Allowance List. The requirements for General Purpose Electronic Test Equipment to support nuclear electrical/electronics testing are contained in the applicable Ship's Portable Electronic Test Equipment Requirements List.

7.5 NUCLEAR TEST EQUIPMENT CERTIFICATION. NTE shall be certified using a Formal Work Package (FWP) for Electronic/Electrical Test Equipment and a Controlled Work Package (CWP) for Mechanical Test Equipment. Certification is required for new equipment prior to initial issue and following repairs or modifications which could impact performance. Periodic recertification is not required. The FWP/CWP should be as simple as possible. As a minimum, the FWP/CWP shall provide the exact equipment reference and indicate the attributes that must be verified and the required testing. Recertification following repair shall be a step in the repair FWP/CWP. Certification shall be documented on NTE Certification Records and is discussed in detail in paragraph 7.5.4 of this chapter. Certification shall be accomplished per paragraph 7.5.1 or 7.5.2 of this chapter. The ultimate objective is to demonstrate that the NTE available for Nuclear Propulsion Plant application is technically correct.

7.5.1 Electronic/Electrical Test Equipment. The FWP shall require completing and retaining an NTE Certification Record.

a. To certify new or existing measuring and recording equipment, such as a Visicorder or strip chart recorder, verify that the specifications given in the equipment technical manual match the specifications required by the applicable RPM, reference (a), or applicable test reference.

b. To certify repaired or re-calibrated measuring and recording equipment, the repair and/or calibration activity shall certify that the item still conforms to the original technical specifications and is properly calibrated (as evidenced by a calibration sticker). The Fleet Maintenance Activity Work Center performing the repair/calibration shall complete the NTE Certification Record. If the repair/calibration was not performed by the Fleet Maintenance Activity, Nuclear Repair shall certify the equipment. Work orders for repair shall require conformance to referenced drawings and figures.

c. To certify other existing electrical test equipment not previously certified, such as switch boxes, jumper boxes, cables, Under Voltage/Under Frequency test boxes, etc., each component and the wiring configuration shall be compared to the referenced drawing for correctness.

d. To certify other new electrical test equipment verify the test equipment as correct with respect to what was ordered and the nameplate data or other markings compared to the equipment requirements of the RPM, reference (a), or referenced test procedure.

7.5.2 Mechanical Test Equipment.

a. To certify existing or newly manufactured mechanical test equipment, the CWP that manufactures the test equipment shall include steps to verify that the material specifications and configuration match the equipment reference. The CWP shall also include all required testing.

b. To certify purchased mechanical test equipment, the CWP shall include steps to verify the equipment as correct with respect to what was ordered, compare the equipment to the requirements of the RPM, reference (a) and or referenced test procedure and shall also specify any testing that may be required prior to use.

7.5.3 Recertification Following Reference Revision. To certify existing equipment after a revision to the equipment configuration reference, take the actions necessary for the NTE to conform to the revision and complete an NTE Certification Record for recertification. The FWP for Electronic/Electrical Test Equipment and a CWP for Mechanical Test Equipment used to accomplish the equipment changes will specify recertification. A new NTE Certification Record will be generated regardless of whether or not the equipment required modification. The new certification record will serve to update the applicable revision and will provide evidence that the NTE was in fact validated to the correct revision.

7.5.4 Certification Documentation. The FWP or CWP shall contain a NTE Certification Record. The minimum attributes are shown in Appendix B of this chapter.

a. The Certification Record page (current and superseded) shall be retained by the Nuclear Repair Officer for the life of the equipment. This record shall be available for review by personnel checking out equipment.

b. The active revision/advance change notice level of the reference to which the equipment was built shall be specific enough to allow verification of the effects of future reference revisions. For example, while the RPM or reference (a) may be at revision 480, a figure showing test equipment details may be revision 453. The reference should be stated as the exact figure number and 453 should be recorded as the revision level.

c. Existing records that contain proper certification data are acceptable and need not be replaced.

7.6 ACCOUNTABILITY.

a. Electrical and electronic test equipment shall be fitted with tamper resistant seals where unauthorized access to calibration settings or internal components may invalidate certification.

b. Requests for test equipment are normally made using an OPNAV 4790/2L form and identifying the appropriate Master Job Catalog routine Job Sequence Number. The OPNAV 4790/2L form requesting the test equipment must be specific with respect to the fittings or other associated components required in addition to the specific piece of test equipment. For hydrostatic test equipment, sufficient information must be provided to complete the check list requirements of Volume IV, Chapter 9 of this manual.

c. Equipment should be issued for a specified period and delinquent equipment recovered as soon as possible.

d. Activities receiving NTE must be briefed that only the issuing activity is authorized to repair NTE and that tampering will invalidate certification.

e. Equipment Check-out/Check-in Forms will, as a minimum, contain the attributes contained in Appendix A of this chapter.

f. Verification that the equipment is in accordance with the current revision of the controlling reference shall be accomplished by:

(1) Review of the NTE Certification Record prepared in accordance with Section 7.5 of this chapter above to demonstrate that the item has been certified.

(2) Compare the revision level stated on the NTE Certification Record to the current revision of the reference.

g. When equipment is returned, those items of the issue and receipt procedure necessary to determine the condition of the equipment shall be repeated. This will ensure that equipment requiring repair is identified in a timely manner. A check-in operational test need not be performed in every case, but would be appropriate if visible physical conditions indicate possible damage affecting operability.

7.6.1 Lost/Damaged Test Equipment. Lost/damaged test equipment must be repaired or replaced in a timely manner. Equipment requiring repair will be entered in the Equipment Deficiency Log, assigned a Job Sequence Number and entered in the Current Ship's Maintenance Project. Out-Of-Commission equipment that results in an inability to provide necessary test equipment for reactor plant testing shall be given high repair priority. Maintenance of NTE will only be accomplished by the issuing activity.

7.6.2 Cleanliness and Foreign Material Exclusion. Mechanical Test Equipment/Assemblies attached to Nuclear Propulsion Plant Systems must meet the requirements for cleanliness control and foreign material exclusion specified by reference (b). Verification of cleanliness will be incorporated into check-out/check-in forms and into FWPs and CWPs.

7.6.3 Stowage. NTE shall be stowed in a location segregated from non-NTE. Ready For Issue equipment will be stowed apart from non-Ready For Issue equipment. Segregated stowage shall be such that it precludes inadvertent mixing of equipments.

7.6.4 Inventory. NTE will be inventoried at least annually. A record of the most recent inventory will be retained by the Nuclear Repair Officer.

APPENDIX A

NUCLEAR TEST EQUIPMENT
CHECK-OUT/CHECK-IN FORM

Receiving Activity: _____Date _____

Lending Activity: _____

1. **Equipment description and serial numbers.** Include all individual components. _____

_____
_____
_____
_____
_____
_____
_____
_____
_____

2. Required return date:

ATTRIBUTE	CHECK-OUT			CHECK-IN		
	SAT	UNSAT	N/A	SAT	UNSAT	N/A
Physical condition of assembly/item						
Calibration current						
Tamper resistant seals intact						
Level of cleanliness is as required						
Operational test. Protective feature set point_____. For hydro rigs, complete Test Rig Determination and Inspection Check List (see Volume IV, Chapter 9 of this manual) and provide with hydro rig.						
Equipment previously certified. Review Certification Record Card						
Equipment verified correct to current revision/advance change notice of referenced drawing or manual.						

3. Equipment found to be unsatisfactory has been segregated from satisfactory equipment and repair request submitted.

CHECK-OUT YES (✔) ____ CHECK-IN YES (✔) _____

CHECK-OUT and CHECK-IN signatures on reverse.

CHECK-OUT

Prepared and Issued By:

Signature _____

Printed Name _____

Received By:

Signature _____

Printed Name _____

NOTE: RECEIPT SIGNATURE ACKNOWLEDGES THAT ONLY THE ISSUING ACTIVITY IS AUTHORIZED TO REPAIR NTE AND THAT TAMPERING WILL INVALIDATE CERTIFICATION. THIS SIGNATURE ALSO ACKNOWLEDGES THAT A REVIEW OF CERTIFICATION RECORDS CONFIRMS THAT THE EQUIPMENT CONFORMS TO THE REQUIRED TEST REFERENCE REQUIREMENTS.

CHECK-IN

Returned by:

Signature _____

Printed Name _____

Received by:

Signature _____

Printed Name _____

APPENDIX B

NUCLEAR SUPPORT AND TEST EQUIPMENT CERTIFICATION RECORD

1. SHIP/ACTIVITY	2. FWP/CWP NUMBER	3. DATE CERTIFIED (CIRCLE ONE) INITIAL CERTIFICATION RECERTIFICATION
4. EQUIPMENT IDENTIFICATION		
5. EQUIPMENT CONFIGURATION REFERENCE, INCLUDING EXACT REVISION AND ACN TO WHICH THE EQUIPMENT WAS BUILT		
6. CERTIFICATION TEST(S)/CHECK(S) PERFORMED AND RESULTS (include certification method)		
7. REASON FOR RECERTIFICATION (not applicable to initial certification)		
8. CERTIFIED BY: DATE:_____ SIGNATURE:_____ PRINTED NAME:_____		9. ACCEPTED BY NRO: DATE:_____ SIGNATURE:_____ PRINTED NAME:_____

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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 FTSC 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 Inter-Deployment Training Cycle. 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 Ship's Non-Tactical Automated Data Processing 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 Activity for system changes.

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 Inter-Deployment Training Cycle 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.

8.6 REPORTS. Before departing the ship, the ESU will debrief the Commanding Officer, or designated officer, on the material condition of the elevator system. The ESU shall provide the ISIC and TYCOM a report, outlining the results, not later than 30 days following the visit.

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CHAPTER 9

SYSTEM TEST CHECK LIST

REFERENCES.

(a) NAVSEA 0387-046-8000 - System Hydrostatic Test Requirements
(b) NAVSEA S9086-RJ-STM-010 - NSTM Chapter 504 (Pressure, Temperature and Other Mechanical and Electromechanical Measuring Instruments)
(c) NAVSEA S9505-AF-MMA-010 - Piping Systems/Submarine Non-Nuclear Piping Systems Test Manual
(d) NAVSEA S9086-RK-STM-010 - NSTM Chapter 505 (Piping Systems)

LISTING OF APPENDICES.

A Nuclear Test Rig Determination and Inspection Check List
B Non-Nuclear Test Rig Determination and Inspection Check List
C Nuclear/Non-Nuclear Pre-Test Inspection Check List
D Nuclear/Non-Nuclear Performance of Test Check List

9.1 PURPOSE. To provide standard check lists for the proper preparation for the conduct of and recovery from nuclear and non-nuclear tests. Appendices A through D of this chapter are applicable to installed ship systems, individual components and support equipment tested in conjunction with FWPs and Controlled Work Packages (CWP).

9.1.1 Background.

a. Appendices A through D of this chapter are similar to a standard FWP that will require entries, prior to each use, to detail the specifics of the test to be performed. When CWPs are utilized, the locally developed FWP should direct execution of the check lists and need only direct other actions that are not included in the check lists. For example, since Forces Afloat rarely perform hydrostatic tests on hot systems, the check lists are prepared based on system temperatures less than 200 degrees F. In the event that a hydrostatic test is performed with temperatures greater than 200 degrees F, the locally developed FWP must contain additional requirements for the test from the referenced test manual.

b. These lists are developed from references (a) through (d) and **are not inclusive of all requirements**. All applicable test references must be reviewed in preparation for the test to ensure no requirement or precaution is overlooked. Other references such as the Reactor Plant Manual (RPM), Propulsion Plant Manual, Steam Plant Manual, Steam and Electric Plant Manuals, Ship Systems Manuals, Ships Information Books, Test Pressure Drawings, component technical manuals, etc, provide additional guidance and requirements that shall be included in the locally developed FWP for the test.

9.2 GENERAL INSTRUCTIONS.

a. Blank spaces are provided throughout the check lists so that requirements for the specific test to be performed may be added. These specifics shall be entered during FWP preparation.

b. Portions that are not applicable shall be marked "N/A" prior to FWP approval.

c. Multiple "Completed by" signature blanks are provided at the end of each check list since one individual may not be able to fully complete a particular check list. Additional signature blanks may be added if required.

d. The Test Rig Determination and Inspection Check List, Appendices A and B of this chapter, shall be completed by the activity issuing the test equipment. It is the responsibility of both the issuing and receiving activity to ensure that the correct test gear is used. This may be accomplished by requesting the correct test equipment, and the issuing activity completing the check list and providing it with the test equipment for review. To satisfy the scope of this chapter, the activity requesting the test equipment must include in their request (OPNAV 4790/2L) the information necessary for the issuing activity to complete Item 1 of Appendices A or B of this chapter, as applicable.

e. These check lists may also be used when a maximum operating pressure test is specified and an external pressure source is required to obtain this pressure. Installed system equipment shall be used whenever possible to perform operating pressure tests.

f. Appendices B, C, and D of this chapter may contain classified information when filled in (i.e., the nuclear information or classified test pressures). It will be the responsibility of the requesting activity to ensure the proper classification is annotated on the document when applicable.

9.3 RECORD RETENTION. System Check Lists do not require retention after the test has been satisfactorily completed, documented in the FWP or CWP, and the FWP or CWP is closed. For Ship's Force testing to recertify CWP work performed by the FMA, the completed check lists, or copies shall be provided with the test documentation provided to the FMA. When the FMA Quality Assurance (QA) Officer accepts the completed retest, the check list may be discarded.

APPENDIX A

NUCLEAR
TEST RIG DETERMINATION AND INSPECTION CHECK LIST

References: (a) NAVSEA 0387-LP-046-8000 - System Hydrostatic Test Requirements

ITEM NO.	ATTRIBUTE	CHECK OFF or N/A
1. Complete the following based on the information provided by the requesting activity.		
a.	System/component to be tested	
b.	Test Pressure _____ Reference_____	
c.	Number of test gages required: Total_____ Primary _____ (per reference (a) paragraph 2.2.1.a.). Backup _____ Indicate zero if multiple primary gages are required, one of which will also serve as a backup or if an installed system gage will be used.	
d.	Level of cleanliness required	
e.	Planned method of over pressure protection (e.g., manual using installed system valve plus one automatic relief included with test rig, or other combination). Unless otherwise specified, the rig will be provided with one manual and one automatic relief.	
2. GAGES: Normally installed instrumentation may be used as backup pressure indication. If an installed gage is not available and the backup gage will be a temporary gage, then complete Items a-f for both primary and backup gages. Otherwise, a-f apply to primary gage(s) only.		
a.	Complete and attach reference (a), Figure 3 for selection of test gages.	
b.	Reference (a), Figure 3, Item 8 (maximum gage error at test pressure) must not exceed 2% of test pressure.	
c.	Nominal indicated test pressure shall be no less than 25% of the primary gage's range. Nominal indicated test pressure shall be no less than 10% of the backup gage's range, if the backup gage is a temporary gage.	

(CONFIDENTIAL When filled in)

ITEM NO.	ATTRIBUTE	CHECK OFF or N/A
d.	The gage range shall be capable of indicating the manual over pressure protection pressure at no greater than 90% of full scale and the potential maximum overpressure at no greater than 98% of full scale.	
e.	Temporary gages shall be single scale analog gages or digital pressure instruments calibrated in psig.	
f.	RECORD GAGE DATA: Primary gage range _____ psi Cal due date_____ Ser Number_____ Backup gage range _____ psi Cal due date_____ Ser Number_____	
g.	Gages have been calibrated within the required periodicity. Circle applicable item: (1) Normal metrology requirements list calibration frequency (This is the frequency unless specified otherwise for the specific test). (2) Special frequency _____ Required by _____(Indicate required frequency and reference).	
3. OVERPRESSURE PROTECTION:		
a.	The manual release of pressure is the primary method of protection.	
b.	Automatic backup relief valve will be provided.	
c.	If the temporary relief valves provided are to be installed in the system, installation shall be such that it does not cause damage to the system or system components.	
d.	The over-capacity of relief valves should not cause excessive thermal and pressure shock. (Relief valve capacity should not be grossly higher than pressure source capacity).	
e.	The blow down characteristics shall be compatible with the system being tested. (The reseating characteristics of automatic reliefs should be consistent with the requirements of the system being tested. For example, a relief that does not reseat until pressure is reduced to zero would not be acceptable for a primary hydro). (Review manufacturer's data).	
f.	Accumulation shall be less than 10%. (Review manufacturer's data).	

(CONFIDENTIAL When filled in)

ITEM NO.	ATTRIBUTE	CHECK OFF or N/A
g.	Temporary automatic relief valves which have more than one inlet and therefore provide different relief valve performance characteristics (e.g., set pressure) shall not be used.	
h.	Temporary automatic reliefs which require no tools for setpoint adjustment (e.g., employ hand adjustment knob) must: (1) Have some means to positively lock the setting once it has been made or (2) Must be designed to prevent ready access to the adjustment knob.	
4. OVERPRESSURE PROTECTION SETPOINT DETERMINATION:		
a.	Record required hydrostatic test pressure _____ psi.	
b.	Record required overpressure protection setpoint _____ psi. Circle applicable determination method: (1) As specified in the applicable RPM. (2) Other Naval Sea Systems Command (NAVSEA) approved document (identify reference). (3) Using Reference (a), Figure 3 (attach).	
c.	Potential maximum overpressure (Reference (a), Figure 3, item 29) conforms to the requirements of reference (a) paragraph 2.6.3.c.	
5. TEMPORARY EQUIPMENT REQUIREMENTS:		
a.	Temporary connections and equipment (cap, spoolpieces, jumpers, blank flanges, etc.) shall be verified to be capable of withstanding hydrostatic test pressure.	
b.	Verify that within the last year and subsequent to disassembly or replacement of any test rig equipment, the assembled test rig (pump, hoses, gages, connecting tubing) has been satisfactorily tested to a pressure at least equal to the maximum pressure which might be encountered during this hydrostatic test. (Hydro is not required to test pressure gage and relief valve replacement or fittings between subassemblies designed to be broken for portability. Setpoint testing of the test rig relief valve while on the test rig meets this requirement).	
c.	Verify the rig has been cleaned to meet the system cleanliness requirements of the system being tested. If the rig is not maintained clean, comply with the cleanliness boundary requirements of reference (a), paragraph 2.6.4.	
d.	No quick-disconnects with check features are to be used in the hydro rig.	

(CONFIDENTIAL When filled in)

ITEM NO.	ATTRIBUTE	CHECK OFF or N/A
6. OPERATIONAL TEST:		
INSTRUCTIONS: The following checks shall be performed with the test rig isolated from the system being tested. This may be done by blanking the hose prior to connecting the rig to the system. Equipment provided by an FMA will be tested at the FMA prior to being issued to a tended ship. The operational test need not be repeated by the tended ship receiving the test gear. **NOTE: THE FOLLOWING CHECKS ARE NOT REQUIRED FOR FMA AND INDUSTRIAL ACTIVITY SHOP TEST FACILITIES WHERE BOTH PRIMARY AND BACKUP TEST GAGES ARE COVERED UNDER THE NAVY METROLOGY AND CALIBRATION (METCAL) SYSTEM.**		
a.	Mark hydro gages with a red pointer at the required relief setpoint.	
b.	Raise rig pressure to the specified test pressure. If the backup gage is included with the test rig, (vice an installed system gage) verify primary and backup gages are in agreement. (Maximum difference after height correction is no more than the sum of the specified accuracies plus a readability error of one half the smallest graduation of each gage). Required accuracy +/-_____psig. If not in agreement, replace or re-calibrate and repeat this step until satisfied.	
c.	Record required overpressure protection setpoint _____ psig. Continue to raise pressure to the specified overpressure protection setpoint. If the manual relief is installed on the rig, with the pressure source operating at the specified manual relief setpoint, verify that the **manual** relief and associated piping relieve the capacity of the pressure source.	
d.	Set/confirm setpoint of the automatic relief valve. With the pressure source operating and at the relief setpoint, verify that the **automatic** relief and associated piping relieve the full capacity of the pressure source.	
e.	Vent the rig to reduce pressure to reseat the automatic relief valve. Slowly raise pressure again to recheck the automatic relief setpoint.	
f.	With the rig vented, verify that pressure gages that will be installed as primary or backup pressure indication, which are not equipped with a dial adjustment device read zero (within the gage accuracy plus the readability of one half of the smallest graduation on the dial face).	

(CONFIDENTIAL When filled in)

ITEM NO.	ATTRIBUTE	CHECK OFF or N/A
g.	With the rig completely assembled, verify cleanliness by operating the pump to flush the pump and any attached piping or equipment.	
h.	Ensure cleanliness controls are established on the rig such that cleanliness is not lost in the interim period between flushing and the operational test and connection to the system being tested.	

Completed by _____ Items Completed _____Date _____

Completed by _____ Items Completed _____Date _____

Reviewed (Div Off/Engineering Duty Officer (EDO)) _____Date _____

(CONFIDENTIAL When filled in)

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APPENDIX B

NON-NUCLEAR
TEST RIG DETERMINATION AND INSPECTION CHECK LIST

References:
(a) NAVSEA S9086-RJ-STM-010 - NSTM Chapter 504 (Pressure, Temperature and Other Mechanical and Electromechanical Measuring Instruments)
(b) NAVSEA S9505-AF-MMA-010 - Piping Systems/Submarine Non-Nuclear Piping Systems Test Manual
(c) NAVSEA S9086-RK-STM-010 - NSTM Chapter 505 (Piping Systems)

ITEM NO.	ATTRIBUTE	CHECK OFF or N/A
1. Complete the following based on information provided by the requesting activity.		
a.	System/component to be tested.	
b.	Test Pressure _____ Reference _____	
c.	Number of test gages required: Total_____ Primary_____ Backup _____ Indicate zero if an installed system gage will be used.	
d.	Level of cleanliness required_____	
e.	Planned method of overpressure protection (e.g., manual using installed system valve plus one automatic relief included with test rig, or other combination). Unless otherwise specified, the rig will be provided with one manual and one automatic relief.	

ITEM NO.	ATTRIBUTE	CHECK OFF or N/A
2. GAGES:		
NOTE:	**TYPICAL GAGES FOR MOST NON-NUCLEAR TESTS ARE LISTED IN REFERENCE (a), TABLE 504-6-1.**	
CAUTION:	**REFERENCE (a) TABLE 504-6-1 ALLOWS EXCEPTIONS TO THE GAGES LISTED IN THE TABLE. IF USING A GAGE NOT LISTED ON THE TABLE, IT MUST STILL COMPLY WITH THE CRITERIA SPECIFIED BELOW.**	
a.	The pressure gage range based on the maximum test pressure up to and including the relief valve setting must be: - greater than the test pressure **and** - not more than 200% of the maximum test pressure.	
b.	For tests 0-60 psi and below, the range may exceed 200% of the test pressure but will be as low as practical.	
c.	Test gage pressure graduations are equal to or smaller than those specified by reference (a) Table 504-6-1.	
d.	Primary gage accuracy shall be at least +/- 1.0% of the gage span.	
e.	RECORD GAGE DATA: Primary gage range _____ psi Cal due date_____ Ser Number_____ Backup gage range _____ psi Cal due date_____ Ser Number_____	
f.	Gages have been calibrated within the required periodicity. Circle applicable item: (1) Normal metrology requirements list calibration frequency (This is the frequency unless specified otherwise for the specific test). (2) Special frequency _____ required by _____ (Indicate required frequency and applicable reference)	
3. OVERPRESSURE PROTECTION:		
a.	The manual release of pressure is the primary method of protection.	
b.	Backup relief valve, automatic or manual, will be provided. (Automatic preferred unless otherwise specified)	
c.	If the temporary relief valves provided are to be installed into the system, installation shall be such that it does not damage the system or system components. Review reference (b) or (c), as applicable.	

ITEM NO.	ATTRIBUTE	CHECK OFF or N/A
d.	The over-capacity of relief valves should not cause excessive thermal and pressure shock. (Relief valve capacity should not be grossly higher than pressure source capacity).	
e.	The blow down characteristics shall be compatible with the system being tested. (The reseating characteristics of automatic reliefs should be consistent with the requirements of the system being tested). (Review manufacturer's data).	
f.	Accumulation shall be less than 10%. (Review manufacturer's data).	
g.	Temporary automatic relief valves which have more than one inlet and therefore provide different relief valve performance characteristics (e.g., set pressure) shall not be used.	
h.	Temporary automatic reliefs which have a rapid adjustment feature by which the setpoint may be inadvertently changed shall not be used.	
4. OVERPRESSURE PROTECTION SETPOINT DETERMINATION:		
a.	If performing a maximum operating pressure test, verify that installed system relief valves are unisolated and not blocked/gagged. The setpoint for the manual release of pressure shall be based on installed system relief setpoints.	
CAUTION: WHEN PERFORMING MAXIMUM OPERATING PRESSURE TESTS, INSTALLED RELIEF VALVES PROVIDE SYSTEM PROTECTION. SYSTEM RELIEF VALVES MUST NOT BE REMOVED FROM SERVICE.		
b.	Record required hydrostatic test pressure _____ psi.	
c.	Record required overpressure protection setpoint _____ psi. Circle applicable determination method: the lesser of: (1) 100 psi over test pressure. (2) 10% above test pressure.	
5. TEMPORARY EQUIPMENT REQUIREMENTS:		
a.	Temporary connections and equipment (cap, spoolpieces, jumpers, blank flanges, hoses, etc.) shall be verified to be capable of withstanding the test pressure.	
b.	Verify that within the last year and subsequent to disassembly or replacement of any test rig equipment the assembled test rig has been satisfactorily tested to a pressure approximately 15% above the maximum pressure it will witness during the system hydrostatic test. (Hydro is not required to test pressure gage and relief valve replacement or fittings between subassemblies designed to be broken for portability. Setpoint testing of the test rig relief valve while on the test rig meets this requirement).	

ITEM NO.	ATTRIBUTE	CHECK OFF or N/A
c.	Verify the rig has been cleaned to meet the system cleanliness requirements of the system being tested.	
d.	No quick-disconnects with check features are to be used in the test rig.	
6. OPERATIONAL TEST:		
INSTRUCTIONS: The following checks shall be performed with the test rig isolated from the system being tested. This may be done by blanking the hose prior to connecting the rig to the system. References (b) and (c) provide a sample step by step procedure for these checks. Equipment provided by an FMA or Industrial Activity shall be tested prior to being issued to a tended ship. If documentation is provided by the issuing FMA or Industrial Activity that the assembled test rig has been verified to meet all of the below requirements, the operational test need not be repeated by the end user. **NOTE: THE FOLLOWING CHECKS ARE NOT REQUIRED FOR FMA AND INDUSTRIAL ACTIVITY SHOP TEST FACILITIES WHERE BOTH PRIMARY AND BACKUP TEST GAGES ARE COVERED UNDER THE NAVY METCAL SYSTEM.**		
a.	Mark hydro gages with a red pointer at the required relief setpoint, half way between the test pressure and the relief valve setpoint.	
b.	Raise rig pressure to the specified test pressure. Verify primary and backup gages are in agreement. (Maximum difference between the two gage readings after height correction is no more than 2%). Required accuracy +/- _____ psig. If not in agreement, replace or re-calibrate and repeat this step until satisfied.	
c.	Continue to raise pressure to the specified overpressure protection setpoint. If the manual relief is installed on the rig (vice using an installed system valve), with the pressure source operating and at the specified manual relief setpoint, verify that the **manual** relief and associated piping relieve the capacity of the pressure source.	
d.	Set/confirm setting of the automatic relief valve. With the pressure source operating and at the relief setpoint, verify that the **automatic** relief and associated piping relieve the capacity of the pressure source.	

ITEM NO.	ATTRIBUTE	CHECK OFF or N/A
e.	Vent the rig to reduce pressure to reseat the automatic relief. Slowly raise pressure again to recheck the automatic relief setpoint.	

Completed by _____ Items Completed _____ Date _____

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APPENDIX C

NUCLEAR/NON-NUCLEAR
PRE-TEST INSPECTION CHECK LIST

References: (a) NAVSEA S9505-AF-MMA-010 – Piping Systems/Submarine Non-Nuclear Piping Systems Test Manual
(b) NAVSEA 0387-LP-046-8000 - System Hydrostatic Test Requirements

ITEM NO.	ATTRIBUTE	CHECK OFF or N/A
1. REVIEW TEST PREPARATIONS: The following attributes are necessary for proper test accomplishment and may be included in the test procedure, indicated on the QA form 26 or covered in the pre-test briefing.		
a.	Test equipment installation location and method of installation is clearly indicated in sketch on the QA form 26, or is clearly defined. Test accomplishment will be in accordance with reference (a).	
b.	Specific jumpers/gagging devices/blanks etc. are indicated for both installation and removal. These items shall be danger or caution tagged.	
c.	Boundaries of test and specific inspection points are clearly identified.	
d.	Instructions are provided for returning the system to normal or to a specifically stated condition upon completion of the test.	
e.	Procedure minimizes the amount of system to be pressurized to accomplish the test.	
f.	All components within the test boundary are capable of withstanding the test pressure (gages not over-ranged, etc).	
g.	Necessary precautions as identified on the test pressure drawing have been taken (List or none). Use reverse if additional space required.	

ITEM NO.	ATTRIBUTE	CHECK OFF or N/A
h.	Applicable chapter (maintenance section) or maintenance instruction of the RPM reviewed for test/flush requirements (List or none). Use reverse if additional space required. (Not applicable to non-nuclear tests)	
i.	Specific actions/precautions taken are included in the test procedure as a result of a review of reference (b), paragraph 2.5.4, 2.5.5 and 2.5.6 to preclude damage to installed system components due to pressure or temperature conditions that may occur during the test (List or none). Use reverse if additional space required (Not applicable to non-nuclear tests).	
2. WALKTHROUGH OF THE TEST AREA: The below listed attributes are basic quality control checks that should be conducted/supervised by the Petty Officer in charge of the test.		
a.	Piping in the test boundary is free from dents, gouges, arc strikes and other external defects (Removal of additional lagging or other interference is not required to perform this check).	
b.	Conditions for detecting leaks are satisfactory (e.g., joints being tested are not covered/lagged).	
c.	Hot piping and/or equipment that could result in a safety hazard to personnel has been insulated or precautions have been taken to minimize the hazard.	
d.	The hydrostatic test will not be a hazard to other evolutions adjacent to the test area (e.g., Work on an open oxygen system adjacent to a sea water hydro).	
e.	Adequate measures have been taken to prevent spray damage to electrical equipment in the event of a leak during pressure testing.	
f.	Pipe hangers removed for work have been reinstalled.	
g.	All mechanical joints are re-made; system integrity established.	
h.	No obvious loose fasteners.	

ITEM NO.	ATTRIBUTE	CHECK OFF or N/A
i.	No obvious instances of missing fasteners or improper fastener material or material mismatch (e.g., no carbon steel fasteners in seawater systems, no improper use of black oxide coated fasteners).	

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APPENDIX D

NUCLEAR/NON-NUCLEAR
PERFORMANCE OF TEST CHECK LIST

NOTE: DO NOT PRESSURIZE TEST PUMP WITH AIR AND WATER SUPPLY UNTIL READY TO ACTUALLY START THE TEST. DO NOT LEAVE TEST PUMP UNATTENDED DURING ANY PORTION OF THE TEST.

ITEM NO.	ATTRIBUTE	CHECK OFF or N/A
1. VERIFY SYSTEM LINE-UP:		
a.	Verify the system to be tested is aligned for the test by performing valve lineup checks or by aligning valves via procedural steps in the test procedure or by steps in an operating instruction.	
b.	Verify that required plant conditions have been established.	
c.	All valves are **DANGER TAGGED OPEN** that:	
	Could block either the primary or backup pressure relief point from the pressure source unless they are to be used during the test to isolate the pressure source from the portion of the system being tested.	
	Could block discharge from the pressure relieving point.	
	Could block either the primary or the back up pressure gage from the pressure source. (To ensure pressure indication, a clear pressure path between the applied pressure source and at least one pressure gage must be confirmed by danger tagging any isolation valve in this path. Confirmation that the other pressure gage is not isolated will be made by comparison with the tagged open gage).	
	Would isolate the test pressure gages and the portion of the system being tested.	
	Are vent paths in adjacent systems when the design or test pressure of the adjacent system is less than that of the system being tested.	
d.	If a section of pipe will be pressurized downstream of a check valve and no provisions are available for measuring the pressure in that section of piping, ensure that: (1) Pressure sources in that portion of the system are isolated or inoperative as discussed in item e below. (2) Provisions are included to manually depressurize any section of pipe isolated by a check valve as soon as possible after test completion.	
e.	Potential pressure sources within the test area boundaries that are not required for testing are isolated or rendered inoperative by danger tagging out fuses, danger tagging shut appropriate valves, etc.	

ITEM NO.	ATTRIBUTE	CHECK OFF or N/A
f.	There shall be no valves in the pressure-relieving path which could shut as a result of depressurization and thereby block the relief path from relieving the applied test pressure.	
g.	System relief valves within the test boundary are rendered inoperable to permit reaching elevated test pressure.	
h.	Systems susceptible to chloride stress corrosion are isolated to protect in-leakage of chlorides from adjacent systems being tested to an elevated pressure. This isolation may be accomplished either by using double valve isolation with leakoff in between or by pressurizing the system susceptible to chloride stress corrosion to prevent in-leakage.	
	If such isolation cannot be attained by practical means or is not assured, then the system susceptible to chloride stress corrosion shall be flushed outwardly before and after the elevated pressure test and appropriate samples taken to confirm the absence of contaminants. (Not applicable to non-nuclear tests).	
i.	Verify test equipment: (1) Installation is as specified on the QA form 26. (2) Test gages are within required calibration periodicity. (3) Automatic relief valves setpoint have been checked within 30 days prior to the test.	
j.	If test gages are provided with a dial adjustment which does not affect calibration, the dial should be adjusted to zero after the gage is installed for the test and prior to opening the valve that isolates the gage from the system being tested.	
k.	Verify calibration and dial adjustment devices, if readily accessible, are protected from inadvertent movement or adjustment during the test.	
l.	The discharge of test medium for overpressure protection is directed into areas where the discharge will not cause damage to equipment, create personnel hazards or radioactive problems.	
m.	Pressure gages shall be clearly visible and readable by test personnel.	
n.	The location of gages is such that no path exists whereby pressure could be applied to any portion of the system undergoing test without a pressure gage (primary or backup) indicating this pressure.	
o.	The primary and backup pressure gages shall be located on different branch lines (where this can be done without extending the test boundaries).	

ITEM NO.	ATTRIBUTE	CHECK OFF or N/A
2. VERIFY PERSONNEL ARE READY TO CONDUCT TEST:		
a.	Brief personnel, ensuring that the following attributes are understood: (1) Personnel assignments. (2) Maintaining communications. (3) Test gage requirements: - Gage locations. - Calibration cross checks. - Gage indication and pressure readings. - Primary pressure indications. - Back up pressure indications. (4) Overpressure setpoint. (5) Type and location of primary overpressure protection. (6) Type and location of back up overpressure protection. (7) Duties of test pressure source operator. (8) Duties of system inspector(s) and required inspection points. (9) Duties of manual overpressure relief operators. (10) Immediate action shall be taken to secure the test pressure source and investigate the problem should any of the following occur: - Pressure gages fail to respond to changes in test pressure. - A rupture of a test gage occurs. - Pressure gage readings do not agree with the sums of their accuracies plus readability errors +/- _____ psig. - Changes in test pressures are erratic or operation of the test pumps after the system is filled solid does not produce a corresponding increase in pressure. (11) Immediate action shall be taken to secure the test pressure source and relieve system pressure if the pressure at which manual overpressure protection is to be initiated is exceeded on any primary or backup pressure gage. (12) Plant and system status. (13) Preliminary leak checks. (14) Valve packing leak checks (if applicable). (15) Criteria for an acceptable elevated pressure test. (16) Pressurizing to elevated test pressure. (17) Depressurization following completion of test.	
b.	Manual overpressure protection relief valve operators have no other responsibilities assigned. NOTE: WHEN PRESSURE IS BEING APPLIED BY A HAND-OPERATED TEST PUMP OR WHEN THE PRIMARY AND BACKUP TEST GAGES AND THE MANUAL OVERPRESSURE PROTECTION VALVE(S) ARE ALL INSTALLED ON THE HYDROSTATIC TEST RIG, THE TEST PUMP OPERATOR MAY ALSO SERVE AS THE PRIMARY OVERPRESSURE PROTECTION WATCH, PROVIDED THAT: (1) THE MANUAL OVERPRESSURE PROTECTION VALVE IS WITHIN EASY REACH.	

ITEM NO.	ATTRIBUTE	CHECK OFF or N/A
	(2) PROPERLY SET AND TESTED BACKUP RELIEF VALVE PROTECTION IS PROVIDED (FOR OTHER THAN HAND-OPERATED TEST PUMPS, EITHER AN AUDIBLE OVERPRESSURE ALARM IS PROVIDED OR A SECOND BACKUP RELIEF VALVE IS INSTALLED ON THE TEST RIG). (3) THE USE OF THIS EXCEPTION DOES NOT RESULT IN ONE INDIVIDUAL BEING SOLELY RESPONSIBLE FOR SATISFACTORY TEST PERFORMANCE.	
c.	Adequate communications have been established between testing personnel.	
d.	Rate of pressurization and depressurization is specified at 100 psi/minute maximum. If testing a small component or small volume system such that 100 psi/minute is not practicable, control rate as low as possible.	
3. PERFORM ELEVATED PRESSURE TEST:		
a.	Obtain permission to conduct test.	
b.	Verify that the water purity of the test medium will not degrade system cleanliness or the required purity of water already in the system.	
c.	Note depressurized gage readings of all primary gages for comparison later, at test completion. Location _____ _____psig Location _____ _____psig	
	Mark all test gages with a red mark at the overpressure protection setpoint, half way between the test pressure and the relief valve setpoint.	
d.	The primary and backup gages are in agreement at two pressures before exceeding normal operating pressure. (Maximum difference after height correction is no more than the sum of the specified accuracies plus a readability error of one half the smallest graduation of each gage for nuclear tests or 2 % for non-nuclear tests.) +/-_____psig.	
e.	If a less accurate gage is used for backup and is indicating higher than the primary gage during gage cross checks, increase the overpressure setpoint mark on the backup gage by the indication differential after the second cross check.	
f.	Increase pressure in increments and perform preliminary leak checks.	
g.	Unless required to be positioned differently (e.g., throttle valves), backseat all valves that were aligned for packing leak checks prior to increasing pressure above normal operating pressure.	
h.	Hold test pressure for 30 minutes prior to commencing final inspection unless otherwise specified.	
i.	Primary and backup gages are in agreement at test pressure. (Same criteria as above) +/-_____ psig.	
j.	Results of inspection _____. Also record data on QA form 26. Remarks:	

ITEM NO.	ATTRIBUTE	CHECK OFF or N/A
k.	Slowly depressurize the test area at less than 100 psi/minute. If testing a small component or small volume system such that 100 psi/minute is not practicable, control rate as low as possible.	
	For nuclear tests only: When depressurizing systems which are adjacent to systems potentially contaminated with chlorides, ensure that the potentially contaminated systems are depressurized before depressurizing the system susceptible to chloride stress corrosion to prevent in-leakage. Ensure that the depressurization path is selected such that any fluid flow produced by depressurization will tend to keep chlorides away from the system of concern.	
l.	Note the depressurized gage readings of all primary gages. Location _____ _____psig Location _____ _____psig Compare to pre-test depressurized readings. Gages shall agree within the gage accuracy and readability error. Disagreement is not cause for rendering the elevated pressure test unsatisfactory, provided gage cross-checks in items d and i above are satisfactory. However, disagreement should be considered unusual and warrant further investigation.	
m.	Remove temporary equipment.	
n.	Perform system restoration as directed by the FWP.	

Completed by _____ Items Completed _____ Date _____

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VOLUME IV

CHAPTER 10

WORK AUTHORIZATION AND CONTROL

REFERENCES

(a) NAVSEA 0905-LP-485-6010 - Manual for the Control of Testing and Ship Conditions
(b) S0400-AD-URM-010/TUM - Tag-Out User's Manual
(c) NAVSEA S9505-AF-MMA-010 - Submarine Non-Nuclear Piping Systems Test Manual
(d) OPNAVINST 5100.19 - Navy Occupational Safety and Health (NAVOSH) Program Manual for Forces Afloat
(e) OPNAVINST 5100.23 - Navy Occupational Safety and Health (NAVOSH) Program Manual Chapter 15
(f) NAVSEA 0967-LP-412-3050 - Sonar Dome Handbook, Volume 5
(g) 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 Sheet
D Maintenance Coordination
E Barrier Criteria for Submarine Hull Penetrations
F Safety of Ship Maintenance Item List Example
G Safety of Ship Maintenance Item List
H Procedures and Safety Precautions for Entering Submarine Spaces, Tanks and Voids
I Close-out Inspection Check-off List
J Re-entry Check-off List

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

10.2 WORK AUTHORIZATION. (Submarines, Aircraft Carriers, for maintenance performed by Naval Shipyards, and their subcontractors on all naval ships and for maintenance performed by other industrial repair activities as specified by Memorandum of Agreement (MOA)). Work on ship's systems and components must be properly authorized and controlled in order to ensure rigorous personnel and ship safety standards are met at all times. Outside activity work on ship's systems and components requires formal authorization through a Work Authorization Form (WAF) for the specific work to be accomplished. 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 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, 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 and WAF index provided to Ship's Force.

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.

10.4.2 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 10.4.10 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. The tagout is then authorized and hung. The work is not to be authorized if doubt exists on either of these points.

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 also signs the WAF. The Watch/Duty Officer and Repair Activity Representative 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 complete 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. The use of transfers is applicable to major depot availabilities where large portions of systems are to be isolated completely and transferred to 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 SUBSAFE 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 copy of the changed TWD Record Sheet. 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 Repair Activity Representative, 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 anew line item to the existing tagout record sheet and obtain shipyard concurrence in block 12 of the WAF. Repair activity representative 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 Changing Conditions to any Existing Work Authorization Forms Revisions. Changes to the scope of the existing job description, tagout boundary or system transfer boundary shall be authorized by a new or 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 new or formal revision to the existing WAF. If a WAF is revised, all applicable verifications required by the original WAF shall be reperformed, including any required tagout actions. Signatures by all applicable parties will be re-entered on the original WAF or attached sheet. 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 number (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 number with each entry.

(2) Line-out all changed or invalidated information. Include initials, date and revision number with each line-out.

(3) Remake all affected signatures.

(4) In block 9, enter revision number (REV A, REV B, REV C, etc.) and 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. Additional concurrences shall be obtained as required and any previous concurrences which might be affected by the change must be re-made. Revised entries and authorization signatures may be made on a WAF Continuation Sheet, shown in Appendix C, to improve readability.

c. Minor Administrative Changes to Existing WAFs. The AO 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.

d. 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 Maintenance Coordinator to determine the need for centralized work control and to assign a Lead Maintenance Activity 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 Maintenance Coordinator 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 repair activity representative 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 Lead Maintenance Activity. The responsibilities of the Lead Maintenance Activity are:

a. Conduct or attend routine progress review meetings with all assigned repair activities.

b. (Chief of Naval Operations (CNO) Availabilities only) Coordinate work and testing controls to include WAFs, tagouts and test sequencing per paragraphs 10.3 and 10.4 of this chapter.

c. Integrate the work of all repair activities, ensuring an authorized MOA, Standard Work Practices and/or NAVSEA Standard Items are in effect for all scheduled work.

d. Report work status to maintenance brokers.

e. Request assistance via broker as needed for outside activity performance.

f. (CNO Availabilities only) Coordinate preparations by assigned repair activities for all key events (e.g. docking, undocking, hot ops, dock trials, fast cruise, sea trials, etc.) to include verification signature checklists of readiness to start.

g. Track progress of all maintenance activities.

h. Perform maintenance coordinator responsibilities (paragraph 10.4.7d (1) through (11) of this chapter).

i. (Submarines only) Provide management oversight of a ship safety council per reference (a).

j. (Submarines and CNO Availabilities only) Coordinate sail safety and sail closeout efforts among the assigned repair activities conducting work.

k. (CNO Availabilities only) Coordinate crane operations, pier laydown areas, dry dock work areas and resolve other real estate conflicts which may impede efficient execution of the availability.

l. (CNO Availabilities only) Provide sea trials agenda, with all repair activity input, for ship Commanding Officer’s concurrence and Type Commander approval.

10.4.7 Maintenance Coordinator.

a. A Maintenance Coordinator will be assigned in writing and will be responsible for maintenance coordination on his/her assigned ship during the periods specified.

b. The Maintenance Coordinator is the waterfront single point of contact for resolving maintenance activity conflicts on his/her ship during specified periods.

c. During CNO availabilities, the cognizant Naval Shipyard or Supervisor of Shipbuilding will assign an individual to perform Maintenance Coordinator duties. During planned upkeep periods, the Lead Maintenance Activity will normally assign an individual to perform Maintenance Coordinator duties. When work is being performed outside of a CNO availability or planned upkeep, the Maintenance Broker will assign an individual to perform Maintenance Coordinator duties. See Appendix D.

d. The Maintenance Coordinator will:

(1) Report to the assigning activity on maintenance coordination issues affecting his/her ship.

(2) Ensure he/she is centrally located near the primary maintenance activity to maintain contact with the assigned ship to enhance communication for support during specified periods and to provide comprehensive coordination of work in progress.

(3) Establish industrial activity maintenance priorities with ship's knowledge/concurrence.

(4) Maintain daily dialog with Maintenance Activity Managers, Maintenance Brokers and the ship.

(5) Maintain a list of activities authorized to work on the ship he/she is responsible for and ensure the list is updated weekly or on an as needed basis.

(6) Ensure activities working on ship have the proper credentials, work schedule and pedigree (authorized maintenance activity) prior to being added on the work authorization list (SUBSAFE, Scope of Certification, radiological).

(7) Ensure that the lead maintenance activity integrates other activities work schedules as necessary into its master work schedule.

(8) Ensure maintenance activities performing maintenance on assigned ships have proper MOA, Standard Work Practices and/or NAVSEA standard items in place and that the MOA, Standard Work Practices and/or NAVSEA standard items address required support for work authorizations and work control.

(9) Direct maintenance providers to their proper points of contact.

(10) Attend all production/maintenance management meetings to communicate/resolve priorities, problems, job interferences and issues.

(11) Define, identify and provide resolution to coordination problems and work conflicts between the Maintenance Managers, Maintenance Activities, Maintenance Brokers and the ship.

e. The Maintenance Broker will ensure Maintenance Activities coordinate their efforts through the Maintenance Coordinator.

f. The ship will:

(1) Monitor all maintenance activities to ensure they are on the master authorization list.

(2) Ensure a current master authorization list is maintained by the Ship's Duty Officer.

(3) Provide the Maintenance Coordinator with information on ship brokered work so all activities are placed on the master authorization list.

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

10.4.9 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 E.

10.4.10 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 DURING FMAV AND VOYAGE REPAIR PERIODS.

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) Other maintenance or evolutions which require special coordination between Ship's Force and maintenance providers to ensure safe accomplishment of authorized work.

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 ship superintendent. A new SOSMIL will be prepared prior to the FMA Daily Production Meeting of Volume II Chapter 4 paragraph 4.6.5.2 of this manual. Appendix F of this chapter is provided as an example SOSMIL. Appendix G 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, indicate the Job Control Number, job description, scheduled end date and any remarks.

(3) The SOSMIL should indicate planned work for the next seven days. A thick black line is helpful 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.

d. Maximum Expected Draft. For those items which will have an affect on ship's draft, expected draft changes will be calculated fore and aft for that evolution and indicated in the remarks section. The worst-case draft change for each item will be totaled 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). 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 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 maintenance has 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 that only the maintenance items listed will be worked. 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 Ship Superintendent/Regional Maintenance Team Leader

(d) Supply Repair Other Vessel Officer

(e) Ship's Force Availability Coordinator

(f) ISIC Material/Squadron Representative

(g) Restricted 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) The Ship Superintendent/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.

h. SOSMIL Use and Pre-Job Briefs. None of the evolutions or maintenance specified in paragraph 10.4.9.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.

10.5 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. The Preservation Maintenance Standard 6310-081-015 (NAVSEA approved) allows paint on piping.

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 H, I or J 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 Appendices I and J. 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 H and Appendices I or J as applicable.

(2) Forwarding to the DCA completed copies of Appendices I and/or J.

c. In cases in which entry can be made by both Ship's Force and FMA personnel, Ship's Force will be responsible for Re-Entry Control (REC) and final certification close-out. For the cases in which only the FMA has access (e.g., waterborne entry into mud tanks or ballast tanks by divers) the IMA will be responsible for re-entry control and final certification close-out.

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

APPENDIX A

WORK AUTHORIZATION FORM

1. USS	2. SYSTEM	3. WAF NO.
4. JSN	5. DIVISION/LWC/RA	
7. JOB DESCRIPTION	6. TECHNICAL WORK DOCUMENT	

PREPARATION FOR WORK

8. POST WORK TESTING AS SPECIFIED: ☐ BELOW ☐ IN THE TWD ☐ NO TEST REQD ☐ FORMAL TEST PROGRAM

9. RESTRICTIONS/PRECAUTIONS/REMARKS

10. DIVISION/REPAIR ACTIVITY READY TO COMMENCE WORK.
LPO/DIV OFF /RA _____ DATE _____

AUTHORIZATION TO WORK

11. SAFETY OF SHIP (Submarine Only): ☐ YES ☐ NO

(If YES RA SSO signature required in depot avail.)_____ _____ DATE _____

12. CONCURRENCES:

_____ DATE _____ _____ DATE _____ _____ DATE _____

13. TAGOUT REQUIRED: ☐ YES ☐ NO

TAGOUT NO._____

SYSTEM/COMPONENT IS LINED UP FOR WORK, A TAGOUT IS HUNG, VERIFIED AND SIGNED BY THE REPAIR ACTIVITY (IF REQUIRED) AND SHIP.

_____
WATCH/DUTY OFFICER DATE

14. PLANT/SHIP CONDITIONS (E.G., DRAINED, DE-PRESSURIZED, DE-ENERGIZED) SET. DIVISION/RA IS AUTHORIZED TO START WORK.

_____
WATCH/DUTY OFFICER DATE

_____
REPAIR ACTIVITY DATE

NOTIFICATION OF WORK COMPLETION

15. RESTRICTIONS/PRECAUTIONS/REMARKS

16. WORK IS COMPLETE

LPO/DIV OFF or RA _____DATE _____

17. TESTING IS COMPLETE

WATCH/DUTY OFF or RA _____DATE_____

18. WAF CLOSED OUT

RA_____DATE_____ WATCH/DUTY OFF _____DATE_____

☐ CHECK IF CONTINUED ON ANOTHER SHEET

INSTRUCTIONS FOR COMPLETING WORK AUTHORIZATION FORM

Block 1. USS: Enter name or the hull number.

Block 2. SYSTEM: Enter the system noun name, abbreviation or identification number.

Block 3. WAF NO.: Enter the WAF serial number.

Block 4. JSN: Enter the Job Sequence Number or job order.

Block 5. DIVISION/Lead Work Center (LWC)/REPAIR ACTIVITY: Enter ship's division, LWC or repair activity Point of Contact responsible for conducting the maintenance.

Block 6. TECHNICAL WORK DOCUMENT: Enter the TWD (e.g., Controlled Work Package (CWP)/Formal Work Package (FWP), TGI) number(s) or enter "see attached TWD Record Sheet." If a TWD Record Sheet is used, it shall be referenced in block 6.

Block 7. JOB DESCRIPTION: Enter a description of work to be performed detailed enough for the Authorizing Officer and/or repair activity representative to understand the scope of the work boundary and prepare/concur in the isolation established for this work. If necessary, use of an additional sheet is authorized. Description of work can contain either a description of work boundaries or a description of components (see paragraph 10.4.3a of this chapter).

Block 8. POST WORK TESTING IS AS SPECIFIED: Check BELOW and identify test requirements when retest is not contained in a TWD or formal test program. Check FORMAL TEST PROGRAM if retesting will be tracked or completed in a program administered by the repair activity. If FORMAL TEST PROGRAM or NO TEST REQUIRED is checked, block 17 is N/A.

Block 9. RESTRICTIONS/PRECAUTIONS/REMARKS (OPENING): Enter any restrictions or precautions associated with the work item. If any information is entered in this block, the person making the entry must enter name, organization and date.

Block 10. DIVISION/REPAIR ACTIVITY READY TO COMMENCE WORK: Signature by Leading Petty Officer/Division Officer for Ship's Force work or repair activity indicates that sufficient prerequisites are met to commence isolation for production work.

Block 11. SAFETY OF SHIP: For submarines, when required by paragraph 10.4.10 of this chapter and reference (a), check YES if work affects ship conditions. If checked YES, when assigned, the repair activity's Ship Safety Officer will sign concurrence, otherwise, enter NONE ASSIGNED. For work not affecting ship conditions, check NO, and sign (repair activity signature required in depot availability).

Block 12. CONCURRENCES: Concurrence signatures may be entered as necessary (e.g., nuclear/non-nuclear interface, assist work center(s), two cognizant department heads). The Authorizing Officer or repair activity representative should define any needed concurrences by noting the concurring organization beneath the signature line in block 12 and obtain the concurrences.

Block 13. TAGOUT REQUIRED: If tagout is required, mark YES. When tagout is hung, enter tagout number(s) and watch officer will sign block. If no tagout is required, mark NO. Enter N/A in TAGOUT NO., and watch officer will sign block.

Block 14. PLANT/SHIP CONDITIONS (E.G., DRAINED, DE-PRESSURIZED, DE-ENERGIZED) SET, FMA/DIVISION/REPAIR ACTIVITY ARE AUTHORIZED TO START WORK: The Watch/Duty Officer signs in all cases for authorizing the start of all work. Note any restrictions and/or precautions in block 9. Repair activity representative signs for authorizing the start of work when the WAF is for repair activity work.

Block 15. RESTRICTIONS/PRECAUTIONS/REMARKS (CLOSURE): Enter any general conditions (e.g., outstanding work) that may affect system restoration. If any information is entered in this block, the person making the entry must enter name, organization and date.

Block 16. WORK IS COMPLETE: A signature by Ship's Force or the repair activity is entered when the work described in block 7 is verified complete and tags may be cleared with any exceptions listed in block 15.

Block 17. TESTING IS COMPLETE: A signature by the activity performing the retest is entered when testing of block 8 is completed. Block 17 is marked N/A if Formal Test Program is in effect or no test required.

Block 18. WAF CLOSED OUT: When work specified in block 7 and testing as specified in block 8 is completed, including all exceptions listed in block 15, repair activity signature is entered to indicate the WAF is closed out. Ship's Force signature indicates acceptance of the work and testing and that appropriate system status has been set (e.g., clear tags and perform valve lineups as appropriate for the situation). Block 18 may be signed prior to completion of testing covered by a formal test program. A copy of the closed out WAF shall be provided to Ship's Force if the repair activity is maintaining the original WAF.

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APPENDIX B

TECHNICAL WORK DOCUMENT RECORD SHEET

TWD RECORD SHEET								
SYSTEM/COMPONENT:			WAF SERIAL NO.					
TWD LINE ITEM NO.	TWD (TGI, DL, DR, CWP, FWP)	BRIEF DESCRIPTION	TWD AUTHORIZATION			STATUS C-COMPLETED, T-TRANSFERRED X-CANCELED		REMARKS
			1ST CHECK (INI)	2ND CHECK & AUTH (INI)	DATE AUTH	C/T/X	INI & DATE	

☐ CHECK BOX IF CONTINUED ON ADDITIONAL SHEET PAGE_____

TECHNICAL WORK DOCUMENT RECORD SHEET COMPLETION INSTRUCTIONS

BLOCK	INFORMATION REQUIRED
SYSTEM/COMPONENT	Enter system or component.
WAF SERIAL NO.	Enter WAF serial number.
TWD LINE ITEM NO.	Enter next sequential number (1, 2, 3, etc.).
TWD (TGI, DEFICIENCY LOG, DEFICIENCY REPORT, CWP, FWP)	Enter TWD (e.g., TGI, Deficiency Log, Deficiency Report or other unique document identification.)
BRIEF DESCRIPTION	Enter brief description
1ST CHECK	Initials of 1st person who reviews and ensures the line item is within the WAF work description and tagout boundaries. (NOTE 1)
2ND CHECK AND AUTHORIZATION	Initials of 2nd person (independent from 1st) who reviews and ensures work is within the WAF work description, tagout boundaries, that the WAF is in an authorized status and authorizes the line item. (NOTE 1)
DATE	Date line item was authorized. (NOTE 1)
LINE ITEM BLOCK (C/T/X)	Status of line item.
(INI) DATE BLOCK	Initials and date of person that verifies a line item is complete, transferred to another WAF or canceled.
REMARKS	Write any pertinent information (may be left blank).

NOTE 1: 1st and 2nd checks of TWD Record Sheet will be based on a review of the issued TWD. All TWDs not reviewed (i.e., left blank) at time of WAF authorization are not authorized until reviews are completed.

APPENDIX C

WORK AUTHORIZATION FORM CONTINUATION SHEET

1. USS	2. SYSTEM	3. WAF NO.
4. JSN	5. DIVISION/LWC/RA	
7. JOB DESCRIPTION	6. TECHNICAL WORK DOCUMENT	

☐ CHECK IF CONTINUED ON ANOTHER SHEET

Page ___ of ___

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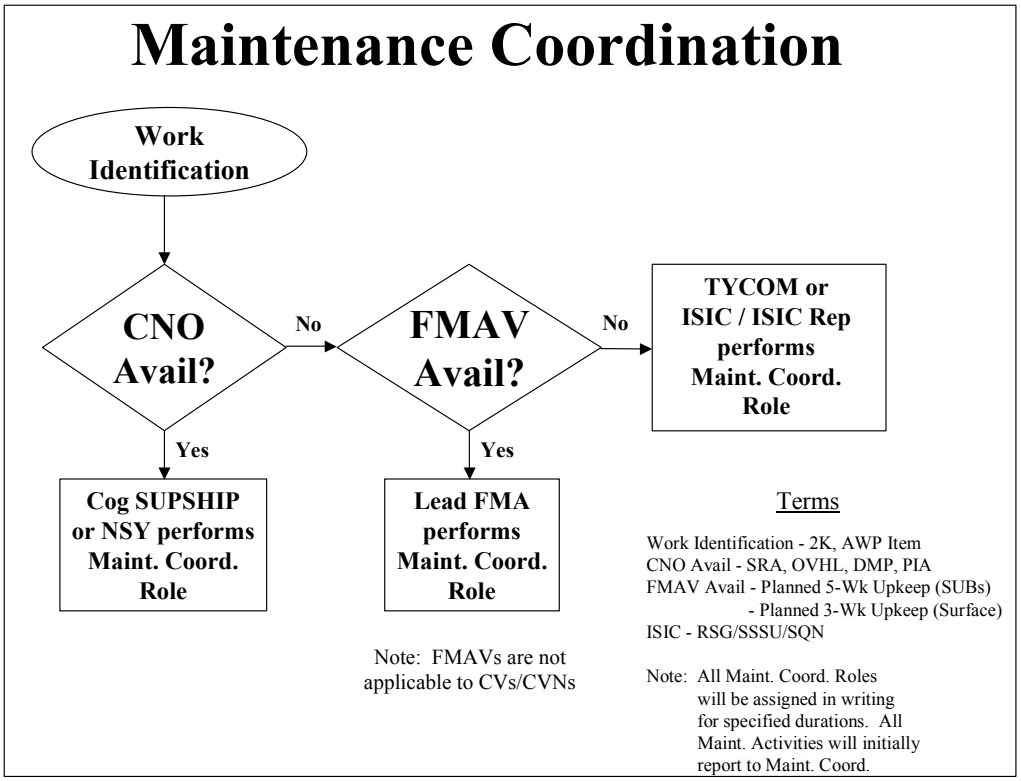
APPENDIX D

MAINTENANCE COORDINATION



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APPENDIX E

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 flanges(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 identity the hull opening by noun name, docking plan number, frame number, side and circumferential distance from the centerline (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.

. 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/marked 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 (c) 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 (c).

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 (c). 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.

APPENDIX F

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

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	Job Description Reason on SOSMIL	Days work planned 28 Mon	29 Tue	23 Wed	24 Thurs	25 Fri	26 Sat	27 Sun	Scheduled end date	Remarks
EA01-2345	TD-101 repair (1,3)			testing	Remove flange				24SEP98	Restoration in progress
EM01-3456	Divers: inspect screw for fouling (10)			Brief 0830					23SEP98	
WQ01-1986	Inspect sonar dome/ (11)			Pump down dome, brief 0830					23SEP98	Draft change expected: 1' up fore 1.5' down aft
EA01-3509	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	Off-loading countermeasures (7)					Off-load			25SEP98	through weapons shipping hatch
EA01-3525	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
2. MBT blow removed
3. Belly bands, hull blanks, cofferdams
4. Dewatering ability removed
5. Firefighting capability removed
6. Bleeding charging Oxygen banks
7. Weapons handling
8. EAB system maintenance
9. Fueling or defueling
10. Diver operations
11. Pumping or flooding sonar dome
12. Special coordination btwn S/F and FMA

Review and approval (all parties must sign):

Squadron Rep:	FMA Rep:	Ship's Force DH:

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APPENDIX G

SAFETY OF SHIP MAINTENANCE ITEM LIST

Ship name: Hull #:	Upkeep #:	Maximum expected draft: Fore: aft:	Actual Morning Draft: Fore: aft:	Date prepared:

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	Job Description Reason on SOSMIL	Days work planned ___ Mon	___ Tue	___ Wed	___ Thurs	___ Fri	___ Sat	___ Sun	Scheduled end date	Remarks

The following items are Safety of Ship:

1. Single closure from sea
2. MBT blow removed
3. Belly bands, hull blanks, cofferdams
4. Dewatering ability removed
5. Firefighting capability removed
6. Bleeding charging Oxygen banks
7. Weapons handling
8. EAB system maintenance
9. Fueling or defueling
10. Diver operations
11. Pumping or flooding sonar dome
12. Special coordination btwn S/F and FMA

Review and approval (all parties must sign):

Squadron Rep:	FMA Rep:	Ship's Force DH:

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APPENDIX H

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 (d) THROUGH (g).

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 any, are 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 I

CLOSE-OUT INSPECTION CHECK-OFF LIST

Name of tank, void or space _____

	DESCRIPTION	PETTY OFFICER/ OFFICER INITIAL
1.	PAINT	
	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.	FRAMEWORK AND FOUNDATIONS	
	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.	PIPING	
	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 or have self-locking nuts used as required.	
4.	TRANSDUCERS, HYDROPHONES, CABLES AND CABLE WAYS	
	a. Ensure all rubber elements are not gouged, cut, scraped or painted.	
	b. Check the cable bend radii in accordance with reference (g).	
	c. Ensure all sonar transducers and hydrophones and corresponding cables are installed in accordance with ship's plans.	
	d. Ensure only CRES banding and rubber channel insulation is used on cableways.	
	e. Ensure cableways and cable are properly supported.	
	f. Ensure electrical coamings are made and tight.	
	g. 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.	
	h. Ensure electrical hull penetrations are properly labeled.	
5.	BAFFLE PLATES AND SOUND DAMPENING TILES	
	a. Sound dampening tiles are proper type in accordance with reference (g).	
	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.	MECHANISMS	
	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.	

7.	VENTS AND DRAINS	
	a. Adequate draining exists from each bay.	
	b. Vents are clear of loose gear and rags.	
8.	GALVANIC PROTECTION	
	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.	CLEANLINESS	
	a. Check space clear of loose gear and rags.	
	b. Check space clean and free of dirt.	
10.	COMPLETION	
	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.	

_____ _____
Signature of Senior Enlisted Inspector Date

_____ _____
Signature of Officer Inspector Date

_____ _____
Reviewed by DCA Date

APPENDIX J

RE-ENTRY CHECK-OFF LIST

	CHECK-OFF ITEM	INITIAL OF PERSON ENTERING SPACE
1.	Obtain permission form the Duty Officer/Officer of the Deck (OOD) or Engineering Officer of the Watch (EOOW)/EDO as applicable.	
2.	Notify the Duty Chief/COW or EWS/EDPO as applicable.	
3.	Have the atmosphere of the tank or void checked by a qualified gas-free engineer in accordance with NSTM S9086-CH-STM-030, chapter 074 Vol 3.	
4.	Ventilate the space with a "Red Devil" blower or other positive ventilation procedure until satisfactory atmosphere samples are obtained.	
5.	Have a qualified ELT conduct a radiological survey of any potential radiation or surface contamination areas.	
6.	Leave matches, lighters, cigarettes, etc. outside of the tank or void to be entered. In the event that a tank designed to hold liquid is to be entered, check the applicable cleanliness instructions for special requirements.	
7.	Do not carry naked lights or any sparking electrical apparatus into the space.	
8.	Ensure that the manhole of a tank or void is guarded by another person who will keep count of the number of personnel in the space and maintain communication with them.	
9.	If burning or welding is to be done in a tank or void preserved with vinyl paint, all persons in that space shall wear air-fed respirators.	

_____ _____

Signature of Inspector Date

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VOLUME IV

CHAPTER 11

TECHNICAL DATA AND INFORMATION MANAGEMENT

REFERENCES.

(a) MSC Procedures Manual - Maintenance Support Center Library Procedures Manual
(b) SECNAVINST 5510.36 - Department of the Navy Information Security Program Regulation
(c) S0005-AA-GYD-030 - Guide for User Maintenance of NAVSEA Technical Manuals; NAVSEA Technical Manual Management Program
(d) NAVSEA S8800-00-GIP-000 - Handbook for Fleet Maintenance Activity Technical Library Personnel
(e) COMNAVAIRLANT/COMNAVAIRPACINST 4700.23 - Aircraft Carrier Maintenance Support Centers (MSC) Policy and Procedures
(f) FGC 2212 - Maintenance Support Center Procedures Manual
(g) SECNAVINST 5510.30 - Department of the Navy Personnel Security Program
(h) SL720-AA-MAN-010 - Fleet Modernization Program (FMP) Management and Operations Manual
(i) S9040-AC-IDX-010 - Ships 3-M Reference Information CD
(j) NAVSUP P2003 - Naval Logistics Library Navy Stock List of Forms and Publications
(k) NAVAIR 00-25-100 - Naval Air System Command Technical Manual Program

11.1 PURPOSE. This chapter defines the responsibilities of assigned departments with respect to the management of technical documentation and data and requires the establishment and operation of technical libraries.

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 TECHNICAL LIBRARIES. Maintenance Support Center (MSC) 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 Technical Library Management (TLMS) or Technical Document Management Information System (TDMIS) 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 abroad nuclear powered aircraft carriers, all NAVSEA 08 controlled documents shall be controlled by the Reactor Department Technical Publication Library. For MSCs having an Aviation Intermediate Maintenance Department (AIMD), all AIMD documents shall be controlled by the AIMD Librarian. The AIMD Library shall control all AIMD documents.

e. Maintain modem/internet access to the following computer networks/websites whenever possible.

(1) Technical Document Management Information System (TDMIS).
http://nsdsa.phdnswc.navy.mil/tdmis/tdmis.htm

(2) Military Engineering Drawing Asset Locator System.
http://www.dlis.dla.mil/medals/

(3) Naval Surface Forces, Atlantic Planning and Execution of Alterations and Repair (FMA and COMNAVSURFLANT and COMNAVSURFPAC commands only)
http://www.spear.navy.mil/ click on SPEAR info.

(4) Fleet Modernization Program Management Information System.

(5) Department of Defense Index of Specifications and Standards (DODISS).

(6) Naval Air Technical Data and Engineering Service Command (NATEC).
http://www.natec.navy.mil

(7) Monthly Advance Change Notice Report.
https://log04.phdnswc.navy.mil/tdmis

(8) Weekly Summary of Technical Directives and Interim Rapid Action Changes (IRAC) Tracker Report - http://www.natec.navy.mil

11.2.1 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 (k) (as applicable) to supply the necessary technical information.

b. Have at least a "Confidential" security clearance.

c. Should be a graduate of the Technical Library Management System Course at Space and Naval Warfare Systems Command Chesapeake, VA or have equivalent experience in the field of Logistic Technical Data.

d. Supervise personnel assigned to library.

e. 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 Activity 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 TLMS 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 a semiannual 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).

(11) Ensure manuals within library's inventory contain applicable Advance Change Notices (ACN), or IRACs. Verify each manual against the ACN report issued by Naval Sea Systems Command (NAVSEA) Data Support Activity, 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 TLMS for manual or automated verification. Verify Naval Supply Systems Command (NAVSUP) manuals with the modem Internet access.

(b) Verify NAVSUP manuals against NAVSUP 2002D. (i.e. NAVSUP 600 CD) or by performing a process verification file with TLMS/TDMIS.

(c) Compare each technical manual held with the ACN Report provided from NSDSA, Port Huenme, CA. This should be performed monthly.

(d) Compare each technical manual held with the Automatic Distribution List (501 Report) to ensure library is receiving the technical manual automatically. This function may be completed by performing the TDMIS 501 Automatic Distribution Process with TLMS or by requesting a 501 Report from NSDSA.

(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 semiannual inventories, annual data verifications and noted deficiencies for 24 months. The annual verification 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. Include requirements to:

(a) Use the bar code feature of TLMS to mark each technical manual in library inventory records (i.e. not borrowed by library from another source) with the command name and unique copy number.

(b) If Process Instructions or documents listed in DODISS or any alteration text documents are held in Satellite library inventories, verify that these documents are up-to-date at least semiannually, and upon receipt of an updated index.

(16) Establish procedures for issuing technical documents to Department of Defense contractor personnel using guidance provided in references (b) and (c) (FMA only).

(17) Be the department point-of-contact for the Integrated Logistics Overhaul team with respect to technical documentation.

11.2.1.1 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.

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 in work centers holding confidential material will have at least a "Confidential" security clearance.

11.2.2 Technical Library Materials. The technical library has a wide variety of technical information and data in many different forms and formats. In general, eight broad categories of information exist which are described in reference (d).

11.2.2.1 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 (unabridged) Index of Publications and Forms (NAVSUP Publication 2003).

e. DODISS.

11.2.2.2 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. Ship Configuration and Logistic Support Information System..

h. Ordnance Publications.

i. Ordnance Data.

11.2.2.3 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.

11.2.2.4 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.

11.2.2.5 Military Specifications and Standards. Military specifications and standards are specific, detailed requirements for equipment or material. Examples found in the DODISS include:

a. Military Specifications.

b. Department of Defense Specifications.

c. Military Standards.

d. Federal Specifications.

e. Military Handbooks.

11.2.2.6 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 Alterations, Machinery Alterations and Ordnance Alterations.

e. Planning Yard Work Instructions and Alterations Equivalent to Repair.

f. Navy Logistics Library (APL and Coordinated Shipboard Allowance List).

11.2.2.7 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. NAVSEA Instructions.

e. Type Commander Instructions.

f. Technical Directives.

11.2.2.8 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. Industrial Process Instruction.

11.3 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 lists the titles and drawings applicable to the ship.

11.3.1 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 divided into three volumes and organized in the following manner:

(1) Volume One is normally organized by Expanded Ship Work Breakdown Structure numbers as the first five characters of a Hierarchical Structure Code (HSC). If the HSC has further

breakdown, the equipment is separated into the last characters of an HSC. Under each HSC, the equipment is listed in Repairable Identification Code sequence, then in publication number sequence. General ship related manuals will have a HSC of 00001.

(2) Volume Two is organized in Publication Number sequence. Under each publication, the supported equipment is listed in HSC, then Repairable Identification Code sequence.

(3) Volume Three is organized into four broad categories:

(a) General and Ship Related Publications are selected by their Ship applicability and publications group code, then sorted into publication number sequence.

(b) Electronics Publications are selected and sequenced by Joint Electronics Type Designator.

(c) Hull, Mechanical and Electrical Publications are selected and sequenced by the Repairable Identification Code.

(d) Ordnance Publications are selected and sequenced by system equipment Mark and Model numbers.

11.3.2 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 made by the industrial activity to reflect work performed during Chief of Naval Operations Maintenance Availabilities and Fleet Maintenance Activity 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.

11.4 MAINTENANCE SUPPORT CENTERS.

a. (Aircraft Carriers only) MSCs provide a centralized organization to aid the Work Center technicians by incorporating Integrated Logistics Support problem solving methods. MSC personnel operate from a central facility with reference material and resources of Integrated Logistics Support troubleshooting readily available. The MSC will function within the policy and procedural guidelines of references (e) and (f).

b. The MSC develops 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 the solutions for 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) 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 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, as defined above, including the following classes of surface ships:

a. DD 963

b. DDG 993

c. DDG 51

d. FFG 7

e. CG 47

f. 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 (b) 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 the 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.

APPENDIX A

SAMPLE LAYOUT OF INSPECTION AREAS

	G	1	3	4	2	1	3	4	2	1	3
	F	4	2	1	3	4	2	1	3	4	2
	E	1	3	4	2	1	3	4	2	1	3
	D	4	2	1	3	4	2	1	3	4	2
STRAKE	C	1	3	4	2	1	3	4	2	1	3
	B	4	2	1	3	4	2	1	3	4	2
	A	1	3	4	2	1	3	4	2	1	3
		18	19	20	21	22	23	24	25	26	27

FRAME

Numbers denote the areas to be tested on each inspection (i.e., the first inspection consists of all number 1 - Requirements for Nondestructive Testing Methods, the second inspection, all number 2's, etc).

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APPENDIX B

HULL REPORTING FORMAT

Strake

Frame Boundary Nos.	Original Drawing Thickness	Minimum Allowable Thickness (75% of Orig)	Actual Thickness	Frame Boundary Nos.	Original Drawing Thickness	Minimum Allowable Thickness (75% of Orig)	Actual Thickness

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VOLUME IV

CHAPTER 13

WEIGHT HANDLING EQUIPMENT TESTING AND INSPECTION

REFERENCES.

(a) NAVFAC P-307 - Management of Weight Handling Equipment, Maintenance and Certification
(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, Volume 2
(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 0901-LP-120-0001 - NSTM Chapter 9120 (Hull Fittings, Lashing Gear, and Access 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 709-6250295 - Weapons Handling Equipment SSN 637 Class Test Loads/ Methods and Inspection Procedures
(ae) NAVSEA STD DWG 709-5549373 - Weapons Handling Equipment SSN 688 Class Test Loads/ Methods and Inspection Procedures
(af) NAVSEA STD DWG 709-6633924 - Vertical Launch System Weapons Handling Equipment SSN 688 Class Test Loads/Methods and Inspection Procedures
(ag) NAVSEA STD DWG 709-5549374 - Weapons Handling Equipment SSN 726 Class Test Loads/ Methods and Inspection Procedures

(ah) NAVSEA STD DWG 709-6726350 - Weapons Handling Equipment SSN 21 Class Test Loads/ Methods and Inspection Procedures
(ai) NAVSEA S9086-UU-STM-010 - NSTM Chapter 613 (Wire and Fiber Rope and Rigging)
(aj) NAVSEA 0989-LP-030-7000 - Lifting Standard
(ak) Title 10 U.S. Code - Title 29 CFR, Part 1910 (Occupational Safety and Health Standards)

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 WHE will be conducted using a Controlled Work Package developed in accordance with Volume V, Part I, Chapter 2 of this manual.

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

(1) No-load Test.

(2) Static Load Test.

(3) Dynamic Load Test.

(4) Rated Load Test.

b. Results of completed weight tests will be documented on QA form 17, using the procedures of Volume V, Part I, chapter 11 of this manual. The serial number (if known) of the equipment shall be recorded on the weight test record.

c. Handling equipment that has satisfactorily passed the required inspections and load testing shall be so marked by the activity conducting the tests. As a minimum, this marking shall include the name of the testing activity, the date (year and month) tested and the rated load or SWL.

(1) Where there is little available space for surface marking, such as on wire rope slings, the item may be marked with a Periodic Load Test Record Strap as shown in reference (e).

(2) Nylon webbing slings shall have etched leather tags sewn to each sling leg to identify the leg and indicate test results as described in reference (f).

(3) Stamped, etched or engraved metal tags, which are attached to the tested item with mechanical fasteners or adhesives, may also be used.

(4) Color coding, for local control only, may be used in addition to, but not as an alternate to, one of the authorized marking methods.

(5) Wired-on metal tags **shall not** be used.

d. A permanent shipboard log shall be maintained to record the following information:

(1) Equipment identification.

(2) Date of the test or inspection.

(3) Description of the test or inspection.

(4) Weight used for the test, in pounds.

(5) Testing activity.

e. New hooks, blocks, sheaves, wire rope, fiber rope, and other loose hardware or gear need not be load tested after installation if it has not been modified and has been purchased to Military Specifications (MILSPEC) or NAVSEA standard drawings through the Naval Supply System. Any load carrying loose gear procured otherwise shall be tested prior to placing in-service to 200% of the SWL of the part in question. If any sheave, block or hook assembly is received that does not bear the manufacturer's test stamp, it shall be tested to 200% of the SWL.

f. Unless otherwise specified, load test capacity tolerance shall be +5%, -0%.

13.2.3 Load Test Types.

13.2.3.1 Static Load Test.

a. Unless otherwise specified, all arrangements for handling and supporting weights (including weights of personnel), all arrangements for taking heavy strains, and all parts upon which the safety of the ship or life depend, shall be given a static load test equal to twice the rated load. In cases where the rated load is not specified, the test load shall be based on the expected duty of the auxiliary, appliance, or fitting. For hoisting arrangements, the static test load shall be suspended clear of all supports and held suspended for a sufficient period to permit inspection of welds and other fastenings, but need not be lifted or moved by a gear under test. After relieving the static test load, there shall be no evidence of permanent deformation of structure.

b. The equipment or system to be tested shall not be used to lift the total static test load. Static load tests shall be completed prior to performance of operational tests. Where static test loads exceed 40% of rope breaking strength, the ship's rope shall not be used for the static test.

13.2.3.2 Dynamic Load Test. Weight handling arrangements shall be tested to demonstrate capacity to withstand additional loads imposed on a system when operating under unfavorable sea conditions at reduced speed. The dynamic load test shall be conducted to demonstrate handling equipment load capabilities throughout the complete operating range. As far as practicable, test loads shall be moved completely through the equipment operating range, within the limits of all operating modes.

NOTE: IF THE EQUIPMENT USES HYDRAULIC POWER, THE SYSTEM RELIEF VALVES SHALL BE CHECKED FOR PROPER SETTINGS BEFORE PERFORMING A DYNAMIC LOAD TEST.

13.2.3.3 Rated Load Test. Following satisfactory completion of the dynamic load test, the rated load test shall be conducted to demonstrate capability to operate with a full load, at rated speed, through the complete range of operating limits. As far as practicable, test loads shall be moved completely through the equipment operating range, within the limits of all operating modes. Proper operational functions shall be demonstrated at each speed in all operating modes. The mechanical safety devices shall be tested for their ability to stop and hold when carrying rated load at rated speed.

13.2.4 Load Test Periodicity.

a. In the interest of personnel safety and equipment protection, inspection and testing of all WHE not covered by Planned Maintenance System (PMS) or other directives will be performed at intervals not to exceed four years. A PMS feedback will be submitted for each piece of WHE not covered by PMS.

NOTE: PER NAVSEA DIRECTION, STATIC, DYNAMIC AND RATED LOAD TESTING OF MAIN STORAGE BATTERY LIFTING GEAR INSTALLED IN SUBMARINE BATTERY COMPARTMENTS IS NOT REQUIRED UNLESS REPAIRS TO STRUCTURAL OR WEIGHT SUPPORTING COMPONENTS HAVE BEEN ACCOMPLISHED. FOLLOWING REPAIRS, LOAD TESTING WILL BE ACCOMPLISHED DURING BATTERY REPLACEMENT AFTER THE BATTERY CELLS HAVE BEEN REMOVED.

b. Testing of the following components is required when newly installed or after major structure repair or modification. Periodic testing is normally not required unless deterioration or damage is suspected, or as directed by PMS.

(1) Accommodation ladders.

(2) Cleats.

(3) Gangplanks.

(4) Leadsman platform.

NOTE: SSN 688 CLASS LIFELINE STANCHIONS DO NOT REQUIRE WEIGHT TESTING FOLLOWING MANUFACTURE OR REPAIR.

(5) Liferails/stanchions.

(6) Lifelines.

(7) Padeyes.

(8) Portable davits.

(9) Reversible eyebolts.

(10) Slings.

(11) Safety nets (not including deck edge safety nets).

(12) Vertical ladders.

13.2.5 Crane Certification Program.

a. A Crane Certification Program shall be implemented in each ship with a crane installed or assigned, in accordance with reference (g).

b. Guidelines for training and qualification of personnel responsible for shipboard crane operation and maintenance are contained in reference (g).

13.2.6 Daily Inspections. Daily, before use visual inspections shall be conducted as follows:

a. Ammunition handling equipment.

(1) A daily, before use visual inspection shall be performed in accordance with PMS for the assigned equipment before any load handling operations.

(2) A no-load operational test shall be conducted by each shift prior to handling ammunition.

b. All handling equipment selected (including slings, shackles, turnbuckles, strongbacks, chain hoists and taglines) shall be visually inspected before use for obvious material deficiencies, equipment capacity markings and load test expiration date (as applicable).

c. Before beginning crane operations for each new day, a qualified crane operator shall perform an inspection of each crane to check for discrepancies in the crane's structure or operating controls using the crane Operator's Daily Check List provided in reference (g).

13.2.7 Use of Nylon Straps.

a. The use of knotted nylon strapping as handling equipment is prohibited.

b. Rigging with nylon straps is permitted only when nylon strapping is equipped with sewn (lifting) eyes and static load tested to 200 percent of rated load.

c. When available handling equipment (for example, wire rope slings) cannot be properly attached, or load surface damage may occur, 6,000-pound (rated breaking strength) nylon strapping is permitted only for loads up to 1,000 pounds.

d. Webbing slings shall be inspected for abrasions and fraying of the webbing and stitching, and broken stitches. Slings shall not be used if signs of deterioration are noted.

13.2.8 Weight Test Procedure Matrix. The following matrix provides sources of load test procedures for shipboard equipment/systems that may require periodic load testing or testing following fabrication or repair:

EQUIPMENT/SYSTEM INSPECTIONS AND TESTING	GOVERNING DOCUMENT(S) FOR MAINTENANCE
Aircraft Elevators	Reference (h), PMS
Aircraft Tiedowns	References (i) and (j)
Anchoring	Reference (k), PMS
Ammunition Handling	References (e), (l) through (p), PMS
Boats & Boat Davits	Reference (f), PMS
Booms	Reference (q), PMS
Cargo & Weapons Elevators	Reference (r), PMS
Cleats	Reference (s)
Cranes	Reference (g), PMS
Deck Edge Safety Nets	References (t) and (u)
Deck Screw Reversible Eyebolts	Reference (v)
Hoists	Reference (w), PMS
Hull Fittings	Reference (x), PMS

EQUIPMENT/SYSTEM INSPECTIONS AND TESTING	GOVERNING DOCUMENT(S) FOR MAINTENANCE
Portable Davits	Reference (y)
Reactor Plant Lifting and Handling Equipment	References (b) through (d)
Stores & Provision Handling	Reference (w), PMS
Temporary Padeyes	Reference (z), Section 611
Trunk Safety Nets	Reference (aa)
Underway Replenishment	Reference (ab), PMS
Vehicle Tiedowns	Reference (ac)
Weapons Handling Equipment SSN 637 Class	Reference (ad)
Weapons Handling Equipment SSN 688 Class	Reference (ae)
Vertical Launch System - Weapons Handling Equipment SSN 688 Class	Reference (af)
Weapons Handling Equipment SSBN/SSGN 726 Class	Reference (ag)
Weapons Handling Equipment SSN 21 Class	Reference (ah)
Wire and Fiber Rope and Rigging	Reference (ai)

13.3 NAVAL FACILITIES ENGINEERING COMMAND ASHORE REQUIREMENTS. WHE assigned to naval shore activities and utilized only in ashore operations or aboard ships when the ship is pierside shall be certified, tested, inspected and operated in compliance with reference (a). 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 (this does not apply to ordnance or radiological lifting and handling). Reference (a) covers line handling mechanisms on floating cranes, hoists and chainfalls which are used in multiple locations, and portable and adjustable gantry cranes and floor cranes. Material handling equipment is covered by Naval Supply Systems Command criteria.

13.3.1 Certification Program. The Commanding Officer is responsible for ensuring safety within the activity and shall designate a WHE certifying official who shall ensure the activity's WHE is inspected, tested and certified in accordance with reference (a).

13.3.2 Operator Licensing Program. All Navy civilian and military personnel assigned duties involving the operation of Navy shore based Category 1, 2, Cab Operated Category 3 or Category 4 WHE shall be qualified and licensed in accordance with the provisions of reference (a).

13.3.2.1 Operator Qualification and Testing. All applicants for Crane Operation Licenses shall meet the requirements of reference (a).

13.3.2.2 Licensing Procedures and Documentation. Reference (a) contains the necessary procedural requirements for licensing and documentation.

13.3.3 Inspections.

a. Pre-Use Check (Category 1, 2, Cab Operated Category 3 and Category 4 Cranes). The operator shall perform an inspection of their assigned crane using a Crane Operator's Daily Checklist as required by reference (a).

b. Reference (a) gives specific instructions for conducting and reporting the following inspections:

(1) Walk Around Inspection.

(2) Machinery House Inspection.

(3) Operator Cab Inspection.

(4) Operating Inspection.

c. Pre-Use Check (Non-Cab Operated Category 3 Cranes) shall be performed in accordance with reference (a).

13.3.4 Test Procedures. Reference (a) contains instructions for performing crane test procedures.

13.3.5 Special Purpose Service. Activities using special purpose service cranes shall follow the requirements of reference (aj) in addition to criteria contained in reference (u).

13.4 SLINGS. Slings used in conjunction with other material handling equipment for the movement of material ashore by hoisting are covered by reference (ak).

a. A sling is an assembly which connects the load to the material handling equipment.

b. Slings include those made from alloy steel chain, wire rope, metal mesh, natural or synthetic fiber rope (conventional three strand construction), and synthetic web (nylon, polyester, and polypropylene).

13.4.1 Crane Rigging Gear and Miscellaneous Equipment. Reference (a) contains maintenance, inspection and test requirements for the following common rigging gear:

a. Slings.

b. Shackles, links, rings, swivels, eye bolts, turnbuckles, hooks and swivel hoist rings.

c. Tackle blocks.

d. Portable load indicating devices (dynamometers, load cells, crane scales, etc.).

e. Lashing (e.g., wire rope, synthetic rope, synthetic webbing).

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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) OPNAVINST 4790.4 - Ships' Maintenance and Material Management (3M) 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 Alterations) 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 15

CIRCUIT BREAKERS

REFERENCES.

(a) NSWC Philadelphia ltr 9320, Ser 934/010 dated 19 Mar 2001, titled Shipboard Circuit Breaker Maintenance and Overhaul Policy

15.1 PURPOSE. To promulgate the Naval Sea Systems Command (NAVSEA) policy on maintenance and overhaul of Navy shipboard shock-hardened circuit breakers of both ACB and AQB types specified in reference (a).

15.2 CIRCUIT BREAKER FUNCTION AND ACQUISITION ON NAVY SHIPS. Circuit breakers onboard Navy ships and submarines are used primarily to provide electrical system protection against disruptive and sometimes destructive abnormal currents. This protection is so precise that it selectively removes only the cause of the abnormal current (such as electrical system damage acquired in battle) while continuing to power other unaffected weapons, electronics and electrical systems. This continuous supply of electrical power is also ensured by the unique ability of these circuit breakers to maintain proper position during severe impacts produced by missiles, bombs, mines, torpedoes and other detonation sources. Due to the unique nature and critical function of Navy shock-hardened circuit breakers, their acquisition is controlled through a Qualified Products List (QPL) governed by requirements set forth in appropriate military specifications. There is no equivalent commercial requirement.

15.3 CIRCUIT BREAKER OVERHAUL FACILITIES AND PART PROCUREMENT. Type AQB circuit breakers with non-replaceable trip units (100 amp and smaller sizes) are not repairable. All other circuit breakers are classified as Depot Level Repairable. NAVSEA has designated Puget Sound Naval Shipyard and the Original Equipment Manufacturer (OEM) as Designated Overhaul Points (DOP) for these items. The current OEMs offering overhaul service for their products are SPD Technologies, Inc., Whipp & Bourne, and Eaton/Cutler-Hammer (for Westinghouse breakers). Other (obsolete) ACB and AQB circuit breakers are overhauled by the Navy DOP. The ability to repair and refurbish circuit breakers is a "core" Naval Shipyard and TRIDENT Refit Facility (TRF) function, with all Naval Shipyards expected to maintain and execute this capability. This does not imply all Naval Shipyards or the TRFs will be appointed DOP status. The single Navy DOP at Puget Sound Naval Shipyard along with the OEMs and their service centers provide production capability and capacity to meet the requirements for restoration of stock assets to Ready For Issue condition and meet other routine circuit breaker overhaul requirements. Prior to the initial listing of a vendor's circuit breaker on the QPL, the OEM must successfully demonstrate by appropriate tests and inspections that the circuit breaker passes all the requirements contained in the military specification. To maintain the integrity of the circuit breaker as a qualified product, NAVSEA prohibits the local manufacture or fabrication of certain (restricted) parts during repair or overhaul. Due to the critical nature and stringent materials and manufacturing requirements, the Navy restricts the manufacture of these parts to the OEM listed for the particular circuit breaker. Specifically, all replacement parts for circuit breakers, except fasteners and general hardware items, are restricted parts. Non-restricted parts include nuts, bolts, screws, washers, lockwashers, cotter pins, O-rings, indicator lights, and indicator light globes (colored and clear). The restricted replacement parts shall be obtained from the Federal Stock System, the OEM or approved material diversion.

15.3.1 Submarines. NAVSEA has established a pool of circuit breakers removed from inactivated SSN 688 Class submarines to support SSN 688 and SSBN/SSGN 726 Class submarine's lifecycle requirements. The OEM has designated some circuit breakers still in use as obsolete and may no longer readily support them with parts. For obsolete breakers no longer supported by the Federal Stock System, Puget Sound Naval Shipyard and in some cases Ship's Maintenance Monitoring Support Performance Monitoring Teams (PMT), may be a source of parts. The ship must obtain the parts by approved material diversion. This will allow Puget Sound Naval Shipyard to either make parts or purchase parts from the OEM. The OEM can still manufacture the obsolete parts but the cost could be excessive. Even after the shipboard repairs are complete, the pay back is critical to ensure the lifecycle pool is maintained. If the lifecycle pool is allowed to deteriorate, circuit breakers for future requirements may not be available.

15.4 NAVY POLICY ON SHIPBOARD CIRCUIT BREAKER MAINTENANCE AND OVERHAUL.

a. Not Repairable Circuit Breakers. Type AQB circuit breakers with non-replaceable trip units (100 amp and smaller) are not repairable. Any attempt to open and repair this type of circuit breaker results in an unacceptable risk to subsequent performance, even if retest is performed.

b. Overhauls shall be performed by the Navy DOP at Puget Sound Naval Shipyard or the OEM. Class A and B overhauls are defined below:

(1) Class A Overhaul. An extensive overhaul that involves complete disassembly and refurbishment, such as re-plating mechanical and electrical parts, and replacing the wire harness. The "most recent" design and technical specifications will be met. The end product shall be in "like new" condition in appearance, operation and performance. All manufacturers' and technical manual performance standards and specifications, and all technical documentation, unless superseded by proper authority, shall be met. The repair activity shall demonstrate that the end product successfully meets all performance criteria of the governing specifications. Defining an overhaul as Class "A" means that all actions required to meet the definitions are authorized.

(2) Class B Overhaul. A less extensive overhaul that re-uses most of the existing parts to restore the operating and performance characteristics of a circuit breaker to its original design and technical specifications. Machinery Alterations, field changes and modifications, even if applicable, are not to be accomplished unless specified by proper authority. The repair activity shall demonstrate that the end product successfully meets all performance criteria of the governing specifications.

c. Non-OEM Vendors. When commercial repair facilities other than the OEM express an interest in performing repair and overhaul work, they must demonstrate to NAVSEA the capability to perform the work. Capability to perform circuit breaker overhaul and repair work includes having the facilities, trained mechanics, and access to the OEM's qualified parts and repair procedures. Use of nonqualified, restricted parts violates the integrity of the circuit breaker, nullifying the breaker's prior qualification under the QPL process. Restricted parts must be obtained from the OEM either directly or via the Federal Stock System (with the exceptions as noted above). If a restricted part is replaced with an unqualified part, the qualification of the particular circuit breaker is revoked until the full set of QPL required tests are repeated and submitted to NAVSEA for approval.

d. Fleet Maintenance Activities and Organizational Level Maintenance and Repair. Maintenance and repair of circuit breakers by Organizational and Fleet Maintenance Activities includes cleaning, inspection, lubrication, accomplishment of technical manual specified corrective maintenance, and operational testing and replacement of the bolt-on parts (obtained from qualified sources). Bolt-on parts include charging motors, arc chutes, auxiliary switches, closing relays, electronic trip units (only units that are adjustable with a portable trip unit calibration test set), indicator lights and indicator light transformers, rectifier units and resistors, secondary disconnects, shunt trip units, transformers, undervoltage trip units, and wiring and connections. Repairs which alter the breaker calibration, require major disassembly of the operating mechanism, or require re-plating must be performed at either a depot level activity or a TRF. Repairs of this type conducted by a non-depot level activity (other than a TRF) to meet operational commitments, must be certified at the earliest available opportunity by an authorized depot activity (DOP, TRF, or Naval Shipyard with demonstrated circuit breaker repair and retest capability). Type Commanders should ensure a Departure From Specification is processed for the above types of emergent repairs.

e. (Submarines Only) Performance Monitoring Teams. PMTs are permitted to perform in-depth circuit breaker maintenance and repairs as an augmentation to Forces Afloat maintenance when the PMT member is designated, trained, certified, and provided with the proper equipment. The PMT shall not make calibration repairs or adjustments that require shop verification by primary current injections. These types of calibration and certification adjustments shall only be accomplished by an authorized depot activity. NAVSEA 08 has authorized the Ship's Maintenance Monitoring Support PMTs to conduct repairs on NAVSEA 08 cognizant circuit breakers similar to those on non-nuclear applications.

f. NAVSEA 08 cognizant circuit breakers. If questions or technical issues arise regarding NAVSEA 08 cognizant circuit breakers which cannot be resolved by consulting the applicable technical manual, prepare a Trouble Record or Liason Action Request and submit to Assistant NAVSEA Technical Representative, Schenectady, NY in accordance with the Commissioned Submarine/Surface Ship General Reactor Plant Overhaul and Repair Specification.

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CHAPTER 16

AIRCRAFT LAUNCH AND RECOVERY SYSTEMS FOR AVIATION SHIPS

REFERENCES.

(a) OPNAVINST 4790.4 - Ships' Maintenance and Material Management (3-M) Manual
(b) OPNAVINST 4790.15 - The 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, Restricted Availabilities, and Technical Availabilities, and to ships not in a repair status. All industrial activity repairs, modifications, and operational tests of shipboard, launching, recovery and VLAs will be monitored by a CAFSU representative. All technical questions concerning the equipment may be directed to the local CAFSU representative. CAFSU shall recommend approval or disapproval of work after consultation with the TYCOM. CAFSU will submit timely written reports concerning repairs, alterations and work accomplished to the Commanding Officer NAVAIRWARCEN for appropriate action and distribution.

16.4.1 Responsibilities.

16.4.1.1 Aircraft Carrier Commanding Officer.

a. Request CAFSU technical assistance when required, by message, letter, or informal means from the TYCOM. In the case of a formal request direct an information copy to the local CAFSU field office.

b. Provide appropriate berthing and messing facilities for CAFSU representatives when embarked.

c. Pass to the TYCOM (N433/N435) any comments concerning meritorious or substandard performance of CAFSU representatives.

d. Upon completion of the CAFSU assignment at sea, ensure timely departure from the ship.

16.4.1.2 Industrial/Repair Activity.

a. Provide support to the CAFSU representative, as appropriate to allow for accomplishment of the objectives set forth in paragraph 16.2.2 of this chapter.

b. Refer technical questions concerning the launching, recovery, and VLA equipment to the local CAFSU representative for timely resolution.

16.5 NAVAL AVIATION DEPOT.

a. The Naval Aviation Depots maintain and operate facilities to perform:

(1) A complete range of industrial level rework operations on designated weapon systems, accessories, and equipments.

(2) Manufacturing of parts and assemblies as required.

(3) Engineering services in the development of change hardware design.

(4) Technical and other professional services for Aircraft Carrier maintenance and logistic problems.

(5) Other levels of Aircraft Carrier maintenance for eligible activities upon specific request or assignment.

(6) Other functions as directed by NAVAIR.

b. In order to meet the material support needs of the operating forces, by accomplishment of the above mission, the following specific functions are assigned:

(1) Perform depot maintenance functions for aircraft, engines, and their components and accessories. Ground Support Equipment trainers, and training equipment as specified in appropriate Aircraft Maintenance Program directives.

(2) Provide engineering, technical, and professional services in support of rework of specific aircraft, engines, aeronautical components, Peculiar Ground Support Equipment, trainers, and training equipment.

(3) Perform shipwork designated as Ship Installations Equipment and systems with the same priority as aircraft rework.

(4) Serve as the major maintenance, repair, and modification point for assigned missiles.

(5) Provide calibration services as assigned by higher authority.

(6) Perform as the NAVAIR Weapons System Support Officer for the overall management of the NAVAIR Engineering Support Office, Weapon Systems Management Office for assigned weapons, and Integrated Logistic Support Office.

(7) Perform as a Cognizant Field Activity for assigned aircraft, equipment, and Peculiar Ground Support Equipment.

16.6 NAVAL AVIATION DEPOT VOYAGE REPAIR TEAM.

a. Naval Aviation Depot Operations Instruction 13800.1 denotes organizational relationships between the TYCOM and the VRT and defines the TYCOM's responsibility, authority for workloading, and operational control of the VRT. Control is exercised through the TYCOM (N433/N435).

b. To provide industrial level support for Ship Installation Equipment (ALRE) the VRT is used to support the following:

(1) Casualty Reports.

(2) Enroute maintenance/Underway repairs.

(3) Miscellaneous repairs beyond Ship's Force capability.

(4) Rotatable spare overhaul.

(5) Special reports.

(6) Preparation for Overseas Movement repairs.

(7) Service Change installations.

(8) Modernization/repair of components in conjunction with Chief of Naval Operations Maintenance Availabilities, Planned Maintenance System or Restricted Availabilities.

c. The capabilities of the VRT are such that almost any task related to launch and recovery equipment is feasible, assuming adequate support from Ship's Force is available. The following ship's support for the VRT is required:

(1) Timely Current Ship's Maintenance Project deferral submission for the Maintenance Manager and TYCOM screening/programming.

(2) Providing sufficient V-2 Division personnel to assist the team, in such areas as providing forklifts, obtaining necessary parts, gaining machine shop assist and space access, etc.

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CHAPTER 17

STEAM CATAPULT INSPECTION

REFERENCES.

(a) NAVSEA S9587-B1-MMA-010 - Catapult Steam Support Systems for CV/CVN Class Ships; Description, Operation and Maintenance
(b) OPNAVINST 9221.1 - U.S. Navy Steam Generating Plant Inspection and Inspector Training and Certification Program
(c) NWP 1-03.1 - Naval Warfare Publication Operational Report
(d) OPNAVINST 5100.19 - Navy Occupational Safety and Health (NAVOSH) Program Manual for Forces Afloat
(e) NAVSEA S9086-CH-STM-030 - NSTM Chapter 074 Volume 3 (Gas Free Engineering)

17.1 PURPOSE. To establish policy and provide procedures and inspection requirements for Steam Catapult Accumulators and support systems including:

a. Inspection scheduling.

b. Required preparations for inspections.

c. Inspection guidelines.

d. Reporting requirements.

17.1.1 Policy. Periodic standardized inspections are required of all steam catapult accumulators and associated support systems including steam fill and blowdown systems, feed water fill and drain systems, steam piping and accumulator drain systems, control and indicating systems associated with the fill, pressurization and blowdown of the steam catapult accumulators. Specific inspection criteria, attributes and intervals are detailed in reference (a). Inspections will be conducted by a certified Steam Generating Plant Inspector (SGPI) in accordance with the requirements of reference (b). Responsibilities for continuation and standardization of catapult accumulator inspections will closely parallel those requirements and responsibilities of the boiler inspection program described in reference (b), as modified by reference (a). The boiler inspection program is detailed in Chapter 3 of this volume.

17.2 TYPES OF INSPECTIONS.

a. Routine Inspection.

b. Strength and Integrity Inspection.

c. Newly constructed ship inspection.

d. Inactivation or Reactivation inspection.

e. Unscheduled inspections.

17.3 RESPONSIBILITIES.

17.3.1 Naval Sea Systems Command.

a. Provide the overall management of the SGPI program to include specific training and documentation with respect to catapult accumulator and support systems inspections.

b. Provide program support and management of the Steam Catapult Inspection and Repair Maintenance Information System (SCIRMIS).

17.3.2 Naval Surface Warfare Center, Carderock Division.

a. Provide technical management of the SGPI program as it applies to steam catapult accumulator inspections. Ensure technical documentation to support the catapult accumulator inspection program is maintained current.

b. Establish and monitor the requirements and standards for the various catapult accumulator inspections. Ensure all inspection reports are entered into SCIRMIS.

c. Provide technical management of the SCIRMIS.

d. Ensure catapult accumulator inspections are conducted on ships under construction and ships being inactivated.

17.3.3 Type Commander.

a. Provide or arrange for certified SGPIs to perform inspections in accordance with the requirements of reference (a).

b. Schedule inspections of all catapult accumulators and support systems required by reference (a). Coordinate the inspections with the appropriate technical activities to avoid unnecessary opening of accumulators.

c. Assist Commanding Officers in arranging for the corrective action of deficient items which are beyond the capability of Ship's Force to perform. Monitor the follow-up action required to correct these deficiencies.

d. Review the SCIRMIS to ensure deferred inspection deficiencies are planned/programmed for repair.

17.3.4 Regional Support Group/Fleet Maintenance Activity Commanding Officers.

a. Provide a certified SGPI, when requested by the ship, Immediate Superior in Command (ISIC) or TYCOM, to conduct the accumulator inspections.

b. Assign inspections to available SGPIs from local commands, when requested.

17.3.5 Ship Commanding Officer.

a. Request inspections and recommend to the TYCOM the desired primary and alternate dates for accomplishment of the inspections.

b. Prepare for the scheduled inspections.

c. Conduct Ship's Force responsible inspections and provide reports required by reference (a).

d. Review inspection results and initiate corrective action for those deficiencies within Ship's Force capability. Submit OPNAV 4792/2K work requests for those corrective actions beyond Ship's Force capability. Submit a Casualty Report in accordance with reference (c) for any discrepancies that will impact an operational schedule.

e. Assess the impact of corrective actions on the ship's operating schedules and advise the TYCOM and operational commanders of any adverse effects.

17.3.6 Steam Generating Plant Inspector.

a. Maintain certification per the requirements of reference (b).

b. Perform inspections in accordance with the requirements of reference (a), as assigned.

17.4 INSPECTION SCHEDULING. Commands will initiate inspection requests in a timely manner to ensure inspections are scheduled in compliance with reference (a).

17.5 SAFETY PROCEDURES.

a. Ensure idle accumulator condition is accomplished in accordance with the provisions of the Engineering Operational Sequencing System and reference (a) in preparations for the inspection.

b. Ensure all safety precautions associated with entry into sealed tanks, voids and/or pressure vessels including gas-free certification are performed in accordance with the requirements of reference (d) and (e).

c. Ensure proper maintenance barriers are established per the requirements of Chapter 10 of this volume.

d. Station an attendant outside the accumulator to provide assistance when maintenance is being performed on the accumulator internals.

e. Maintain accountability of all items taken into an accumulator. Foreign Material Exclusion closures will be used to the maximum extent practical to prevent tools or other foreign materials from being inadvertently left in the accumulator or associated ship's systems.

(1) Personnel entering accumulators will empty their pockets of all unnecessary items.

(2) Removal of all items and foreign material exclusion closures from the accumulator will be verified and accounted for prior to conducting a final close-out inspection.

17.6 CATAPULT ACCUMULATOR INSPECTIONS AND REQUIREMENTS. Catapult accumulator inspections conducted in accordance with the requirements of reference (a) shall fulfill all other catapult accumulator inspection requirements. When practical, various inspections should be scheduled for coincidental performance.

17.6.1 Routine Inspection. Routine inspections will be conducted at least once every 18 months by a TYCOM SGPI. The 18 month period begins with the first warm-up of the catapult accumulator to normal operating temperature and pressure following the previous routine inspection. Routine inspections may be conducted as early as 12 months or as late as 24 months to provide scheduling flexibility. Inspections that exceed the 18 month interval must have TYCOM concurrence.

17.6.2 Strength and Integrity Inspection. The interval between strength and integrity inspections shall be 60 months. The 60 month period commences with the first heat-up of the catapult accumulator to normal operating temperature and pressure following the previous strength and integrity inspection. These inspections may be conducted as early as 48 months or as late as 72 months to provide scheduling flexibility. Inspections that exceed the 60 month interval shall have TYCOM concurrence and be approved by Naval Surface Warfare Center, Carderock Division (NSWCCD). Strength and integrity inspections **shall not** exceed 72 months. Strength and integrity inspections will be conducted by NSWCCD and a TYCOM SGPI.

17.6.3 Newly Constructed Ship Inspection. This inspection shall be conducted in conjunction with The Board of Inspection and Survey during the Acceptance Trials period. This inspection serves as the initiating inspection for both the routine and the strength and integrity inspections and will include the same inspection attributes as the strength and integrity inspection. This inspection will be conducted by NSWCCD and a TYCOM SGPI as scheduled by the industrial activity or Supervisor of Shipbuilding, as applicable.

17.6.4 Inactivation or Reactivation Inspection. This inspection shall use the attributes of a strength and integrity inspection and shall be conducted prior to the final action (in the case of inactivation) unless a strength and integrity inspection has been conducted in the last 18 months. In this instance, the last inspection report may be used to document accumulator lay-up condition. For reactivations, a strength and integrity inspection shall be scheduled by the cognizant activity and conducted by NSWCCD and a TYCOM SGPI prior to reactivation of the unit.

17.6.5 Unscheduled Inspections. Additional catapult accumulator inspection will be conducted in accordance with the requirements of the applicable accumulator technical manual whenever the following conditions exist:

a. Variations in endspeed. Whenever variations in catapult endspeed are experienced.

b. Reinspection of replaced manifold gasket. Whenever the internal flanged joint gasket is replaced, the joint shall be reinspected, on a not to interfere with operations basis, upon the first cool down following initial operations.

17.7 INSPECTION GUIDELINES AND REPORTS.

17.7.1 Guidelines.

a. All inspections will be conducted using the requirements of reference (a). The catapult accumulator, including the support systems identified in paragraph 17.1.1 of this chapter will be inspected and the results documented in the SCIRMIS.

b. All Repair Before Operate deficiencies shall be corrected and re-inspected by a certified SGPI (preferably the same SGPI noting the discrepancy) prior to heat-up of the catapult accumulator.

17.7.2 Reports. The inspector(s) conducting the inspection shall provide a report of the inspection results to the ship's Commanding Officer (or designated representative) following completion of the inspection. The results shall also be entered into the SCIRMIS data base. A copy of the report will be provided to the TYCOM, ISIC, Regional Support Group/Fleet Maintenance Activity, and NSWCCD.

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VOLUME IV

CHAPTER 18

SUBMARINE SALVAGE INSPECTION

REFERENCES.

(a) NWP 1-03.1 - Naval Warfare Publication Operational Report

LISTING OF APPENDICES.

A Standard Submarine Salvage Inspection Check-off List
B Pre-Inspection Information/Certification
C Sample Report of Salvage Inspection Forwarding Letter

18.1 PURPOSE. To ensure the continued readiness and quality of maintenance performed on submarine rescue and salvage equipment.

18.2 INSPECTIONS.

18.2.1 Periodicity. The readiness of submarine rescue and salvage equipment is determined by periodic salvage inspections. Salvage inspections will be conducted within a 48 month interval, or as listed below:

a. Whenever requested by the submarine.

b. Prior to initial builder's trials for new construction ships, prior to initial sea trials for ships in Chief of Naval Operations (CNO) Maintenance Availabilities, and prior to initial sea trials for ships in Interim Dry Docking.

c. A partial salvage inspection will be completed for all items worked during an availability (i.e., hatches, salvage air valves, etc.).

d. Once every three years for SSBN/SSGNs.

18.2.2 Procedures and Reports. The specific rescue and salvage items to be inspected and the type of submarines to which they are applicable are identified in Appendix A of this chapter. Appendix B of this chapter is a pre-inspection form to be completed by the submarine prior to the salvage inspection. Appendix C of this chapter is a sample Submarine Salvage Inspection forwarding letter.

18.2.3 Inspection Resources. Insofar as practical, portions of the salvage inspection related to diving are to be conducted by qualified divers who are knowledgeable in submarine rescue and salvage matters. The hatch and watertight door portion of this inspection will be conducted by members of the local Ship's Maintenance Monitoring Support Performance Monitoring Team (PMT). Type Commander (TYCOM) Diving Operational Readiness Assessment should be performed in conjunction with the salvage inspection. Diving Operational Readiness Assessments performed within six months may be considered as meeting the Diving Equipment requirements of Appendix A, Part I, paragraph 8 of this chapter. Other portions of the inspection should be conducted by personnel who, by their rate and experience, are qualified in that particular section. All members of the inspection

team who are not divers must be qualified in submarines. Inspection teams are to be assembled, as required, from the following sources in order of the priority shown:

a. Deep Submergence Units.

b. Submarine Fleet Maintenance Activities.

c. Immediate Superior In Command (ISIC) Staffs.

d. Submarines of the same class.

e. Other submarines.

f. Salvage ships (ARS or ATS).

18.3 RESPONSIBILITIES. Responsibility for the preparation, conduct and completion reporting for a salvage inspection is as follows:

18.3.1 Immediate Superior In Command.

a. Schedule salvage inspections for assigned submarines as specified in paragraph 18.2.1 of this chapter. The inspection should be conducted early enough in the availability to allow for the correction of deficiencies prior to Fast Cruise.

b. Designate the inspecting team using the guidance provided in paragraph 18.2.3 of this chapter to conduct the salvage inspection.

18.3.2 Commanding Officer/Officer In Charge.

a. Request the ISIC to conduct a salvage inspection in accordance with the periodicity set forth in paragraph 18.2.1 of this chapter.

b. Coordinate support requirements as may be needed by the inspecting team to fulfill the requirements of Appendix A of this chapter.

NOTE: HATCHES THAT ARE FOULED WILL PREVENT THE SATISFACTORY COMPLETION OF THIS INSPECTION. COORDINATION BETWEEN THE SHIP, INSPECTING TEAM AND MAINTENANCE ACTIVITY IS THE RESPONSIBILITY OF THE COMMANDING OFFICER/OFFICER IN CHARGE.

c. Complete and forward a pre-inspection information letter, shown in Appendix B of this chapter, to the Senior Inspecting Officer.

d. Assemble all ship's data indicated in Appendix A of this chapter prior to the inspection for ease of reference by the inspecting team.

e. Upon receipt of the Senior Inspecting Officer's report, take action to correct the discrepancies found and report their corrections to the ISIC with a copy to the TYCOM prior to commencement of Fast Cruise.

f. Submit a Casualty Report (CASREP), if applicable, in accordance with reference (a) for each item which degrades the Deep Submergence Rescue Vehicle (DSRV) mother submarine capability. Identified by Note 22, Appendix A of this chapter.

18.3.3 Senior Inspecting Officer.

a. Assemble the inspecting team designated by the ISIC.

b. Conduct the salvage inspection in accordance with Appendix A of this chapter. Ensure Appendix B of this chapter is received prior to commencement of the inspection. The inspection should be completed at least 14 days prior to commencement of Fast Cruise, or for new construction ships and ships in a CNO Maintenance Availability, at least 28 days prior to the scheduled commencement of Sea Trials.

c. At the completion of the salvage inspection, report the following to the Commanding Officer/Officer In Charge of the inspected ship:

(1) Completion of the inspection.

(2) Which, if any, systems or equipment have not been restored to normal operating conditions (due to maintenance or required repairs, etc.).

(3) That an advance copy of the inspection results has been provided to the ship to facilitate early correction of deficiencies found.

d. Submit the inspection report to the Commanding Officer/Officer In Charge of the inspected ship in the format of Appendix C of this chapter within three working days following the completion of the inspection, with a copy to the cognizant ISIC.

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APPENDIX A

STANDARD SUBMARINE SALVAGE INSPECTION CHECK-OFF LIST

PART I: SALVAGE

INSPECTION TEAM	Reference Note	Sat	Unsat	Submarine Inspector Signature	Inspection Team Member Signature
1. Salvage Drawings:					
a. Verify salvage drawings:	Fleet Modernization Program Management and Operations Manual NAVSEA SL720-AA-MAN-010				
(1) Have been updated during ship's new construction period/last CNO Maintenance Availability or					
(2) Latest revision is identified in ship's plan index.					
(3) Have correct distribution.	Ship Dwg. Consolidated Index Number 513 or 845				
(4) Are identified as Selected Record Drawings					
2. High/Low Salvage Connections: (not applicable to NR-1)					
a. Verify deck touch plate markings are installed and per plan.	Ship's Plans				
b. Inspect external valve operating gear for conditions of the salvage valve; i.e., excessive paint, lack of lubrication, distortion, damaged or missing grease boots.	Note 2				

An asterisk (*) will be used in addition to a check mark (✓) in the unsat column to identify any exceptions. An explanation of the exception will be provided with the Salvage Inspection Report, Appendix C of this chapter.

INSPECTION TEAM	Reference Note	Sat	Unsat	Submarine Inspector Signature	Inspection Team Member Signature
c. Check that each valve is free to operate with the inspecting command's salvage wrench.	Notes 3 and 7				
d. Perform a "J" pressure and a low pressure 100 psi seat tightness test from the sea side. No leakage is allowed.	Note 3				
e. External salvage system caps:					
(1) For ships equipped with threaded caps, check that caps are threaded with pipe threads, are properly lubricated and installed without gaskets.	Note 4				
(2) For ships equipped with Roylyn type fittings, verify the ship's salvage system arrangement plan contains a note that Roylyn type fittings are installed.	Note 5				
(3) Remove cap assembly, test connect/disconnect with the inspecting command's female fitting.	Kaiser Aero Space & Electronics Dwg. 9495 (Formally Roylyn Inc.)				
(4) Inspect all Roylyn caps. Ensure cap operates properly and is free of paint and/or debris. Reinstall cap with safety wire, where applicable.					
f. Verify strainers are properly installed on all compartment low salvage lines and are clear of debris.	Note 6				
3. Internal Air Salvage:					
a. Test satisfactory operation of all internal salvage air valves (not applicable to NR-1).	Note 21				
b. Verify all compartment pressure gages are in calibration as indicated on calibration label.					

An asterisk (*) will be used in addition to a check mark (✓) in the unsat column to identify any exceptions. An explanation of the exception will be provided with the Salvage Inspection Report, Appendix C of this chapter.

INSPECTION TEAM	Reference Note	Sat	Unsat	Submarine Inspector Signature	Inspection Team Member Signature
4. Bulkhead Flappers:					
a. Test satisfactory local and remote (as applicable) operation of all ventilation system bulkhead flappers.					
5. Hull Access Hatches (Upper and Lower if installed), Watertight Doors and Torpedo Loading Hatches: Inspection performed by local PMT.					
a. Perform/witness all maintenance required by Maintenance Index Page (MIP) to complete salvage inspection.	Planned Maintenance System (PMS) MIP A-80 R-3 and R-4				
6. External Gagging Devices: (not applicable to NR-1)					
a. Witness demonstration that all valves with external gagging devices can be gagged from open to shut with the inspecting command's salvage wrench and with the number of turns specified on the ship's salvage system arrangement plan. Record number of turns to operate. _____	Notes 7 and 9				
b. Witness resetting of each gagging device and demonstrate satisfactory operation of the valves by normal means.	Note 10				
7. Salvage/Lifting Padeyes (NR-1 Only):					
a. Installed and properly preserved.	Ship's Plans				
8. Diving Equipment:					
a. Verify latest revision of U.S. Navy Diving Manual is onboard.	NAVSEA 0994-LP-001-9010				
b. SSN and NR-1 only:					

An asterisk (*) will be used in addition to a check mark (✓) in the unsat column to identify any exceptions. An explanation of the exception will be provided with the Salvage Inspection Report, Appendix C of this chapter.

INSPECTION TEAM	Reference Note	Sat	Unsat	Submarine Inspector Signature	Inspection Team Member Signature
(1) Verify the requirements of MILPERSMAN have been implemented and that assigned scuba divers are currently qualified/requalified and that the ship's Diving Officer has been designated in writing by the Commanding Officer.	MILPERSMAN Art. 1220-100 Series				
(2) Verify allowance of scuba diving equipment onboard.	Ship's Coordinated Shipboard Allowance List (COSAL)				
(3) Inspect equipment for condition and conformance with U.S. Navy Diving Manual and applicable NAVSHIPS Technical Manuals. Ensure no unauthorized alterations have been accomplished and that equipment, including charging connections and filters, is in satisfactory working order and approved for service use.	NAVSEA 0994-LP-001-9010				
(4) Ensure air samples are current for the air bank used to charge scuba cylinders. (if applicable)	MIP 5921/101				
(5) Assigned divers demonstrate capability to conduct diving operations (assembly of equipment and check out, set up record keeping data for repetitive dives, use of dive tables, PMS on equipment). State if actual diving operations are observed.	MIP 5921/Series				
9. Escape Trunks:					
a. Check Flood Line Orifice Size 1.258" (688 Class ONLY w/SEIE 4142 installed)	Installed				
b. Stole Charging Valves (Installed by S/A 4142 for 688 Class, TZ-0890 for 726 Class and S/A 4149 for 21 Class)	Watertight Caps Installed (two (2) each).				
10. Crash Bags:					
a. Inventoried in accordance with Allowance Equipage List (AEL)	2-330023072				
b. Guard Book	Latest Revision				

An asterisk (*) will be used in addition to a check mark (✓) in the unsat column to identify any exceptions. An explanation of the exception will be provided with the Salvage Inspection Report, Appendix C of this chapter.

PART II: RESCUE

INSPECTION ITEM	Reference Note	Fwd		Aft		Submarine Inspector Signature	Inspection Team Member Signature
		Sat	Unsat	Sat	Unsat		
1. Submarine Rescue Chamber (SRC) and DSRV Fittings (not applicable to NR-1 and USS Dolphin):	Naval Ships' Technical Manual (NSTM) S9086-T9-STM-000 Chapter 594						
a. Verify four padeyes are installed per plan for SRC/DSRV on fwd and aft seating surfaces. SSN 688 and SSBN/SSGN 726 Class four padeyes are installed for SRC in upper hatch free flood areas.	Ship's Plans NOTE 22						
b. Inspect SRC/DSRV seating surface.	Note 11 and 22						
c. Remove plug from hatch fairing. Check condition of SRC downhaul shackle. Verify downhaul shackle is free of corrosion and can be operated by hand and that lockwire is installed to prevent the backing out of shackle pin/screw. Use of plastisol on haul down shackle is not authorized as it prevents visual inspection of shackle for corrosion and promotes corrosion. Upon completion of Alteration and Improvement 3124, the shackle is powder coated white (SSN 688 and SSBN/SSGN 726 Class only).	Ship's Plans NOTE 22						

An asterisk (*) will be used in addition to a check mark (✓) in the unsat column to identify any exceptions. An explanation of the exception will be provided with the Salvage Inspection Report, Appendix C of this chapter.

INSPECTION ITEM	Reference Note	Fwd		Aft		Submarine Inspector Signature	Inspection Team Member Signature
		Sat	Unsat	Sat	Unsat		
d. BQN-13. (1) Inspect AN/BQN-13 Beacon to ensure that: (not applicable to SSBN/SSGN 726 Class) (a) Cable is free of abrasions, cuts or damage. (b) Cable plug and encapsulation are free of defects. (c) Unit has no physical damage. (d) Transducer is free of oil leaks, bubbles and paint.							
2. Escape Trunks and Logistics Escape Trunks:	Note 20						
a. Escape trunk hatch fairings must be maintained in a condition to be easily disassembled to support submarine rescue. Verify MIP (SSN 688/21 Class) or Maintenance Standard (MS) (SSBN/SSGN 726 Class) has been completed within the required periodicity on all escape trunk hatches. Visually inspect escape trunk hatch fairings for compliance with applicable Maintenance Requirements (MRs). Paint fouling or corrosion of fairing fasteners must be immediately corrected.	SSN 688 MIP A-80/905 MRC 24M-1R SSN 21 MIP A-80/921 MRC 24M-2R SSBN/SSGN 726 MS 1670-081-011						
b. Demonstrate that each access hatch can be dogged and opened from topside with salvage wrench or handwheel (as applicable) in direction of installed arrow.							

An asterisk (*) will be used in addition to a check mark (✓) in the unsat column to identify any exceptions. An explanation of the exception will be provided with the Salvage Inspection Report, Appendix C of this chapter.

INSPECTION ITEM	Reference Note	Fwd		Aft		Submarine Inspector Signature	Inspection Team Member Signature
		Sat	Unsat	Sat	Unsat		
c. Demonstrate satisfactory operation of the escape hatch closing mechanisms in accordance with the installed instruction plates and equipment.							
d. Demonstrate satisfactory operation and examine the condition of the following equipment:							
(1) Vent valves (trunk and compartment).							
(2) Blow valves (trunk and compartment).							
(3) Flood and drain valves (including remote operation mechanisms and strainer installations).							
(4) Demonstrate satisfactory operation and examine the condition of the following equipment: Charging manifold (test inflate a life preserver; inspect all hoses and fittings). For ships with Submarine Escape Immersion Equipment (SEIE) suits, conduct Hood Inflation System/Stole Charging Valve operational check to confirm valves operate properly.	MIP H-409/001 MIP H-409/003 MIP H-409/005						
S/A 4142 (SSN 688) S/A 4149 (SSN 21) and TZ 890 (SSBN/SSGN 726) removes manifold, hoses and Steinke Hoods.							
(5) Pressure proof lights, mounted above waterline.							
(6) Electric lantern screened lenses and pressure relief hole sealed with plastic (MIL-1-3064) and mounted above waterline.	General Specs for Ships NAVSEA S9AAO-SPN-010 Sect 332F						
(7) 31MC installed above waterline.							
e. Verify the following equipment installed:							
(1) Hammer signal label plate posted above waterline.							
(2) Diver's knife.	Note 12						
(3) Ballpeen hammer.							

An asterisk (*) will be used in addition to a check mark (✓) in the unsat column to identify any exceptions. An explanation of the exception will be provided with the Salvage Inspection Report, Appendix C of this chapter.

INSPECTION ITEM	Reference Note	Fwd		Aft		Submarine Inspector Signature	Inspection Team Member Signature
		Sat	Unsat	Sat	Unsat		
(4) Persuader (crows foot).							
(5) Escape procedure posted above waterline.							
(6) Mechanical timer above waterline. Not applicable to ships with SEIE suits, S/A 4142 (SSN 688), S/A 4149 (SSN 21) and TZ 890 (SSBN/SSGN 726).	Note 12						
(7) Maximum permissible bottom time plate posted near timer and above waterline. Not applicable to ships with SEIE suits, S/A 4142 (SSN 688), S/A 4149 (SSN 21) and TZ 890 (SSBN/SSGN 726).							
f. Verify valve handwheels are properly color coded and labeled in accordance with Ship's Drawing Index, Ship's placards and Posted Information Plates.	NSTM S9086-RD-STM-010 Chapter 505						
g. Verify gages are in calibration as indicated on calibration label.							
h. Verify upper watertight hatch cavity drain valve operation is satisfactory (SSN 688 and SSBN/SSGN 726 Class).							
i. Witness satisfactory rigging and operation of escape trunk portable skirt (SSN 688 and SSBN/SSGN 726 Class).	Ship's Plans						
3. Emergency Communications Equipment:							
a. Inventory allowance of the following equipment and confirm proper stowage as indicated:	Ship's COSAL & Equipment Configuration Accounting System						
(1) EPIRB Model S-1015 or AN/CRT-3 (same compartment as life raft, not applicable to SSBN/SSGN 726 Class and NR-1) or RLB-23.							
(2) SEPIRB Model T-1630/SRT or T-616/SRT (same compartment as signal ejector/3" launcher for SSBN/SSGN 726 Class).							

An asterisk (*) will be used in addition to a check mark (✓) in the unsat column to identify any exceptions. An explanation of the exception will be provided with the Salvage Inspection Report, Appendix C of this chapter.

INSPECTION ITEM	Reference Note	Fwd		Aft		Submarine Inspector Signature	Inspection Team Member Signature
		Sat	Unsat	Sat	Unsat		
(3) URC-4 or AN/PRC-96 (2 onboard, not applicable to NR-1).							
(4) AN/BQC-1 with operating instructions posted on inside of cover, (not applicable to SSN 688/ SSBN/SSGN 726 Classes and NR-1).							
(5) SEPIRB/EPIRB (not applicable to NR-1).							
b. Verify from ship's records that all applicable PMS has been performed and witness satisfactory performance of indicated MRCs.							
(1) AN/CRT-3 (all procedures, not applicable to SSBN/SSGN 726 Class and NR-1).	MIP 4415/4						
(2) EPIRB.	MIP 4413/12						
(3) SEPIRB.	MIP 4413/15						
(4) AN/URC-4 or AN/PRC-96 (all procedures, not applicable to NR-1).	MIP 4415/4						
(5) AN/BQC-1 (all procedures, not applicable to SSN 688/SSBN/SSGN 726 Classes and NR-1).	MIP SO-018/903 or 904						
(6) AN/BQN-13 (all procedures except R-1M, not applicable to SSBN/SSGN 726 Class).	MIP SO-104/902						
(7) T-616/SRT (all procedures, not applicable to NR-1).	MIP C-531/2						
(8) BQQ-6 Emergency Communications and Distress Beacon Groups (SSBN/SSGN 726 Class only).	MIP SO-405/902						
c. Inventory allowance of spare batteries for AN/URC-4/PRC-96, BQC-1 and BQN-13. Ensure shelf life of batteries has not been exceeded. (NR-1 BQN-13 only, AN/BQQ-6 for SSBN/SSGN 726 Class).	Ship's COSAL Note 13						

An asterisk (*) will be used in addition to a check mark (✓) in the unsat column to identify any exceptions. An explanation of the exception will be provided with the Salvage Inspection Report, Appendix C of this chapter.

INSPECTION ITEM	Reference Note	Fwd		Aft		Submarine Inspector Signature	Inspection Team Member Signature
		Sat	Unsat	Sat	Unsat		
(1) Check that the BQC receptacle is marked "For use with AN/BQC Telephone Set" (not applicable to SSN 688/SSBN/SSGN 726 Classes and NR-1).							
(2) Check that the BQQ-6 Emergency Communications Group receptacle is marked "61/62/63 Receptacle/Emergency Communications for AN/BQQ-6" (SSBN/SSGN 726 Class only).							
4. Life Saving and Safety Equipment:							
a. Inventory allowance (randomly, type and quantity as applicable) and witness satisfactory performance of PMS procedures on the following: (PMS procedures are to be demonstrated on one representative candidate from each of the sub groups listed below).	Ship's COSAL PMS Note 14						
(1) Inflatable life preservers.	MIP 5831/12						
(2) Non-inflatable life preservers.	MIP 5832/7						
(3) Escape appliances. (not applicable to ships with SEIE Suits, S/A-4142 (SSN 688), S/A 4149 (SSN 21) and TZ 890 (SSBN/SSGN 726))	Note 15 MIP H-409/1 MIP H-409/3						
(4) Life rafts (not applicable to SSBN/SSGN 726, SSN 774 and NR-1). (not applicable to ships with SEIE Suits, S/A-4142 (SSN 688), S/A 4149 (SSN 21))	Note 16 MIP H-411/1						
(5) Man overboard bag.	Note 17 MIP 5832/21						
(6) Qualified swimmer designated for man overboard.	Note 18 MILPERS MAN Art. 141 4-010 Series						
(7) Safety harness (belts).	MIP 6231/1						

An asterisk (*) will be used in addition to a check mark (✓) in the unsat column to identify any exceptions. An explanation of the exception will be provided with the Salvage Inspection Report, Appendix C of this chapter.

INSPECTION ITEM	Reference Note	Fwd		Aft		Submarine Inspector Signature	Inspection Team Member Signature
		Sat	Unsat	Sat	Unsat		
(8) Safety track.	MIP H-313/3						
(9) Distress marker lights.	MIP 5832/10						
(10) Life lines and stanchions.	MIP H-300/2						
(11) Desalter kits or portable desalinators.	Note 19 Ship's COSAL						
(Not applicable to SSBN/SSGN 726 Class).	Desalinators installed by A&I 3226						
(12) SEIE Suits.	MIP H-409/5						
(Installed by S/A-4142 (SSN 688), S/A 4149 (SSN 21) and TZ 890 (SSBN/SSGN 726))							
(13) Crash Bags.	MIP H-409/5						
(Installed by S/A-4142 (SSN 688), S/A 4149 (SSN 21) and TZ 890 (SSBN/SSGN 726))							
5. Escape Training:							
a. Verify that all hands are trained in buoyant ascent and buoyant free breathing ascent or SEIE escape.							
6. Atmosphere Control:							
a. Inventory quantity onboard and inspect condition of the following:							
(1) CO_2 absorbent canisters.							
Amount onboard _____							
Required _____							
(2) O_2 candles.							
Amount onboard _____							
Required _____							

An asterisk (*) will be used in addition to a check mark (✓) in the unsat column to identify any exceptions. An explanation of the exception will be provided with the Salvage Inspection Report, Appendix C of this chapter.

INSPECTION ITEM	Reference Note	Fwd		Aft		Submarine Inspector Signature	Inspection Team Member Signature
		Sat	Unsat	Sat	Unsat		
(3) O_2 candle furnace. Comment on condition._____ (4) Emergency Air Breathing masks (test random 5% for proper operation). b. Verify CO_2 absorbent canister PMS has been completed within required periodicity. Additionally, randomly select 10% of canisters onboard and weigh them in accordance with the applicable MRC. c. Sample inspect emergency air breathing manifold in-line filters and filter housing for presence of corrosion. 7. Signal Ejectors and 3" Launchers (Not Applicable to NR-1): a. Demonstrate satisfactory operation of each signal ejector manually and hydropneumatically as applicable. b. Verify a minimum of six Red Submarine Emergency Identification Signals and Submarine Floating Signal pyrotechnics stowed in compartment with signal ejector or launcher. c. Operational verification shall include a demonstrated launch (water slug) from both remote and local operating stations (SSN 688 and SSBN/SSGN 726 Class only).	MIP 6641/9						

An asterisk (*) will be used in addition to a check mark (✓) in the unsat column to identify any exceptions. An explanation of the exception will be provided with the Salvage Inspection Report, Appendix C of this chapter.

NOTES

1. General.

a. Items pertaining to SRC/DSRV seating surfaces and buoy cable angle tests require substantial support equipment and are designated for industrial activity accomplishment.

b. Configuration differences are noted as comments in the reference column.

c. Portions of the Salvage Inspection (as specified by the maintenance activity) may be conducted prior to the start of CNO availabilities as "pre-availability inspections" to support planning of the availability. These items need not be re-inspected provided no work was performed during the availability which affects their status. When specified, these items will be performed by Ship's Force and written certification by the Commanding Officer provided to the maintenance activity, the ISIC and the Senior Inspecting Officer.

2. Reach rods, universal joints, and connecting links in the superstructure should be secured with non-corrosive pins. Inspect valve stems for misalignment and ensure that reach rod connection is one of square socket design with the non-corrosive pin used only to secure the reach rod to the universal.

3. All high/low salvage valves are to be tested for freedom of operation at the frequency specified, except during the salvage inspection conducted incident to an overhaul. Salvage Air valve testing completed up to one year prior to the start of an availability will satisfy the salvage inspection requirements provided that certified records verifying the tests are available. Written certification by the Commanding Officer that specified external salvage valves have been overhauled by the industrial activity or Ship's Force and have been successfully hydrostatically tested will constitute certification that the valve operates freely, providing all inspections (Part I, items 2b, 2c and 2d of this Appendix) for each valve so certified are satisfactory. If the results of the inspection of operating gear are not satisfactory, or doubt exists concerning freedom of operation, the specific valves in question shall be checked. Provide appropriate container for collecting anti-freeze drained from salvage piping when hull valve is cycled. Ensure controlled re-assembly in accordance with Quality Assurance requirements is performed when installing salvage caps. Exercise caution to prevent liquid in salvage air piping from impinging on nearby equipment when hull valve is cycled. Ensure anti-freeze is added to piping after inspection to prevent freezing.

4. Caps and salvage air hose connections that have pipe threads are not designed to include gaskets. Use of gaskets is not considered necessary. Coating of threads is desirable, particularly to prevent seizure. Apply a light coat of Termaline grease or Neolube on threads.

5. Discrepancies between physical installation and salvage plans are to be reported to the TYCOM with an information copy to all plan holders.

6. Low salvage line strainers located in the reactor compartment of nuclear powered submarines are not, in most cases, visible through the lower level viewing windows. Therefore, certification by the Commanding Officer that the reactor compartment low salvage line strainer has been verified properly installed by Ship's Force during the course of the salvage inspection will suffice. Certification to this effect shall be included in the salvage inspection letter of Appendix C of this chapter.

7. The inspected ship's, vice the inspecting command's, salvage wrench shall be used if the inspecting command is another submarine. Discrepancies in the actual, versus plan, number of turns shall be reported to the TYCOM with information copy to all plan holders. Report discrepancies to the nearest 1/8th of a turn.

8. Prior to testing Outboard Diesel Exhaust Valve, ensure replacement shear pin is available onboard.

9. When inspecting the gagging gear for the inboard ventilation exhaust valve and the inboard ventilation induction valve, the valve linkages shall be inspected and the valves shall be adjusted in accordance with the requirements in the Non-Primary Plant Valves Technical Manual or individual ship's valve drawing.

10. On some designs, operation of the gagging device overrides the regular operating gear of the valve indicator in such a manner that the entire mechanism must be reset/readjusted before the normal operating gear or the valve position indicator will function as intended. If the gagging mechanism is operated or used for any reason, the mechanism shall be reset and the valve subsequently opened and closed by the normal operating gear in every manner in which the gear is designed to function to ensure the valve is in proper operating condition.

11. Inspections of the SRC/DSRV seating surface for flatness, surface area free of protuberances and thickness requires industrial activity support. Inspection procedures are provided in NAVSEA Drawing DSRV-800-2656512 Inspections are to be performed as early in the maintenance availability as possible to allow correction of noted deficiencies prior to commencement of fast cruise.

12. Diver's knife and timer may be stored in secure stowage in escape compartment.

13. Shelf life is computed from date of manufacture which is printed in code on the battery. For example, a battery code "1187" means the battery was manufactured in the 11th month of 1987. For expiration dates, see Naval Supply Systems Command Publication 4105, List of Items Requiring Special Handling.

14. The allowance of escape appliances for submarines with two escape compartments consists of 110 percent of complement in each compartment, and for submarines with three escape compartments consists of 55 percent of complement in the forward and aft compartments and 110 percent of complement in the midships escape compartment. Additionally, the following quantity of non-inflatable life preserves are to be carried for topside use:

a. SSN allowance - 20.

b. SSBN/SSGN allowance - 38.

15. Escape appliances are to be equipped as follows:

a. One cell flashlight or chemical personnel marker light attached, whistle, and dye marker stowed in pocket. Batteries will be in case/box lots stowed with escape appliances. Ensure shelf life of batteries or personnel marker light will not be exceeded prior to next PMS check.

b. Toggle and cord attached to belt.

16. Life rafts are to be equipped as specified on the inventory lists within the raft. Not applicable to ships with SEIE suits.

17. Man overboard bags to be equipped as specified in Man Overboard Casualty Procedures.

18. Man overboard swimmer to be qualified as a swimmer first class with appropriate entries in service record.

19. The number of desalter kits required shall be obtained from the ship's COSAL (AEL 2-360033002). For some ships, desalter kits were replaced by portable desalinators with the installation of Alteration and Improvement 3226. If Alteration and Improvement 3226 has been installed onboard, take inventory of the portable reverse osmosis desalinators. SSBN/SSGN 726 Class submarines carry no desalter kits or portable desalinators.

20. For SSBN/SSGN 726 Class only, one or more of the Logistics and Escape Trunks (LET) will be removed during refit. When removed, the LET is isolated from service air and electric power. Communications circuits, electrical power, and charging manifold tests should be conducted prior to LET removal to ensure piping and electrical system continuity, and tested again upon reinstallation.

21. Exercise extreme caution when testing operation of 4500 psi compartment pressurization valves.

22. Unsatisfactory conditions degrade the SRC and/or DSRV mother submarine capability and require a CASREP be submitted in accordance with reference (a).

APPENDIX B

PRE-INSPECTION INFORMATION/CERTIFICATION

From: Commanding Officer, USS (Ship's Name and Hull No.)
To: Senior Inspecting Officer

Subj: SUBMARINE SALVAGE INSPECTION OF USS (Ship's Name and Hull No.)

Ref: (a) COMFLTFORCOMINST 4790.3; Joint Fleet Maintenance Manual, Volume IV, Chapter 18

Encl: (1) Standard Submarine Salvage Inspection Check-Off List

1. The overall responsibility for the coordination and assembly of reference plans and publications in support of our submarine salvage inspections is assigned to (preferably the XO, 1st Lt, or Weapons Officer). Our Topside Coordinator is (Name), and our Below Decks Coordinator is (Name).

2. The following information/certification is presented in accordance with reference (a): _____.

	Reference:	Inspected Item:	Certification of Ship's Representative:
(a)	Encl (1), Part I, para. 2	High and Low Salvage Connections.	Date: _____
		External Salvage Valves have been overhauled & seat tightness tested.	Tested by: _____ (Overhauling Activity)
		Low Salvage strainer properly installed in reactor compartment.	_____ Yes _____ No
(b)	Encl (1), Part I, para. 3.b., Part II, para. 2.g.	Gages have been tested or calibrated within the past 12 months. (list any discrepancies in para. 2)	_____ Ship's Force Representative
(c)	Encl (1), Part I, para. 6.	External Gagging Devices. Valves will be lined up & reset by:	_____ Qualified Eng. Petty Officer
(d)	Encl (1), Part I, para. 8.b.(1) and 8.b.(2)	Diver Qualifications. All divers requalified in accordance with MILPERSMAN Art 1220-100. (exceptions noted in para. 2, N/A for SSBN/SSGNs)	_____ (Yes, No or N/A)
		Diving Equipment has been inventoried and conforms with ship's COSAL. (N/A for SSBN/SSGNs)	_____ Diving Petty Officer

SAMPLE

(e)	Encl (1), Part II, para. 1.	SRC/DSRV. Flatness Test applicability for this scheduled inspection. (DSRV mating arrangement drawing available to check cable cutter access). Submitted for review and verification.	_____ Yes, if applicable
		DSRV Mother Sub Mod (applicable SSNs).	_____ Yes, if applicable
(f)	Encl (1), Part II, para. 2.	Escape Trunks. Ship's representative for escape trunk will be:	_____ Ship's Representative
(g)	Encl (1), Part II, para. 3.	Emergency Communications Equipment Operational and stowed with the following exceptions:	_____ Yes, or list exceptions in paragraph 2.
(h)	Encl (1), Part II, para. 4.	Life Saving & Safety Equipment PMS procedures last conducted on: (List discrepancies in paragraph 2.)	_____ Date

Inventories are as follows:	Amount on Board	Required (COSAL)
Number of escape appliances or SEIE valises.	_____	_____
Location	_____	_____

(Forward/Aft/Midships)

	Amount on Board	Required (COSAL)
Inflatable life preservers	_____	_____
Number of non-inflatable life preservers	_____	_____

	Amount on Board	Required (COSAL)
Life Rafts (if applicable)	_____	_____
Number of safety harnesses	_____	_____
Distress Marker Lights	_____	_____
Number of desalter kits or desalinators	_____	_____

NOTE: MUST CONFORM TO CURRENT PMS SCHEDULE

(i)	Encl (1), Part II, para. 5.	Escape Training. All hands are qualified in Buoyant Ascent and Buoyant Free Ascent or SEIE escape.	_____ Yes, or list discrepancies in paragraph 3.

SAMPLE

(j)	Encl (1), Part II, para. 6.	Atmosphere Control. The following amount of absorbent is aboard:	_____ Type and Amount
		The allowance is:	_____ Amount
		O_2 candles applicable	_____ Yes or No
		The following number of O_2 candles are onboard:	_____ Number or N/A
		The allowance is:	_____ Number or N/A
(k)	Encl (1), Part II, para. 7.	Signal Ejector operation and Red Submarine Emergency Identification Signal inventory will be accomplished by:	_____ Ship's Representative
		Signal ejector operation cannot be demonstrated as muzzle is above waterline or ship is in dry-dock. The signal ejector was last operated on:	_____ (Date)

NOTE: IF EJECTOR WAS NOT OPERATED IN PAST THIRTY DAYS, OPERATION MUST BE DEMONSTRATED BY FLOODING THROUGH MUZZLE WITH FIRE HOSE.

3. Discrepancies.

a. Discrepancies are as follows:

b. The following items were not inspected for the reasons given and a waiver is requested.

Nomenclature	Paragraph	Reason

_____
Commanding Officer
(or By Direction Authority)

SAMPLE

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APPENDIX C

SAMPLE REPORT OF SALVAGE INSPECTION FORWARDING LETTER

From: Senior Inspecting Officer
To: Commanding Officer, USS (Ship's Name and Hull No.)

Subj: REPORT OF SUBMARINE SALVAGE INSPECTION OF USS (SHIP'S NAME AND HULL NO.)

Ref: (a) COMFLTFORCOMINST 4790.3; Joint Fleet Maintenance Manual, Volume IV, Chapter 18

Encl: (1) Standard Submarine Salvage Inspection Check Off List

1. A (new construction/post CNO Maintenance Availability/Interim Dry-Docking) Salvage Inspection of USS (Ship's Name and Hull No.) was conducted on (Date) using the procedures of reference (a).

2. The following provides amplifying information concerning the (exceptions/discrepancies) identified in enclosure (1). (all exceptions will be discussed)

_____

(Signed)

Copy to: (as appropriate)
COMSUBGRU
COMSUBRON
NAVSHIPYD
SUPSHIP
NAVSEA Program Manager

SAMPLE

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VOLUME IV

CHAPTER 19

RETENTION OF MATERIAL DEFICIENCY REPORTS AND RECORDS OF EQUIPMENT CHARACTERISTICS AND TESTS

19.1 PURPOSE. This chapter provides a listing of the inspection reports and equipment records, including the retention requirements, which must be maintained by each ship.

19.2 INSPECTION REPORTS. A copy of each of the following inspection reports will be retained until superseded by a subsequent report:

a. Board of Inspection and Survey Inspection Reports.

b. Hull Surveys.

c. Salvage Inspections.

d. Docking Reports (CNO Maintenance Availability to CNO Maintenance Availability).

e. Turbine Lifting and Repair Reports.

f. Technical Assistance Reports by System Commands, Naval Sea Systems Command Technical Representatives, etc.

g. Boiler Inspection Reports (retained until equipment is transferred or vessel is stricken. May be discarded if old data is incorporated in a new report).

h. Battery Inspection Reports.

i. Diesel Engine Inspection Reports.

j. Main and Air Ejector Condenser Eddy Current (Probalog) Reports.

19.3 RETENTION OF RECORDS OF EQUIPMENT CHARACTERISTICS AND TESTS. The following records will be maintained onboard until superseded:

a. Anti Submarine Warfare Test Program Reports.

b. Structureborne, Airborne, and Waterborne Noise Reports.

c. (Submarine Force surface units only) Radar, Radio and Acoustic Radiation Patterns.

d. Equipment Calibration and Alignment Graphs and Charts.

e. Antenna and Superstructure Arrangement Photographs.

f. Record of Shipboard Tests.

g. Lube Oil and Trend Analysis Reports.

h. Battery Record Book (test discharges, etc.).

i. Diesel Trend Analysis Records.

j. Readings and Clearances for Main Bearings and Journals:

(1) Main Propulsion Shafting.

(2) Main and Auxiliary Engines.

(3) Main Propulsion Motors and Generators.

(4) Rudder and Diving Planes.

(5) Diesel Generator Bearings.

k. Navigational Light Certification.

l. Equilibrium Diagram.

m. Panama Canal Tonnage Certification.

n. Aviation Helicopter Certification.

o. Weight Handling Equipment Certification.

p. Cavitation Curves.

q. Machinery/Vibration Survey Results.

r. Resistance Test Records shall be maintained for the following equipment in the Electrical Work Centers PMS Space Manual:

(1) SSN/SSBN/SSGNs:

(a) Ship's Service Turbine Generators.

(b) Ship's Service Motor Generators.

(c) 400 Hz Motor Generators.

(d) Emergency Diesel Generators.

(e) Emergency Propulsion Motors.

(f) Secondary Propulsion Motors.

(g) Trim/Drain Pump Motors.

(h) Main and Shaft Lube Oil Pump DC Motors.

(i) High Pressure Brine Pump Motors.

(j) Low Pressure Blower Motors.

(2) AGSS:

(a) 60 Hz Motor Generators.

(b) 400 Hz Motor Generators.

(c) Propulsion Generators.

(d) Propulsion Motors.

(e) Trim/Drain Pump Motors.

(f) Hydraulic (IMO) Pump Motors.

(g) High Pressure Air Compressor Motors.

(h) Air Conditioning Plant Motors.

(i) External Hydraulic Motors.

(j) Battery Exhaust Fan.

(k) Battery Cables.

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VOLUME IV

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) OPNAVINST 3150.27 - Navy Diving Program
(c) NAVSEAINST 3151.1 - Diving and Manned Hyperbaric Systems Certification Program
(d) NAVSEA SS500-AQ-MMO-010 - Operation and Maintenance Manual for U.S. Navy Two-Man Open Diving Bell
(e) NAVSEA 0994-LP-001-9010 - U.S. Navy Diving Manual, Volume 1 (Air Diving)
(f) NAVSEA 0994-LP-001-9020 - U.S. Navy Diving Manual, Volume 2 (Mixed Gas Diving)
(g) NAVSEA S9594-AE-GTP-010 - Disabled Submarine/Requirements for Employment of U.S. Navy Submarine Rescue Systems
(h) NAVSEA SS750-AA-MMA-010 - Submarine Rescue Chamber (SRC), Modernized 850 Ft
(i) NAVSEA SS800-AG-MAN-010/P-9290 - System Certification Procedures and Criteria Manual for Deep Submergence Systems

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) and Dry Deck Shelters (DDS).

20.2 DIVER LIFE SUPPORT SYSTEM MAINTENANCE AND CERTIFICATION.

20.2.1 General. The DLSS maintenance program includes, but is not limited to, maintenance, repair, and modification of a certified DLSS. For the purpose of DLSSs the term "System" will apply to DLSS, Surface Supported Dive Systems, Decompression Chambers, and Fly Away Dive Systems. Manned Deep Submergence Rescue Vehicles are addressed in Volume II, Chapter 5 of this manual.

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 shall be in accordance with references (a) through (f). Reference (c) 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 or SOC depth.

c. Identifies the responsibilities for implementing and executing the material certification program policies and procedures.

d. Provides procedures for requesting waivers to approved operating and maintenance procedures and for alterations to system design.

20.2.4 System Certification.

a. System certification is a procedure for ensuring the adequacy of the dive system to safely operate over its intended mission range. This certification is accomplished through technical reviews and periodic on-site inspections. Quality Assurance (QA) provides support for the system through documented maintenance and repair procedures.

b. System certification is required for any dive system used by the U.S. Navy. System certification procedures and criteria shall be in accordance with reference (a). Deep submergence systems and equipment, as well as Surface Support Dive Systems requiring certification are listed in references (a) and (b). Appendix A of this chapter provides a listing of system certification requirements for diving systems and equipment.

c. The system SOC is a list of those subsystems, including emergency and backup systems, required to ensure diver safety. The SOC also includes system operating, maintenance, and emergency procedures.

20.2.5 Maintenance Guidelines.

a. Once a need for maintenance has been identified, QA requirements must be considered concurrent with planning and execution of the maintenance. Due to the technical complexity of the dive systems, special technical and administrative procedures are required to ensure conformance to specifications in specifically designated systems and equipments. Volume V, Part III of this manual contains the technical and administrative QA requirements for maintenance 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 Volume V, Part I, Chapter 8 of this manual, 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 System Certification Authority (SCA), Naval Sea Systems Command (NAVSEA) (00C4) shall issue a DLSS certification letter specifying the parameters under which the system shall be operated and maintained. 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 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.

(3) Category IC Date indicated to sustain certification.

(4) Category II Desirable. Deficiencies will be corrected when manpower and materials are available.

b. Category IA, IB, and IC SCSCs shall be forwarded to NAVSEA, via the TYCOM, with the appropriate documentation for clearing the deficiency. The DLSS certification letter will not be issued until all Category IA and Category IB SCSCs are cleared. Diving in pursuit of certification, which includes any manned use of the diving or recompression chamber systems, will not take place until all Category IA cards are cleared. Operational utilization of these systems will not take place until all Category IA and Category IB SCSCs have been cleared and NAVSEA has issued a certification letter/message. Upon the recommendation of NAVSEA and the TYCOM, the CNO may issue a waiver to support high priority operations if all Category IA cards have been cleared and the outstanding Category IB deficiencies will not compromise personnel or system operation safety. To preclude decertification of a DLSS, all diving commands will conduct and document periodic internal audits. Additionally, the ISICs will conduct regular monitoring audits and Diving Operational Readiness Inspections of all diving activities under their cognizance using the attributes contained in Volume V, Part I, Chapter 9 of this manual, and Chapter 2 of this volume.

20.2.7 Certification Maintenance Requirements. Requirements for sustaining certification of surface supported diving and recompression chambers are as follows:

a. Maintain written maintenance, inspection, repair, and replacement records for all SOC items. Re-Entry Control procedures must be followed.

b. Report any material casualty to equipment within the SOC to NAVSEA via the ISIC and TYCOM.

c. Obtain SCA approval, via the TYCOM, prior to modifying any system or equipment within the SOC.

d. Maintain a log of all chamber pressurizations including chamber treatments and oxygen and pressure tolerance testing. Report any chamber pressurization beyond 165 feet to the TYCOM and NAVSEA, including the circumstances which necessitated such pressurization.

e. Immediately report any diving operations conducted to a depth in excess of the depths authorized in the applicable NAVSEA DLSS certification letter, by message, to the TYCOM and NAVSEA, with an information copy to the cognizant ISIC. This message will include the circumstances which resulted in exceeding authorized SOC depth.

20.2.8 Action. To maintain the DLSSs in satisfactory material condition and to provide assurance that they will be fully operational, the following is required:

a. Perform all planned maintenance in accordance with the applicable Maintenance Index Page (MIP)/MRCs. Information contained in applicable equipment technical manuals will be used in conjunction with existing MRCs for accomplishment of PMS.

b. Accomplish corrective maintenance in a manner which returns the components to the specifications shown by the applicable drawing. Material used in completing any maintenance action shall be as specified in the NAVSEA approved system/component drawings, technical manuals or other approved documents. Material shall be certified in accordance with Volume V, Part I, Chapter 6 of this manual.

NOTE: IF THE VENDOR OR MANUFACTURER SPECIFIED IN THE NAVSEA DRAWING OR DOCUMENT CANNOT PROVIDE THE REQUIRED SPECIFIC COMPONENT, THEN USE OF A SUBSTITUTE COMPONENT OR MANUFACTURER MUST BE APPROVED BY NAVSEA, VIA THE TYCOM, USING A DFS. A DFS IS ALSO REQUIRED WHEN MATERIAL OTHER THAN THAT SPECIFIED IN APPROVED DRAWINGS OR DOCUMENTS IS USED.

c. Document all work performed on SOC items using the applicable forms and procedures provided in Volume V, Part III of this manual. This applies regardless of whether the work is a planned or corrective maintenance action. Documentation will, as a minimum, include the following:

(1) Name of the person performing the work.

(2) Date the work was performed.

(3) Reason for accomplishing the work.

(4) Applicable drawing number or reference document.

(5) Brief description of the work performed.

(6) Description of the testing performed and test results.

(7) Signature of the officer/Chief Petty Officer (CPO) responsible for assuring the quality of work.

d. Maintain all work documents as official records until the next recertification survey or in accordance with Volume V, Part III of this manual, whichever is longer. The Documents will be available for inspection by the SCA and QA auditors during this period.

e. Obtain NAVSEA approval prior to accomplishing any alteration or modifications to DLSSs. Unauthorized alterations or modifications will automatically revoke NAVSEA certification. In the case of a system which has been refurbished, but not yet certified, unauthorized alterations or modifications could negate previous steps accomplished by the certification process. Alterations or modifications proposed by Forces Afloat will be prepared and forwarded to NAVSEA in accordance with Volume VI, Chapter 3 of this manual.

f. When emergency situations occur during DLSS operations that require immediate corrective action and are beyond the scope of a corrective maintenance action, a message shall be sent to the TYCOM, info NAVSEA, advising of the situation.

g. Semiannual requalification dives required to maintain diver qualification shall be scheduled and completed as required. This serves to exercise the various components as well as to maintain the proficiency of the divers and support personnel.

20.2.9 Commanding Officer/Officer In Charge Responsibilities.

a. Maintain certification of the DLSS through satisfactory maintenance and material management and accomplishment of all required certification dives.

b. Ensure all deficiencies identified during a recertification inspection are corrected in a expeditious manner. If a deficiency cannot be corrected by the date required, a request for an extension of the dive date shall be submitted to NAVSEA via the TYCOM.

c. Maintain crew proficiency, verify completeness of required equipment, and readiness of the DLSS to meet operational requirements.

d. Establish and maintain a QA program in accordance with the applicable sections of Volume V, Part III of this manual.

20.3 SUBMARINE RESCUE CHAMBER MAINTENANCE AND CERTIFICATION.

20.3.1 Certification.

a. To meet the intent of references (b), (g), and Volume V, Part III of this manual, and to allow manned operations of SRCs to their designed depth capability, NAVSEA has established a formal certification program. Reference (h) and Appendix B of this chapter provide a listing of items and components NAVSEA has identified as being within the SOC program. Included is the refurbishment of SRCs and the upgrading of the supporting technical documentation. To maintain the SRCs, a formal maintenance program is required to be implemented by Forces Afloat.

b. SRC maintenance is based on the prevention or correction of system and equipment degradation caused by the effects of exposure and normal use. The maintenance instructions of reference (h) do not cover major repair items such as, structural work on the pressure hull, replacement of seawater piping or penetrations. Work of this magnitude is not routine and should not be performed without NAVSEA concurrence and technical instructions issued to correct the specific problem.

c. Continued certification of the SRC is based on satisfactory maintenance and compliance with the dive requirements identified in paragraph 20.3.2.h of this chapter. Compliance with these requirements and with the material condition of the SRC will be verified during periodic NAVSEA inspections. The results of these inspections are promulgated by a NAVSEA letter of certification which will identify the requirements to maintain certification and, if required, forward System Certification Cards identifying deficiencies and corrective actions necessary for continued certification.

20.3.2 Action. To maintain SRCs in satisfactory material condition and to provide assurance they will be fully operational in the event of a submarine casualty, the following is required:

a. Meet the requirements of the NAVSEA certification letter.

b. Perform all planned maintenance in accordance with the applicable MIP/MRCs. Information contained in chapter 4 of reference (h) will be used in conjunction with existing MRCs for accomplishment of planned maintenance.

c. Accomplish corrective maintenance in a manner which returns the components to the specifications shown by the applicable drawing. Material used during any maintenance action shall be as specified in the NAVSEA approved system/component drawings or other approved technical documents. Material shall be certified in accordance with Volume V, Part I, Chapter 6 of this manual.

NOTE: IF THE VENDOR OR MANUFACTURER SPECIFIED IN THE NAVSEA DRAWING OR DOCUMENT CANNOT PROVIDE A SPECIFIC COMPONENT, THEN USE OF A SUBSTITUTE COMPONENT OR MANUFACTURER MUST BE APPROVED BY NAVSEA, VIA THE TYCOM, USING A DFS. A DFS IS ALSO REQUIRED WHEN MATERIAL OTHER THAN THAT SPECIFIED IN APPROVED DRAWINGS OR DOCUMENTS IS USED.

d. Document all work performed on SOC items using the applicable forms and procedures provided in Volume V, Part III of this manual. This applies regardless of whether the work is a planned or corrective maintenance action. Documentation will, as a minimum, include the following:

(1) Name of the person performing the work.

(2) Date the work was performed.

(3) Reason for accomplishing the work.

(4) Applicable drawing number or reference document.

(5) Brief description of the work performed.

(6) Description of the testing performed and test results.

(7) Signature of the officer/CPO responsible for assuring quality of work.

e. Maintain all work documents as official records for a three year period following completion of SRC refurbishment or in accordance with Volume V of this manual, whichever is longer. The documents will be available for inspection by the SCA and QA auditor during this period.

f. Obtain NAVSEA approval prior to accomplishing any alteration or modifications to SRCs. The accomplishment of unauthorized alterations or modifications will automatically revoke NAVSEA certification. In the case where an SRC has been refurbished, but not yet certified, unauthorized alterations or modifications could negate previous steps accomplished by the certification process. Alterations or modifications proposed by Forces Afloat will be prepared and forwarded to NAVSEA in accordance with Volume VI, Chapter 3 of this manual.

g. When emergency situations occur during SRC operations that require immediate corrective action and are beyond the scope of a corrective maintenance action, send a message to the TYCOM, info NAVSEA, advising of the situation.

h. In addition to the annual 400 foot manned dive required for certified SRCs, a 200 foot false seat test shall be conducted quarterly with all SRCs, unless precluded by operational requirements. This serves to exercise the various components that cannot complete operational testing while the chamber is located on the host ship's deck. All SRC operations will be conducted using the procedures provided in chapter 3 of reference (h).

i. All SRC specific equipment, specialized tool kits for SSN 688/SSN 21/SSBN/SSGN 726 Class submarines, and equipment required to support SRC operations will be maintained in an operationally ready condition.

j. Commanding Officers/Officers In Charge are responsible for maintaining the certification of the SRC through satisfactory maintenance and material management of the SRC and accomplishment of all required certification dives. Additionally, they shall ensure all deficiencies identified during a recertification inspection are corrected in a expeditious manner. If a deficiency cannot be corrected by the date required, a request for an extension of the dive date shall be submitted to NAVSEA via the TYCOM.

20.4 DRY DECK SHELTER MAINTENANCE AND CERTIFICATION.

20.4.1 Certification.

a. To meet the intent of references (b), (i), and Volume V, Part III of this manual, and to allow manned operations of DDSs to their designed depth capability, NAVSEA has established a formal certification program.

b. Maintenance is based on the prevention or correction of degradation caused by the effects of exposure and normal use of the DDS.

c. Continued certification of the DDS is based on satisfactory maintenance. Compliance with the maintenance and material requirements of the DDS is verified during periodic NAVSEA inspections. The results of these inspections are promulgated by a NAVSEA letter of certification which identifies the requirements for maintaining certification and, if required, will forward System Certification Cards which identify deficiencies and the corrective actions required to maintain certification.

20.4.2 Action. To maintain the DDS in satisfactory material condition and to provide assurance they will be fully operational in the event of a national tasking, the following is required:

a. Meet all of the requirements of the NAVSEA certification letter.

b. Accomplish corrective maintenance in a manner which returns the components to the specifications shown by the applicable drawing. Material used during any maintenance shall be as specified in NAVSEA approved system/component drawings, technical manuals or other approved technical documents. Material shall be certified in accordance with Volume V, Part I, Chapter 6 of this manual.

NOTE: IF THE VENDOR OR MANUFACTURER SPECIFIED IN THE NAVSEA DRAWING OR DOCUMENT CANNOT PROVIDE A SPECIFIC COMPONENT, THEN USE OF A SUBSTITUTE COMPONENT OR MANUFACTURER MUST BE APPROVED BY NAVSEA, VIA THE TYCOM, USING A DFS. A DFS IS ALSO REQUIRED WHEN MATERIAL OTHER THAN THAT SPECIFIED IN APPROVED DRAWINGS OR DOCUMENTS IS USED.

c. Document all work performed on SOC items using the applicable forms and procedures provided in Volume V, Part III of this manual. This applies regardless of whether the work is a planned or corrective maintenance action. Documentation will, as a minimum, include the following:

(1) Name of the person performing the work.

(2) Date the work was performed.

(3) Reason for accomplishing the work.

(4) Applicable drawing number or reference document.

(5) Brief description of the work performed.

(6) Description of the testing performed and test results.

(7) Signature of the officer/CPO responsible for assuring quality of work.

d. Maintain all work documents as official records for a three year period following completion of DDS refurbishment or in accordance with Volume V of this manual, whichever is longer. The documents will be available for inspection by the SCA and QA auditors during this period. The SEAL Delivery Vehicle Team shall maintain custody over these work documents.

e. Certification of the DDS is the responsibility of the parent SEAL Delivery Vehicle Team. It is the responsibility of both the team and the host unit to maintain certification when the DDS is installed on the host unit. Specifics of material and certification maintenance are covered in the applicable Memoranda of Agreement.

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APPENDIX A

SYSTEM CERTIFICATION REQUIREMENTS

Equipment Type	Service Approved	Authorized For Navy Use	Certify
Deep Dive Systems			X
Hyperbaric Research Facilities			X
Recompression Chamber System	Note 1		X
Diving Bells	Note 2		X
Shipboard Surface Supported Diving Air Systems			X
Underwater Breathing Apparatus Used with Deep Dive Systems	X		X
Mixed Gas and O^2 Scuba	X		X
Open Circuit Air Scuba		X	
Lightweight Surface Supplied Outfits (Air, HeO^2)	X		Note 3
Deep Sea (Hard Hat) Outfits (Air, HeO^2)	X		Note 3
Diver Life Vests	X		
Diver Operated Tools	Note 4	Note 4	
Diver Held Sonar, Navigation, etc.		X	
Diver Communications		X	
Wet Suits	Note 4	Note 4	
Variable Volume (Dry) Suits		X	
Air Compressors, Filters, etc.		X	Note 5
Diving Accessories (Mask, Fins, Watches, Knives, Compass, Depth Gauges, Weight Belts, etc.)	Note 4	Note 4	

Notes:

1. Service approval shall be obtained for transportable recompression chamber systems procured for fleet use.

2. Service approval shall be obtained for diving bells procured for fleet use.

3. Certification shall be obtained for each type of outfit. Individual outfits need not be individually certified.

4. Requirements are determined by NAVSEA and are based on the potential for hazard to divers, procurement quantities, and Logistic Support considerations.

5. When compressor/diving air systems are permanently installed as components of a diving or recompression system, they shall be included in the SOC. The Commanding Officer/Officer In Charge must ensure that compressors and diving equipment are properly installed and maintained in accordance with reference (a).

APPENDIX B

SUBMARINE RESCUE CHAMBER SCOPE OF CERTIFICATION ITEMS

1. Pressure Hull.

2. Ballast Tank.

3. Appurtenances.

   a. Deadlights.

   b. Hatches.

   c. Hull Inserts.

   d. Padeyes.

4. Seawater Ballast System.

5. Jettison System - Downhaul Cable Cutter.

6. Life Support System - Air Supply and Exhaust System (to certification boundary at ship's SRC air manifold connection).

7. Non-Compensated Equipment Subject to Implosion - Lower Compartment Lights.

8. Downhaul Winch.

9. Communications Systems.

   a. Sound Powered Telephone.

   b. Underwater Telephone.

10. Depth Detectors.

    a. Depth Gage.

    b. Compartment Pressure Gage.

    c. Secondary Depth Detecting (Support Ship Fathometer, Umbilical Pay-out Markings).

11. Accessibility to Vital Equipment.

12. Chamber Stability and Buoyancy.

13. Electric Power Systems.

    a. Normal Power System (to certification boundary at ship's SRC power supply fuse panel).

    b. Battle Lanterns.

14. Operating and emergency procedures (Reference (h)).

15. Lifting Pendant.

VOLUME IV

CHAPTER 21

ELECTROLYTIC OXYGEN GENERATOR REQUIREMENTS

REFERENCES.

(a) NAVSEA S9515-AA-MMO-010/020/030/040 - 6L16 Electrolytic Oxygen Generator (EOG) Technical Manual, Volumes 1 through 4
(b) NAVSEA S9515-AC-MMM-010/020/030 - 7L16 Electrolytic Oxygen Generator (EOG) Technical Manual, Volumes 1, 2 and 3
(c) NAVPERS 18068 - Manual of Navy Enlisted Manpower and Personnel Classifications and Occupational Standards
(d) COMSUBLANT/COMSUBPACINST C3500.1 - Submarine Force Training Manual

21.1 PURPOSE. To establish the prerequisites and procedures for qualification of personnel, operation and maintenance of Electrolytic Oxygen Generators (EOG).

21.1.1 Policy. TYCOM policy regarding the operation and maintenance is:

a. All current technical documentation shall be available at the EOG for operator use. As a minimum, the on hand documentation will include reference (a) or (b) as applicable, 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: EOG OPERATORS AND MAINTENANCE TECHNICIANS SHALL BE LIMITED TO THOSE INDIVIDUALS HOLDING THE NAVY ENLISTED CLASSIFICATIONS (NEC) REQUIRED BY REFERENCE (c) FOR THE TYPE OF EOG (I.E., 6L16 OR 7L16) OPERATED AND/OR MAINTAINED. REFERENCE (c) REFERS.

c. At least two qualified operators and one qualified technician shall be onboard during EOG 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 EOG operation**.

e. There shall be a minimum of two qualified Oxygen Clean Workers on board to conduct maintenance on oxygen systems and the EOG.

21.1.2 Background.

a. EOG 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 EOG 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 EOGs. 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) or (b) as applicable, and the supporting PMS.

c. Ensure Performance Monitoring Team (PMT) inspectors perform material inspections of the ship's EOGs immediately prior to entry and departure from a 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 EOG 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 EOG personnel qualifications.

c. Prohibit operation of the EOGs if shipboard procedures are not in compliance with this chapter and reference (a) or (b), as applicable.

d. Ensure the EOG Material Maintenance Log is maintained and correctly reflects **all** corrective and planned maintenance performed.

e. Ensure periodic reviews of the EOG 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 EOGs. Ensure EOGs 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 EOGs 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. EOGs will be operated by Ship's Force qualified operators as described in paragraph 21.1.1 of this chapter. The EOGs will be in a static shutdown condition, pressurized with nitrogen and meet the 3000 PSIG testing requirements of reference (a) or (b), as applicable.

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 EOGs 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) or (b), as applicable.

21.3 REQUIREMENTS FOR SHIPBOARD PERSONNEL QUALIFICATION.

21.3.1 Training. Operators and maintenance technicians (both 6L16 and 7L16 EOGs) must be graduates of the training courses required for the appropriate NEC in accordance with the requirements of reference (c).

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

a. The NECs required for 6L16 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 7L16 installations:

(1) NEC 4262 An individual certified to this NEC will have successfully completed EOG Operator/Maintenance Course A-652-0051, 0052 or 0061.

(2) NEC 4762 An individual certified to this NEC will have successfully completed EOG Operator/Technician Course A-623-0035, 0036 or 0040.

NOTE: 7L16 OPERATOR/MAINTENANCE AND OPERATOR/TECHNICIAN COURSES NO LONGER EXIST.

(3) In the event the ship is unable to meet the formal training/NEC requirements for 7L16 operators because the schools no longer exist and/or the Bureau of Naval Personnel is unable to fill the billets with the correct NEC personnel, the ship shall request the TYCOM, via the ISIC, to authorize an alternative training program.

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

a. For 6L16/7L16 NEC 4252/4262: Stand watches, under instruction, for a two week period underway, with the EOGs in operation.

b. For 6L16/7L16 NEC 4752/4762: Stand watches, under instruction, for a minimum of three days while underway with the EOGs 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. Demonstrate an understanding of the approved NAVSEA EOG Log Sheets, including the significance of data recorded and operational limits.

d. Demonstrate a knowledge of corrective action(s) to be taken in the event of sudden changes in equipment operating parameters.

e. Successfully complete qualifications for the EOG and support systems in accordance with reference (d).

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CHAPTER 22

SUBMARINE ANTENNA TESTING

REFERENCES.

(a) NAVSEA 0900-LP-016-6090 - Handbook for Submarine Antenna Systems

22.1 PURPOSE. To provide Type Commander policy with respect to pressure testing submarine communication antennas. This policy is not applicable to non-communication masts and cables. Amplifying information is contained in reference (a).

22.2 BACKGROUND. Submarine antennas and associated cable connections between the antenna and electrical hull fitting are sensitive to seawater intrusion. In the event that seawater enters an electrical hull fitting or radome and is subsequently used for transmission, significant component damage may occur. Also, if the antenna floods and sea water stays in the antenna until the next maintenance availability the antenna is usually a complete loss.

22.3 POLICY.

22.3.1 Hydrostatic Pressure Testing. Hydrostatic pressure testing of submarine antennas with cables attached prior to initial installation is mandatory except for buoys and floating wires. This pre-installation test is intended solely to verify the correctness of the final assembly and does not equal or replace the more elaborate acceptance testing required for various individual manufactured components.

22.3.2 Fleet Maintenance. Maintenance actions conducted by Fleet Maintenance Activities or Ship's Force regarding the watertight integrity test requirements between submarine antennas and their respective hull connectors, shall be as follows:

a. When the antenna or cable is disconnected or replaced shipboard, the Technical Work Document will include the checks below in the assembly procedure to reconnect the cable to the base of the antenna and/or electrical hull fitting:

(1) Craftsman verification that surface finishes of O-ring seating surfaces are in accordance with applicable specifications.

(2) Craftsman verification that the O-ring is properly installed and in accordance with applicable specifications.

b. Prior to performing the deep dive certification after a maintenance action, passive/pre-energize testing shall be performed in accordance with the system specific Technical Manuals or Maintenance Index Pages/Maintenance Requirement Cards (MIP/MRC) to certify clear Radio Frequency and Control Lines before power is applied or a transmission is attempted. This practice shall apply each time the antenna system is used.

c. Upon completion of the maintenance action, a deep dive shall be performed by the ship to certify that watertight integrity has been restored to the antenna system. After performing the deep dive, passive/pre-energize testing shall be performed in accordance with the system specific Technical Manuals or MIPs/MRCs to ensure the system is not grounded.

22.4 PROCEDURE.

a. Upon completion of maintenance and before underway for submerged operations, the ship shall place CAUTION tags on the Main Power Switch or transmit keys for the affected antennas. The Amplifying Instructions for the CAUTION tags will state - "DO NOT OPERATE/TRANSMIT ON THIS ANTENNA UNTIL COMPLETION OF PASSIVE CHECKS FOLLOWING A DIVE TO TEST DEPTH. PASSIVE CHECKS MUST BE PERFORMED PRIOR TO EACH USE UNTIL THE DEEP DIVE IS COMPLETE."

b. It is understood that in some cases, due to water depth restrictions, the deep dive may not be performed for quite some time. In these cases, the ship should dive to the maximum depth possible and conduct passive checks. Provided the checks are satisfactory, the CAUTION tag may be replaced with one stating - "DO NOT OPERATE/TRANSMIT ON THIS ANTENNA FOLLOWING OPERATIONS GREATER THAN (enter max depth obtained). PASSIVE CHECKS MUST BE PERFORMED PRIOR TO EACH USE UNTIL THE DEEP DIVE IS COMPLETED."

c. The tag(s) may be removed following completion of a deep dive to test depth and completion of satisfactory passive testing performed in accordance with the system specific technical manuals or MIPs/MRCs to ensure the system is not grounded.

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CHAPTER 23

GAS TURBINE ENGINE INSPECTION

REFERENCES.

(a) OPNAVINST 9234.1 - Marine Gas Turbine Inspector (MGTI) 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 4 - General Gas Turbine Bulletin Number 4 (Marine Gas Turbine Operating Data Report)
(f) OPNAVINST 3120.32 - Standard Organization and Regulations of the U.S. Navy, Section 630.17

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 TYCOM. This chapter provides the guidance for Marine Gas Turbine inspection requirements, including preparation, procedures, criteria and reporting.

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:

NOTE: PARAGRAPH 23.2.1.a IS NOT APPLICABLE TO AIRCRAFT CARRIERS.

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 Fleet Technical Support Center.

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), Systems and Equipment Material Assessment Team II (SEMAT II), 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. The MGTI is authorized, but not limited, to performing the following per references (a) and (b).

a. Perform periodic intermediate level inspections per Gas Turbine Bulletins (GTB) and Ancillary Equipment Bulletins.

b. Perform GTRR, SEMAT II, post casualty investigations, pre-deployment inspections and pre-Planned Major Maintenance Availability inspections.

c. Provide troubleshooting assistance to ships and FMAs.

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-SSES via the Fleet Technical Support Centers (FTSC).

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.

23.3 GAS TURBINE INSPECTIONS AND REQUIREMENTS.

23.3.1 Applicability.

a. All shipboard LM2500 propulsion and Allison 501-K17/K34 electrical power generation gas turbine engines on ships 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 (b) and (c), established Planned Maintenance System (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 recorded monthly in the Marine Gas Turbine Equipment Service Record and reported semi-annually via reference (e), are the engine hours used to determine inspections.

b. Reference (d) lists all Technical Directives and their revisions/amendments.

c. GTB Inspections should **not** be scheduled in conjunction with pre-availability or pre-deployment inspections.

d. Any ship not able to complete required GTB Inspections within the required periodicity will request a Departure From Specifications 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 FTSC 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 SEMAT II, or other assessment programs scheduled by the ISIC or TYCOM.

23.5 PREPARATION FOR INSPECTION. The following preparations shall be completed prior to the MGTI arrival when conducting pre-Planned Major Maintenance Availability, pre-deployment, and GTRR.

a. For other than casualty inspections Ship's Force shall conduct full power data run with gas generator speed above 8500 RPM. Operate at full power for 20 minutes and provide a printout every five minutes. Record the actual gas generator speed.

b. Forward a copy of full power data to FTSC Atlantic Fleet or FTSC Pacific Fleet, as applicable, and retain a copy on board for use by the MGTI.

c. Ensure ship's borescope set is available and in good working order.

d. Ensure Marine Gas Turbine Equipment Service Records for all gas turbine engines are complete and available. Have available a copy of the last engine hours message sent in accordance with reference (e).

e. Ensure control consoles and associated electronic enclosure power supplies are in good working order.

f. Prepare LM2500 gas turbine engines for inspection.

(1) Water wash all Gas Turbine engines in accordance with PMS.

(2) Tag-out. All gas turbine engines will be danger tagged in accordance with reference (f) to prevent improper operation.

(3) Ensure all bolts to inlet plenums and exhaust access openings are loosened.

(4) Loosen nuts on the accessory gearbox drive pad cover plates, note the quantity of oil that drains when the cover plate is loosened.

(5) Borescope engines and report results to MGTI in accordance with PMS. Leave all borescope plugs loose and Variable Stator Vanes (VSV) in full open position.

(6) Remove all four thermocouple segments and all PT5.4 probes and/or dummy caps. Cover all open ports to prevent entry of foreign objects.

(7) Special tools, support and test equipment will be available, in good condition and calibrated (as required).

(8) Have the last two assessment reports for each LM2500 gas turbine engine available for review.

g. Prepare Allison 501-Kl7/K34 engines for inspection.

(1) Water wash Gas Turbine engines.

(2) Tag-out. All gas turbine engines will be danger tagged in accordance with reference (f) to prevent improper operation.

NOTE: ONE GAS TURBINE GENERATOR MAY BE LEFT IN STANDBY STATUS.

(3) Loosen all igniter and liner support bolts.

(4) Remove the center thermocouple in all six combustion liners (CG-47 Class ships) or liners 2, 3, 4, 5, and 6 (DD-963 and DDG-993 Class ships). Remove the combustion liner assembly alignment pins 1-6 (DDG-51 Class ships).

(5) Open inlet plenum and remove air inlet adapter V-band clamp.

(6) Loosen all top inspection cover bolts on speed decreaser.

(7) Inspect AGB magnetic drain plug. Leave any loose metallic material found for MGTI inspection.

(8) Remove the scattershields and sound suppressor.

(9) Remove the starter.

(10) Borescope engines and report results to MGTI in accordance with PMS.

(11) Special tools, support and test equipment will be available, in good condition, and calibrated (as required).

(12) Have the last two assessment reports for each Allison 501-Kl7/K34 gas turbine engine available.

h. Administrative review will consist of but is not limited to the following items.

(1) Ensure all required gas turbine technical manuals and technical directives as listed in the current Technical Directive Index (reference (d)) are complete, in good condition, up to date and available. Ensure that the latest revision of reference (c) is available in the technical library or on Compact Disk-Read Only Memory (CD-ROM).

(2) Ensure that Marine Gas Turbine Equipment Service Records are updated, available and the latest hours recorded concur with the hours reported on the last monthly hour report (reference (e)).

(3) Have all TYCOM issued Departure from Specification's and NSWCCD-SSES waivers that relate to the gas turbine engines available.

i. After completion of the static inspection of the LM2500 and Allison 501-Kl7/K34 engines and a review of the inspection results, the MGTI with FTSC concurrence may require specific engines be operated for further evaluation. This operation will be scheduled and conducted on a case-by-case basis.

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 SEMAT II, 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. Conditions exist that if left unattended, would definitely pose a hazard to personnel or result in severe equipment damage. Repair Before Operating (RBO) deficiencies require reinspection by a MGTI after repairs and before the gas turbine engine is operated. The following items are examples of RBO items and **are not to be construed as a complete list.**

a. LM 2500.

(1) Bent/broken VSV vane actuation arms.

(2) Improperly rigged VSVs.

(3) Foreign Object Damage screen with cracks or missing wires that are beyond serviceable limits.

(4) Evidence of serious internal failure.

(5) Stall (tip clang).

(6) Bent or damage blades.

(7) Loose/missing casing split line bolts.

(8) GTB inspection periodicity/time limits exceeded.

(9) Fuel oil or lube oil lines chafed in excess of maximum limits.

(10) Exhaust duct mount lug weld crack(s) beyond allowable limits.

b. Allison 501-K17/K34.

(1) Combustor liner out of specifications.

(2) Eroded turbine section beyond serviceable limits.

(3) Vertical and/or side mount out of specifications.

(4) Heavily caked/dirty fuel nozzles.

(5) Burned ignitors.

(6) Fuel oil or lube oil lines chafed in excess of maximum limits.

(7) Improperly connected thermocouple leads and open thermocouples as indicated by and installed monitor or PMS.

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

a. LM 2500.

(1) Chafed fuel oil or lube oil lines.

(2) Worn VSV bearings or bushings.

(3) Exhaust duct mount lug welds cracked, but within service limits.

b. Allison 501-K17/K34.

(1) Fuel nozzles not maintained in accordance with PMS.

(2) Broken cannon plugs.

(3) Exhaust leaks.

(4) Chafed fuel oil or lube oil lines.

c. Gas turbine engine can be operated but 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 4790/2K.

b. The engine cannot be started until RBO repairs are complete and reinspected by an MGTI.

c. No other reports are required.

VOLUME IV

CHAPTER 24

WOOD HULLED SHIPS AND CRAFT

REFERENCES.

(a) NAVSEA S9086-DA-STM-000 - NSTM Chapter 100 (Hull Structures)
(b) NAVSEA S9086-VG-STM-010 - NSTM Chapter 634 (Deck Coverings)
(c) MIL-S-24340 - Polyurethane (Polyether Base) Deck Sealing Compound
(d) NAVSEA STD DWG 805-921806 - Installation of Planking on Deck Plating
(e) NAVSEA S9086-VD-STM-010/020/030 - NSTM Chapter 631 Volumes 1, 2 and 3 (Preservation of Ships In-Service)

24.1 PURPOSE. This chapter contains procedures for the inspection, repair and maintenance of wood decks and structures on wood hulled ships and craft.

24.2 WOOD DECAY.

24.2.1 Primary Causes. Wood decay is caused by a fungus growth which breaks down the cell structure within the wood. This fungus thrives in fresh water but its growth is significantly retarded by salt water. Wood decay generally occurs in those spaces which are poorly ventilated and where fresh water has gained access. Poor drainage, allowing fresh water to stand, even in small amounts, is particularly hazardous. The primary causes of wood decay found in ships using wood for hulls, decking and structures are identified below.

a. Insufficient ventilation and air circulation especially in spaces plagued by dampness and high humidity (i.e., chill room platforms, and areas around fresh water tanks).

b. Obstructed drain pipes, scuppers, limbers, and drain holes.

c. Uncaulked or poorly maintained deck seams, especially around plywood decking and deck house areas.

d. Washing down with fresh water.

e. Depressions in the deck from sanding which allows fresh water to stand.

f. Leaking plumbing especially in heads, water closets, and food preparation areas.

24.2.2 Recognition. Decay in the deck and hull structure is often concealed and hard to detect. It is usually not recognizable by visible fungus except in joints between surfaces. Decay may be suspected if paint coating is discolored or the wood surface is cupped. The affected wood has a pronounced stringy, fibrous appearance. Thoroughly decayed wood is brittle which, when dry, breaks easily across the grain with a distinct brash fracture and may crumble into powder. Black stains spreading along the grain from ferrous metal fastenings are usually a result of chemical reactions instead of from decay fungi. Testing procedures for suspected decay areas are detailed in reference (a).

24.2.3 Preventive Measures. Detailed preventive measures are described in reference (a). General preventive measures for the reduction of wood decay are identified in the following paragraphs, and should be accomplished by Ship's Force.

a. Correct/remove all interference with complete water run off.

b. Repair fresh water leaks in plumbing drains and fresh water supply systems.

c. Maintain ventilation system in proper operation. Ensure ventilation system filters are kept clean, maintained clear of all foreign material, and ventilation terminals remain open.

d. Carefully caulk and maintain deck seams, especially around plywood decking, deck house, hull fittings and foundation areas.

e. In fair weather, open hatches and deck plates to supplement the air circulation.

f. Remove wet dunnage or shoring in below deck spaces and permit to dry.

g. Avoid washing down with fresh water. Use only salt water due to its preservation values.

h. Wash down the ship/craft with salt water following periods of inclement weather to eliminate fresh water and restore salt washed away by the rainfall.

i. Avoid heavy build up of paint.

j. Check MCM bilges and accessible voids for standing fluids once each watch. Identify and correct any leaks and promptly remove any fluids. MCMs are designed to operate with dry bilges. Prolonged contact with fluids will result in wood swell, which can lead to external glass reinforced plastic delamination, planking damage, and machinery misalignment.

24.2.4 Corrective Measures.

a. Treat new wood, used during new construction or in repaired areas, with a copper naphthenate preservative. This product is produced in a clear and colorless form or in a bright green color. The green preservative has a higher level of copper and is considered to be the more durable and efficient of the two preservatives. If the treated wood is to be varnished, finished with light-colored paints or left bare, use the clear preservative since the green color will bleed through varnishes and light-colored paints.

b. Build up a heavy concentration of the preservative with a series of three or more heavy applications using a brush, spray or immersing the wood in a preservative filled tank. On-going protection requires periodic application of the preservative to bare wood structures at about five-year intervals. Wood treated on this basis will last indefinitely.

c. Early identification of decayed areas will allow damaged wood to be treated with an anti-decay product that will harden up the soft wood and prevent the further spread of decay. The product, available commercially, is a two-part mixture with deep penetrating properties that fills wood pores with a capillary action.

d. Before a wood structure is so badly decayed that its replacement is necessary, a possible long lasting repair is made by drilling a series of 1/4" to 3/8" diameter holes in and around the affected areas and gravity feeding the anti-decay mixture in sufficient quantity to allow total penetration of the damaged area. A guide for proper application of this product is provided with each repair kit. Avoid removing or disturbing bad wood during repairs, since the original wood, whether good or bad, serves as a container for the product and preserves the shape and size of the affected member. Initial curing of the product takes place about one hour after application. Total curing takes place after one week, at which time the treated wood resembles petrified wood and the growth of rot in the treated area is effectively stopped. Repairs should be accomplished by Ship's Force during regular maintenance periods.

24.3 DECK AND HULL MAINTENANCE.

24.3.1 Inspection Requirements. With reasonable care, wood hulled ships can give many years of economical service. Make frequent inspections to detect any leaks beneath the covering board, around the deck house areas and seams in the deck planking. Reference (a) lists general maintenance requirements for wood hulled ships.

24.3.2 Maintenance Policies. Specific maintenance policies and repair practices are described in the following paragraphs.

a. As a general policy, because of the ever present risk of decay developing beneath any wood coating, leave wood strip planked decks uncoated and unpainted.

b. Limit the cleaning of wood decks to scrubbing with mild detergents and salt water. Never use fresh water for wash-downs since it encourages growth of decay producing fungi. Do not use strong detergents, acids, and bleaches for deck cleaning. Do not sand decks.

c. Set up a routine of daily wetting down of wood strip planked decks with salt water. This wetting down causes strip deck planking to remain swollen and creates a tighter fit between planks. Wetting down is especially necessary during warm weather periods when the sun's heat will quickly dry out the deck planking. Do not allow water to accumulate in deck recesses for any length of time.

d. Cover all plywood decks with a coating in accordance with the application and deck preparation procedures of reference (b).

e. Planking renewal will be approved by the TYCOM only on the basis of a technical survey that has positively shown specific need and complete justification for such renewal. Often used general terms such as "Rotten and Worn" are not considered sufficient justification. The technical basis for planking renewal shall be formed in the following manner:

(1) Drill test bore holes in weather deck areas to find planking thickness in specific areas where plank wear is suspected. If the planking is not worn beyond the limits set forth in reference (b), the planking will not be renewed unless other extenuating and justifiable circumstances dictate, and replacement is authorized by the TYCOM.

(2) Take boring plug samples of planking suspected of being decayed. Notify the TYCOM of inspection results.

(3) Once planking has reached the maximum wear limits (found by bore test), the TYCOM will determine the need to replank or apply a deck coating.

f. So far as practicable, repair deck leaks by recaulking deck seams.

g. When deck planking wear limits have been reached, and other factors such as extensive deck leaks suggest use of a deck covering, a coating of polyurethane deck overlay may be used. Non-skid material must be Naval Sea Systems Command approved material compatible with the deck overlay as defined in reference (b).

h. Reset metallic planking fasteners when fastener heads are level with, or protrude above, deck level. Where the planking level is within 1/4" or less of fastener head, filling with seam filler vice wooden plugging is authorized. Where bung plugs are installed, they shall be set in black polyurethane seam filler per the requirements of reference (c).

i. Ships currently having polysulfide or polyurethane coated strip deck planking in good condition shall continue to use the applied covering. Make minor repairs to this polyurethane coating as necessary using either a polysulfide or polyurethane repair kit. When the polysulfide covering is no longer economically repairable, replace it with a polyurethane type coating. Repairing cracks and holes in impervious deck coatings shall be accomplished as soon as practical. Failure to do so will lead to deck rot and costly repairs.

24.3.3 Deck Covering Repairs. Interior and exterior deck covering material is prescribed by Military Specifications and will be installed only as approved by the TYCOM. Repair previously installed deck coverings as necessary. Reference (b) prescribes approved materials and preparation procedures for wooden decks.

24.3.4 Caulking Techniques. Removal of old caulking from leaking seams and recaulking is the standard method for repairing deck leaks. Fill the caulked seams with a black polyurethane seam filler, per the requirements of reference (c). Before filling, caulk the seams with sufficient cotton. Seam out gaging (beveling) as specified in reference (d). Detailed instructions concerning equipment used, the preparation of seams, the method of application and primers to be used are described in reference (b).

24.3.5 Weather Deck/Planked Deck Repair.

a. Remove all loose or decayed cotton or oakum caulking after removing all seam filler. In areas where caulking is found to be in good condition, set this material deeper into the seam opening, ensuring it is driven in solidly to make room for additional caulking.

b. Small, tight seams will require a new single thread of cotton. The size of the seam in width and depth determines the amount of cotton or oakum required. Install sufficient cotton and/or oakum so that the level of the top of the caulking is 1/4" to 3/8" below the surface of the decking. This will allow room for the seam filler.

c. Unless marine glue (pitch) is used as a seam filler, seal the surface of the caulked cotton or oakum with a special seam primer that is compatible with the seam filler. Do not use a rubber type seam filler over oakum.

d. Prime or fill newly caulked seams at the end of each day's caulking to keep moisture out of the caulking material and to protect the dry surface of the deck plank seams.

e. Rubber type seam fillers that are installed in seams with a caulking gun must also be hand worked into the seam with a putty knife. This is necessary to eliminate air pockets and voids in the seam. Hand working of the seam filler must be in one single direction to avoid air pockets.

24.3.6 Underwater Planking Repairs.

a. The forward and after rabbet shall receive a thorough inspection. The rabbet seam in the stern area is covered with an anchor chafe plate and is not available for inspection or repair unless the anchor chafe plate is removed. Slack or rotten caulking allows for infestation of marine burrowers and decay which, in the case of the rabbet seams forward, goes undetected.

b. Inspect and test caulked plank seams covered with bottom sheathing for soundness whenever areas are exposed due to the removal of sheathing. In most cases the seams have been covered for many years and have not been available for periodic maintenance. These seams, although covered with sheathing, do eventually waste away or become slack. The seams at the planking butts are more susceptible to slackening and erosion due to movement at the joints. Under normal conditions, it is necessary to recaulk these joints every 10 to 15 years.

c. If the outer strand of oakum caulking appears to be satisfactory, then the seam may be repaired by setting the existing caulking deep into the seam and adding more strands of oakum to fill the seam depth. If the old caulking is wasted away or decayed, clean out the seam and remove all caulking and residue to make room for the new material.

d. Before filling the newly caulked seam with a seam compound, paint the oakum and seam with anti-fouling paint. Painting the seam protects the oakum from marine burrowers and primes the wood in the way of the seam filler. Painting the oakum produces a hard surface finish which also makes a water barrier necessary for the protection of the oakum.

24.4 SURFACE PREPARATION AND PAINTING.

24.4.1 General Techniques. The greatest single factor affecting the performance of any paint system is the method and care used in the preparation of the surface to be coated. The preservation of wooden ships presents some unique problems not encountered in other types of ships. Reference (e) provides guidance for surface preparation materials and methods of application, techniques, and general safety precautions for painting.

24.4.2 Preparation and Painting Policies. Specific TYCOM policies pertaining to the preparation and paint application are identified in the following paragraphs:

a. The use of torches to blister the existing paint coating for removal is authorized; however, care shall be taken to guard against damage to other items or equipment in the vicinity. Avoid application of heat on or near items such as electric wiring, plastics, gaskets, and all flammable materials. Use only enough heat as required to blister the paint. Excessive heat chars the wood fibers and removal of the charred wood results in an uneven surface. Remove all interferences that can reasonable be removed before applying heat. This includes all label plates, brackets, clips, etc.

b. Scraping tools used to remove blistered paint must be kept sharp to be effective. Do all scraping in the direction of the wood grain to prevent shredding of wood fibers and gouging of the bare wood surface. This phase of paint removal is important in preparing the surface for sanding.

c. All areas stripped as previously described are now ready for sanding before priming. Hand sanding, with wooden blocks where practicable, using the correct grit paper, is the prescribed final step. Careful dusting before paint application is absolutely necessary to achieve a good primer bond, or bond between subsequent paint coats.

(1) Power disc sanders are not authorized for use in surface preparation. Improper use of the disc sander is the biggest cause of uneven surfaces and damage.

(2) Belt sanders and vibrating sanders are authorized for use in preparing the hull freeboard for priming and top-coating.

24.5 WOODEN HULL BOTTOM SHEATHING. For bottom sheathing to be effective and to provide protection to the underlying hull planking, the sheathing must fit the shape of the vessel's contoured bottom, be securely fastened, and be faired to the level of adjoining pieces of sheathing. The sheathing shall be installed per the requirements of reference (a).

a. Sheathing the bottoms of wood vessels servers to protect the hull from burrowers, especially if the vessels are to endure long periods between dry-dockings.

b. For vessels that are active and are dry-docked annually, the use of sheathing is not required.

24.6 WOODEN SEA CHEST FOUNDATIONS.

a. To prevent overheating of the wood filler blocks and wood cap blocks in sea chests, the wood must be insulated from the metal fittings. Use of delron sleeves or bushings around the body of the through-hull fitting and around the bolt fastenings is one approved method.

b. A Cathodic Corrosion Control system using an impressed current through anodes installed on boat bottoms isolates the anode fittings with the use of delron bushings and by the application of a mastic material applied over bare wood in a 36" diameter area around the anode.

c. Replace wood fillers and caps that are badly decayed. If repairs cannot be made immediately, then treat the bad wood with a preservative or decay inhibitor to slow up the rate of deterioration until the bad wood can be replaced. When new fillers in the form of blocks and caps are fabricated, they should be treated with preservative prior to installation and after the wood has been finally shaped and fitted.