COMSCINST **4700.16**	**COG CODE N7**	DATE **16 JUN 1997**

DEPARTMENT OF THE NAVY
COMMANDER MILITARY SEALIFT COMMAND
WASHINGTON NAVY YARD BLDG 210
901 M STREET SE
WASHINGTON DC 20398-5540

COMSCINST 4700.16
N7
16 June 1997

COMSC INSTRUCTION 4700.16

Subj: MSC GENERAL TECHNICAL REQUIREMENTS

Ref: (a) COMSCINST 4700.10A, Standardization of MSC Work Packages

Encl: (1) MSC Drawing No. 803-7081122; MSC General Technical Requirements
(2) MSC Drawing No. 803-7081124; MSC Work Item Preparation Guide

1. Purpose. To promulgate the Military Sealift Command (MSC) General Technical Requirements (GTR) (enclosure (1)) and the MSC Work Item Preparation Guide (enclosure (2)). These documents set forth a method of performing and standardized format for developing individual work items, respectively. These documents are provided to facilitate the standardization of work package development and accomplishment of work requirements associated with the repair and overhaul of MSC ships.

2. Scope. The requirements of this instruction apply to all MSC owned, civilian mariner (CIVMAR) operated ships. Compliance with this instruction shall be required for all work packages whose preparation begins on or after the effective date of this instruction and for selected ship operating subcontracts for repair or industrial assistance awarded after the effective date of this instruction.

3. Background. In recognition of the need for standardization, COMSC has developed a guide for use in developing work items (enclosure (2)). This guide also includes a standard work package index. Development of a work package still requires rigorous attention to ensure that each work requirement is adequately addressed and that the responsibilities of the Government and the Contractor are clearly delineated.

4. Definitions. The following definitions apply to terms used in this instruction:

a. General Technical Requirements (GTR). The standards of performance for the work directed by work items. The GTRs are controlled by COMSC.

b. Preparing Activity. Any organizational command or Contractor preparing a work package.

c. Specification. A term usually meaning either a single work item or a complete set of work items.

d. Standard Item. Items which are (1) used for repetitive work, (2) invoked by the work items; they may not be modified except by a formal review and reissue procedure.

e. Work Item. Any item which provides sufficient details dependent on the type of specification (design or performance) to allow a Contractor to perform work .

f. Work Package. A set of work items for an individual availability which incorporates or invokes applicable references including but not limited to the GTRs, ABS and Coast Guard regulations.

5. Action

a. COMSC. COMSC (N7) will maintain enclosures (1) and (2). Revisions to these documents shall be issued when deemed appropriate.

b. Program Managers

(1) Program Managers shall ensure that the procedures described in this instruction are employed for work packages developed for MSC owned, CIVMAR operated ships. Repetition or duplication of requirements shall be avoided.

(2) Program Managers shall ensure that Preparing Activities are provided with copies of enclosures (1) and (2) and any future revisions of these documents.

c. Preparing Activities. Preparing Activities shall employ enclosures (1) and (2) and the appropriate Standard Items as prescribed in this instruction. Individual/additional work items shall be developed as necessary to identify the unique work requirements of the given contract in the format prescribed in enclosure (2). The first work item of a work package shall invoke enclosure (1).

d. Effective Date. This instruction shall be fully implemented and utilized in all ship repair and conversion contracts or subcontracts for MSC owned, CIVMAR operated ships scheduled to begin work package development on or after the effective date of this instruction and in all contracts and subcontracts thereafter. All work packages issued by MSC whose preparation began before this date, including all contracts and subcontracts currently being performed or awarded prior to the effective date of this instruction, and all solicitations currently being competed, but not yet awarded will use the GTRs contained in reference (a).

C. R. BURCHELL
Deputy Commander

Distribution:
COMSCINST 5000.19
List I (Case A, B)
SNDL 41B (MSC Area Commanders)
41C (MSC Subarea Commanders)
MSC Port Engineers

MILITARY SEALIFT COMMAND
GENERAL TECHNICAL REQUIREMENTS
(GTRs)

DRAWN BY: JJMA-WMF	CHECKED BY: JJMA-MSM		DEPARTMENT OF THE NAVY MILITARY SEALIFT COMMAND WASHINGTON D.C., 20398
D. P. RUSSELL Head, Policy Branch	DATE 16 May 97		
J. C. BOHR Head, Project Coordination	DATE 16 May 97		MILITARY SEALIFT COMMAND GENERAL TECHNICAL REQUIREMENTS (GTRs)
ROBERT E. VAN JONES Director, Technical Division	DATE 16 May 97		
K. D. BAETSEN Deputy, Engineering Director	DATE 22 May 97		
APPROVED FOR COMSC T. G. CONNORS	DATE 23 May 97		

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REV	REVISION DESCRIPTION	APPROVED

CHANGES TO GENERAL TECHNICAL REQUIREMENTS (GTRs)

It is expected that this document will be dynamic. Any omissions, discrepancies, or suggestions for improvements to this document shall be forwarded to COMSC N7 using the Feedback Form at the end of GTR 29. All feedback will be retained and thoroughly evaluated for incorporation into subsequent revisions to the GTRs. Originators will be advised of action on their proposed change.

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GENERAL TECHNICAL REQUIREMENTS (GTRs) INDEX

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MILITARY SEALIFT COMMAND
GENERAL TECHNICAL REQUIREMENTS

GTR No. 1

REGULATORY BODIES, AND ORDER OF PRECEDENCE

1.0 ABSTRACT

This Item identifies regulatory body requirements and order of precedence requirements.

2.0 REFERENCES: None

3.0 REGULATORY BODIES

Whether or not specifically required in a work item or GTR, all of the applicable laws of the United States and the requirements of the various regulatory bodies in force at the time of contract award shall apply to the work performed under the contract, including but not limited to those listed below:

3.1 American Bureau of Shipping (ABS), Rules for Building and Classing Steel Vessels, Requirements for Certification of Construction and Survey of Cargo Gear on Merchant Vessels, Rules for Building and Classing Steel Vessels Under 200 Feet [61 Meters] in Length, Guide for Certification of Cranes, Guide for Construction of Shipboard Elevators, and Rules for Building and Classing Underwater Vehicles, Systems, and Hyperbaric Facilities.

3.2 United States Coast Guard (USCG), Code of Federal Regulations, Title 46 - Shipping (46 CFR), Code of Federal Regulations, Title 33 - Navigation and Navigable Waters (33 CFR), Code of Federal Regulations, Title 35 - Panama Canal (35 CFR), and Navigation and Vessel Inspection Circulars.

3.3 International Maritime Organization (IMO): Including all resolutions and amendments as adopted for the International Convention for the Safety of Life at Sea (SOLAS), the International Convention for the Prevention of Pollution from Ships (MARPOL), and the International Convention for the Prevention of Collisions at Sea (COLREGS).

3.4 United States Public Health Service (USPHS), including Publication No. 393, "Handbook on Sanitation of Vessel Construction", and USPHS and MARAD's Joint Publication No. P 161019 "Ratproofing of Ships", to entitle ship to receive Deratization Exemption Certificate and Certificate of Sanitary Construction.

3.5 Federal Communications Commission (FCC).

REGULATORY BODIES, AND ORDER OF PRECEDENCE

3.6 U.S. Department of Labor, "Safety and Health Regulations for Longshoring" and "Occupational Safety and Health Act (OSHA)".

3.7 Panama Canal Company Regulations.

3.8 Suez Maritime Canal Universal Company Rules of Navigation.

4.0 ORDER OF PRECEDENCE

4.1 As a subcategory of FAR Clause 52.215-33(e) (Order of Precedence), the following order of precedence in descending order shall apply:

4.1.1 Regulatory requirements.

4.1.2 Work item requirements.

4.1.3 Contract Drawing.

4.1.4 Contract Guidance Drawings.

4.1.5 GTR.

4.2 Order of Precedence within Work Package

General work items in the Work Package (001 through 099) state the broadest requirements and apply to the complete contract. Specific work items may require additional or different services or work and shall prevail over the general work items.

4.3 Specific Requirements

Where requirements of the Contract, Contract Drawings, Contract Guidance Drawings, or the Work Package are in excess of regulatory body requirements, the Contract, Contract Drawings, Contract Guidance Drawings, or the Work Package shall prevail.

MILITARY SEALIFT COMMAND
GENERAL TECHNICAL REQUIREMENTS

GTR No. 2

ACCESS FOR INSPECTION, OPERATION, MAINTENANCE, AND REPAIR

1.0 ABSTRACT

This Item establishes the general requirements for inspection, maintenance, operation, removal, installation, and repair access to Government furnished and Contractor furnished equipment, machinery, and associated foundations.

2.0 REFERENCES

2.1 American Society for Testing and Materials (ASTM), F1166, Standard Practice for Human Engineering Design for Marine Systems, Equipment, and Facilities.

3.0 LAYOUT

3.1 Machinery, equipment, and associated foundations shall be installed to permit ready access to all parts for inspection, maintenance, operation, removal, installation, and repair without disturbing other structures or ship's components. Piping runs, cable runs, ventilation ducts, controls, valves, and wireways shall not be installed in areas rendered inaccessible by the location of fittings or by other obstructions. When layouts call for the installation of permanent ladders, doors, catwalks, manholes, scuttles, and bolted plates, they shall be installed for ease of removal and reinstallation. Battens and gratings in holds, storerooms, and other spaces and protective casings around pipes shall be readily removable.

3.2 Equipment and accompanying local operating panels and gageboards shall be installed to conform with manufacturer’s requirements for clear access to equipment for ease of maintenance, repair, inspection, and operation. This includes but is not limited to providing clearance for opening and closing of operating panels, motor controller boxes, drawers, and doors.

3.3 Outfitting arrangements shall be designed to allow full opening and closing of all drawers, doors, and pull down desk tops.

3.4 Equipment shall be installed to ensure personnel safety and protection of equipment in accordance with Reference 2.1.

3.5 Installation and modification arrangements shall not degrade the capabilities, operability, human engineering considerations, safety, alignment, maintainability, electromagnetic capability, and intended use of new or existing equipment.

4.0 MANHOLES AND ACCESS OPENINGS

GTR No. 2

ACCESS FOR INSPECTION, OPERATION, MAINTENANCE, AND REPAIR

4.1 Access openings and manholes shall not be restricted by interferences including but not limited to cable runs, pipes, valves, heating coils, girders, longitudinals, web frames, or major bulkhead stiffeners. When access openings or manholes require ladders, rungs, and/or grabrails for accessibility, they shall be installed in line with the openings. All trunks and casings shall be large enough to facilitate unobstructed servicing of piping, manifolds, and other items.

4.2 Where access to components such as piping cleanout connections, wiring, ducts, vents, piping, air conditioning controls, filters, heaters, valves, and ducting access plates are needed due to maintenance/inspection requirements, the access shall comply with Reference 2.1, be hinged and fitted with quick acting catches, and be clearly labeled to identify the concealed equipment.

4.3 Duct access openings shall have bolted cover plates and shall comply with Reference 2.1. Cover plates shall be of the same thickness and material as the duct, transition, or trunk to which it is attached. A gasket shall be installed between the cover plate and the duct, transition piece, or trunk. Access openings shall be as large as possible but not more than 600 by 600 mm (24 by 24 in) and not less than 200 mm (8 in) by 230 mm (9 in). Access openings in transition sections shall be rectangular, circular, or trapezoidal. Access openings shall be installed in the bottom of the duct unless the top side of the duct is more accessible.

5.0 PROVISIONS FOR REMOVALS

New equipment shall be installed in locations to facilitate removal of components in accordance with the manufacturer’s requirements. This includes but is not limited to shafting, tube bundles, and machinery parts. Provisions for removals may consist of areas of decks, bulkheads, etc. which have been soft patched and arranged so that when a section is removed, the remaining structure will be self-supporting.

GTR No. 3

TESTS, INSPECTIONS, TRIALS AND CERTIFICATES

1.0 ABSTRACT

This Item describes the general requirements associated with performing tests, inspections and trials and obtaining certificates to demonstrate total compliance with the Work Package requirements as well as specific testing requirements and procedures for each type of work being performed (HVAC, electrical, piping, etc.).

2.0 REFERENCES

2.1 Society of Naval Architects and Marine Engineers (SNAME), Technical and Research Bulletin 3-39, Guide for Shop and Installation Tests.

2.2 Institute for Electrical and Electronic Engineers (IEEE) Standard 45, Recommended Practice for Electric Installations on Shipboard.

2.3 MIL-STD-1605 (Series), Procedures for Conducting a Shipboard Electromagnetic Interference (EMI) Survey.

2.4 Institute for Electrical and Electronic Engineers (IEEE) Standard 149-1979, Standard Test Procedures For Antennas.

2.5 Institute for Electrical and Electronic Engineers (IEEE) Standard 43-1974, Recommended Practice For Testing Insulation Resistance Of Rotating Machinery.

2.6 Institute for Electrical and Electronic Engineers (IEEE) Standard 112-1991, Standard Test Procedure For Polyphase Induction Motors And Generators.

2.7 Institute for Electrical and Electronic Engineers (IEEE) Standard 115-1983, Test Procedures For Synchronous Machines.

2.8 Institute for Electrical and Electronic Engineers (IEEE) Standard 120-1989, Master Test Guide For Electrical Measurements In Power Circuits.

2.9 U.S. Public Health and Human Services, Standards of Sanitation and Ratproofing for the Construction Vessels.

2.10 American Society of Mechanical Engineers (ASME), A17.1, Safety Code for Elevators and Escalators, Part X: Routine, Periodic, and Acceptance and Tests.

2.11 American Society of Mechanical Engineers (ASME), A17.3, Safety Code for Existing Elevators and Escalators.

2.12 NAVSHIPS Technical Manual (NSTM) 772, Cargo and Weapons Elevators.

2.13 ASHRAE Standard 151P, Practices for Measurement, Testing, Adjusting and Balancing of Shipboard HVAC and Refrigeration Systems.

3.0 DEFINITIONS

3.1 Completion Test - A completion test verifies that all aspects of the work item have been completed. For compartments, it means all equipment, piping, electrical, deck coverings, overheads, etc. is installed and tested and proves the compartment is complete and ready for service. For tanks, it means all cleaning, flushing, installations, testing has been completed, all temporary services are removed and the tank is ready for service. A completion test may include a series of functional, operational, and structural tightness tests.

3.2 Functional Test - A functional test verifies that equipment, material, components, and gear meet their intended purpose and that all work has been performed satisfactorily to the specific instructions of the work item and the manufacturer's instructions. For instance, functional tests shall be used to verify the proper installation and operation of components and gear such as doors, scuttles, cabinets, etc.

3.3 Operational Test - An operational test verifies that:

- All work has been performed satisfactorily and to the specific instructions and requirements of the work item, manufacturer, and regulatory bodies.
- The equipment, material, machinery, or system including all flows, levels, temperatures, loads, and alarms complies with manufacturer's parameters.
- The equipment, material, machinery, or system performs its intended purpose.

3.4 Tightness Test - A tightness test verifies that all structural work including any structural attachments which would affect the tightness of the structure, is complete and ready for service. This may be accomplished using air or water depending on the specific instructions in the work item, regulatory body requirements and the intended service.

4.0 GENERAL

4.1 Tests and inspections are required on all systems, equipment, machinery, surfaces, items, and components that are installed, repaired, overhauled, relocated, or modified. Tests, trials and inspections shall be conducted as indicated in the individual

items of this Work Package and in the presence of the MSCREP. All applicable Regulatory Bodies and required Technical Representation shall attend each test, trial and inspection.

4.2 Preliminary tests are required to be conducted on all units before calling for an official test.

4.3 A test, trial, or inspection is successful if it meets the requirements of the test procedure and if it is completed to the satisfaction of the MSCREP, technical representatives, and regulatory bodies.

4.4 Ensure that all industrial work which may impact the test, trial, or inspection outcome is completed before its conduct. The Contractor is responsible for notifying all applicable regulatory bodies of scheduled testing and retaining of required technical representatives at contractor expense for verification of test results. Failure to obtain regulatory body representatives to witness testing, trial, or inspection shall require rescheduling the test, trial, or inspection at Contractor's expense.

4.5 Provide materials, power, equipment, instrumentation, and personnel to perform each test, trial, and inspection and to record data. Materials, equipment and services include but are not limited to manlifts, lighting, ventilation, and instrumentation to conduct each inspection. Operation of (existing/installed) shipboard equipment shall only be accomplished by ship's force.

4.6 Notify the MSCREP at least 4 hours but not more than 24 hours before the test, trial, or inspection to be witnessed. When work to be witnessed is scheduled to occur after the normal day shift working hours, on a weekend or holiday, or off-site testing is required, the MSCREP shall be notified at least 24 hours in advance but not less than 4 hours prior to the end of the last normal day shift.

5.0 INSTRUMENTS AND GAGES USED FOR DATA RECORDING

Contractor furnished measuring instruments shall be calibrated within 6 months of the date of the test. Calibrated equipment shall be identified with a label stating date of most recent calibration and calibrating agency. Ship installed gages and test instruments shall not be used to obtain test, trial, and inspection data unless approved by the MSCREP prior to conduct of the test.

6.0 LEAK TESTING OF SYSTEMS CONTAINING REFRIGERANTS OR HALON

Refrigerant containing chloro-flouro carbons (CFC) shall not be used as a leak test gas. One of the following leak test gases shall be used:

- A mixture of trace quantity of non-CFC refrigerant and dry air or nitrogen. In this case, leak test gas shall be recovered and reused and not released into the atmosphere.
- A non-ozone depleting alternative gas.
- An EPA SNAP (Significant New Alternatives Policy) approved alternative refrigerant.

7.0 PAINTING TEST AND INSPECTION REQUIREMENTS

7.1 The Contractor and the MSCREP shall conduct a joint inspection of areas to be prepared and painted before surface preparation begins to ensure that protective measures are implemented.

7.2 The Contractor shall perform inspections after completion of each stage of surface preparation, each coat, and each stripe coat, to verify surface condition, DFT and space cleanliness, and before securing space. At least 2 DFT readings shall be taken per 100 square feet.

7.3 The Contractor shall stop the inspection if surface preparation, coating, or final inspection fails to meet acceptance criteria of the inspection. The cause of the failure shall be identified. After failure correction, the complete inspection shall be reconducted. The Contractor shall remedy failed areas at no additional cost to the Government.

7.4 The Contractor shall conduct a final inspection of space, surfaces, and tanks to ensure that spaces are clean.

8.0 STRUCTURAL TIGHTNESS AND COMPLETION TESTS

New, repaired, and modified ship's tanks, cofferdams, void spaces, and structures designated as oiltight, watertight, airtight, or fumetight shall be tested to ensure tightness. New weather decks and interior steel decks, coamings, and deck connections of steel bulkheads, in way of toilets, washrooms, and other wet spaces shall be tested to ensure tightness before installing deck or bulkhead covering.

TESTS, INSPECTIONS, TRIALS AND CERTIFICATES

8.1 Test Requirements

8.1.1 Air Tests

a. Air tests (either an air hose test or an air pressure test), hydrostatic tests, or vacuum box tests shall be used to test the tightness of oiltight, watertight, or airtight compartments.

b. Air hose testing shall be used to test the tightness of structure separating two main machinery spaces. Air hose testing shall be used to test the tightness of bulkheads separating cargo holds, or separating cargo holds and a main machinery space, where main deck cargo hatch covers are not designed to be watertight under a pressure head.

c. If air testing (air hose or air pressure) is used, structural integrity and tightness shall be considered satisfactory if no bubbles develop in the leak indicator solution.

d. Inaccessible spaces adjacent to the sea, including skegs, fairwaters, rudder support assemblies, and vee-type bilge keels, shall be tested at an air pressure of 14 kPa (2 psi). Shaft tubes and rudders shall be tested for tightness with air pressure of 14 kPa (2 psi). These tests shall be conducted before filling with preservative coating.

8.1.2 Water Tests

a. If hydrostatic tests are conducted, other tightness tests are not necessary providing tests are conducted after work affecting structural integrity has been completed.

b. Where water hose testing is used, the nozzle shall be within 3 meters (10 ft) of the structure under test, and the stream shall be directed against structure portions in a manner most likely to reveal leaks. The nozzle diameter shall be at least 13 mm (0.5 in) and the pressure at the nozzle shall be at least 210 kPa (30 psi). Compartment boundaries, plate connections, closures, fittings, and boundary penetrations shall be tested. The opposite side of the structure shall be inspected to detect leakage.

c. When conducting air pressure tests, Contractor's air pressure test fixture shall be comprised of a pressure gage with a range suitable for the required test pressure, a quick acting manual relief valve at least 25 mm (1 in) in diameter, and an automatic relief valve at least 25 mm (1 in) in diameter set to relieve pressure at 7 kPa (1 psi) over the required test pressure. Manometers are acceptable in lieu of a pressure gage.

d. Where an air hose test is used, the nozzle shall be 300 mm (12

inches) from the tested item and the stream directed against all compartment boundaries, plate connections, closures, fittings, and boundary penetrations in the manner most likely to reveal leaks. The nozzle diameter shall be at least 10 mm (.375 in), and the pressure at the nozzle at least 620 kPa (90 psi). A soap solution shall be applied on the opposite side of the structure and the structure inspected to detect leakage.

e. If water hose testing is used, structural integrity and tightness shall be considered satisfactory if no visible leakage develops.

f. Airports, fixed lights, and fixed, hinged, or otherwise movable weather windows shall be hose tested with at least 207 kPa (30 psi) water pressure.

8.1.3 Visual Test

Visual examinations of fumetight structures shall be made by lighting one side of the structure and darkening the other side. Inspection shall be made from the dark side and shall be considered satisfactory if no light penetrates into the dark side.

8.1.4 Functional and Tightness for Doors, Hatches, and Manholes

Doors and scuttles shall be functionally tested by opening and closing them by their operating gear to demonstrate operability to the MSCREP in accordance with Reference 2.1. They shall also be chalk tested and air box tested to prove tightness.

9.0 TESTS FOR HULL FITTINGS AND APPURTENANCES

9.1 Accommodation Ladder

Static load and operational tests shall be performed on accommodation ladders in accordance with Reference 2.1.

9.2 Pilot's Ladder

The rigging of the Pilot's Ladder at port and starboard deployment stations shall be demonstrated to the MSCREP.

9.3 Liferails and Stanchions

At least one liferail end stanchion and one other liferail stanchion on each platform or deck shall be tested by a 136 kg (300 lb.) horizontal load, outboard at the stanchion's top, and perpendicular to the railings. The load shall be held for 10 minutes. 20 % of top liferail sections on each platform or deck (one of which shall be an end section), as selected by the MSCREP, shall be tested by applying a 136 kg (300 lb.) load horizontally outboard and perpendicular to the rail at the rail's midpoint. The load shall be held for 10 minutes. Permanent deformation or damage shall not be visible after load release from the liferails and stanchions.

9.4 Padeyes

Padeyes shall be given a static test of twice the design working load for a period of 10 minutes without damage or permanent distortion occurring to the fitting. The weight of power hoists shall be considered as part of the design working load for test purposes.

10.0 ELECTRICAL AND ELECTRONICS

10.1 General

Shop and installation tests shall be performed on electrical, electronic, navigation, and interior communication equipment that is new or removed from the ship for modification, overhaul, or repair in accordance with References 2.2 through 2.8. Operational tests on equipment that is modified, overhauled, or repaired onboard the ship shall be performed in accordance with References 2.2 through 2.8.

10.2 Insulation Resistance Tests

10.2.1 End to end continuity and electrical insulation resistance tests on new, modified, overhauled, or repaired system cables shall be performed in accordance with Reference 2.2.

10.2.2 The MSCREP shall be immediately notified if insulation values of equipment or cable are less than 1 Megohm.

10.3 Enclosure Ground Tests

Electronic equipment enclosures shall be tested for continuity and resistance of the grounding path. The resistance of the grounding path between the equipment enclosure and a ship structural member shall not exceed 0.1 ohm.

10.4 Propulsion And Auxiliary Generator Tests

New, modified, overhauled, or repaired generators shall be tested in accordance

with Reference 2.1.

10.5 Switchboard/Switchgear Tests

New, modified, overhauled, or repaired switchboards, switchgear, and automatic and manual bus transfer equipment shall be tested in accordance with Reference 2.2.

10.6 Power Distribution

Each new, modified, overhauled, or repaired circuit shall be operationally tested. The voltage dip shall be recorded using an oscilloscope to demonstrate that a temporary voltage dip during motor starting or speed change does not interrupt service to other equipment.

10.7 Motors And Controls

10.7.1 New, modified, overhauled, and repaired motors and associated controllers shall be tested in accordance with Reference 2.1.

10.7.2 Individual line amperes shall not differ from the nameplate average value by more than ±10 %. The motor nameplate full load ampere value shall be compared with the value indicated on the motor controller overload heater coils to ensure that the heater coil is of the correct rating to provide motor protection.

10.8 Lighting

New, modified, overhauled, and repaired ship's service lighting circuits shall be tested in accordance with Reference 2.2.

10.9 Storage Batteries And Chargers

The Contractor shall test new storage batteries and their associated battery charging units in accordance with manufacturer’s recommendations. Voltage and specific gravity values for each cell for the fully discharged and fully charged conditions shall comply with manufacturer's specified values for each condition.

10.10 HF Antennas

New, repaired, overhauled, or modified HF antennas shall be tested in accordance with References 2.3 and 2.4.

11.0 AUXILIARY SYSTEMS TESTS REQUIREMENTS

Operational tests on contractor and government furnished auxiliary systems, machinery, or components and installation tests on auxiliary systems, machinery, or components that are repaired, overhauled, or modified shall be performed in accordance with Reference 2.1.

11.1 Fresh Water Systems

11.1.1 The fresh water system, including compression tanks, shall be hydrostatically tested to 150 percent of working pressure.

11.1.2 Potable water systems shall be tested by filling from shore and also by transferring water from one tank to an overboard connection using the ship's pumps. To demonstrate that the specified water delivery (pressure and quantity) is met, the water supply to groups of fixtures at the most remote forward, after, and topside location shall be checked. The capacity of the pump or pumps used to supply the group of fixtures shall meet the flow requirements for these fixtures.

11.1.3 The Contractor shall disinfect the potable water tank in accordance with Reference 2.9. After the Contractor has disinfected the potable water tank, the Contractor shall conduct the tests required by Reference 2.9 and submit results to the MSCREP. If tests results do not comply with the limits established in Reference 2.9, the Contractor shall repeat the tank flushing, superchlorinating, and testing. The operation of the disinfection system shall be demonstrated after potable tank disinfection and again before the sea trials. Minimum residual concentration readiness shall be determined by taking water samples from each installed sampling connection.

11.1.4 The hot potable water system shall be tested to demonstrate the ability of the system to deliver hot water at a minimum of 49 °C (120 °F) at the most remote plumbing fixtures of each heater loop within 10 seconds.

11.1.5 The chilled water system shall be tested to insure that, with all valves in the open position, the measured water flow (gpm) at each plant is within 90-110 % of the connected load.

11.2 High and Low Pressure Evaporators, Distillers, Auxiliary Steam Generators, and Miscellaneous Heat Exchange Equipment

The Contractor shall test evaporators, auxiliary steam generating equipment, and heat exchangers, in accordance with Reference 2.1.

11.3 Dumbwaiters and Passenger and Stores Elevators

The Contractor shall test dumbwaiters and passenger, cargo and stores elevators in accordance with References 2.10, 2.11, and 2.12.

11.4 Firemain, Flushing, Sprinkling, Washdown and Salt Water Service Systems

After installation or repair and prior to sea trials, the firemain, flushing, sprinkling, washdown and salt water service systems shall be hydrostatically tested at 150 percent of maximum working pressure as required for USCG certification.

11.5 Fire Fighting Equipment

11.5.1 Carbon Dioxide Systems

a. Prior to connection the cylinders, a pressure test shall be applied. Only carbon dioxide or other inert gas shall be used for the test. The piping from the cylinders to the stop valves in the manifold shall be subjected to a pressure of 1,000 psi with no additional gas being introduced to the system. The pressure drop shall not exceed 150 psi per minute for a 2 minute period. The individual branch lines to the various spaces protected shall be subject to the same test except that a pressure of 600 psi shall be used. The distribution piping shall be capped within the space protected at the first joint ahead of the nozzles.

b. Remote control for release of carbon dioxide equipment shall be operated.

c. Operation of the discharge delay and alarm shall be checked. Discharge of gas into spaces that may be occupied shall be delayed for a sufficient period to allow escape from any portion of the space. The alarm shall be audible throughout the space with the machinery operating.

d. Operating levers, selector valves, etc. shall be properly identified.

e. Pressure switches for automatic shut-down of ventilation shall be operated.

f. All carbon dioxide cylinders shall be checked for weight. Cylinder weight shall be within 10 percent of the stamped weight.

11.5.2 Halon 1301 Systems

a. Prior to connecting the cylinders, a pressure test shall be applied. Only carbon dioxide or other inert gas shall be used for the test. The piping from the cylinders to the stop valves in the manifold shall be subjected to a pressure of 1-1/2 times the design pressure of the system (900 psi for nominal 360 psi systems and 2800 psi for nominal 600 psi systems). With no additional gas being introduced to the system, pressure drop shall not exceed 150 psi per minute for a 2 minute period. The individual branch lines to the various spaces protected shall be subject to the same test. The distribution piping shall be capped within the space protected at the first joint ahead of the nozzles.

b. Remote release mechanisms shall be checked to insure that cables and pulleys are free to move and that the mechanism operates properly.

c. The discharge alarm must be checked and operated with dry air or nitrogen. The alarm shall be audible throughout the space with machinery operating.

d. Pressure switches for automatic shut-down of ventilation and equipment shall be operated.

e. The weight and pressure of each cylinder shall be checked. Cylinder charge shall be 5 percent or less. Cylinder pressure shall not vary more than 10 percent from normal pressure (adjusted for temperature).

11.5.3 Aqueous Potassium Carbonate System (APC)

The nitrogen pressurization piping of the galley APC system shall be gas pressure tested for tightness and strength to 135 percent of design pressure.

APC switches shall be operated by a reduction of line pressure to verify cut-off of fryer element power. Verification of unobstructed flow through piping and nozzles shall be performed using compressed air at 85 to 100 psi. Activation of the APC system by remote manual means shall be demonstrated.

11.5.4 Portable Fire Fighting Equipment

The installation, charge, tagging, and placement of portable fire extinguishers shall be verified.

11.5.5 Aqueous Film Forming Foam (AFFF) System

The system piping for AFFF stations shall be hydrostatically tested for strength and tightness. Compressed air at 85 to 100 psi shall be used to demonstrate unobstructed flow through piping and sprinkling nozzles. Outlets may be temporarily capped if necessary to allow testing of one or two outlets at a time. All AFFF concentrate tanks shall be tested for strength and tightness by a hydrostatic pressure of 10 psi. All installed AFFF systems shall be operationally tested for AFFF making ability. Duration of the test shall be 1 minute, after which an AFFF sample shall be taken. The AFFF (seawater) solution produced shall be checked by the refractometer method for 4 percent minimum concentration. AFFF hose reel units shall be test-operated with the AFFF station set up in the AFFF recirculation mode. Seawater shall be discharged overboard. During the test, the local and remote controls shall be operated.

a. High Capacity AFFF Systems

The systems, exclusive of the AFFF sprinkler groups, shall be tested hydrostatically as specified for the firemain. In addition, the systems shall be given an operational test during which all remote actuation controls shall be selectively operated and flow observed at the respective service outlets. Flow test of AFFF sprinkler groups shall be conducted by removing the cap from the group control valve, installing the test fitting, connecting a 2-1/2-inch hose to the test fitting, and positioning the other end at the discharge location. During the above operational tests, AFFF stations shall be aligned to recirculate AFFF concentrate to the AFFF concentrate tank. All lines containing seawater shall be drained after testing.

b. Machinery Space AFF Systems

The systems, exclusive of AFFF sprinkler groups, shall be tested hydrostatically as specified for the firemain. The systems shall be given an operational test during which all manual control valves and nitrogen cylinder actuating valves shall be selectively operated. The AFFF concentrate shall be recirculated and the PKP cylinders shall be isolated during the test. Flow shall be observed from a hose reel and from a 1-1/2 inch hose attached to the group control valve test fitting. All lines containing seawater shall be drained after testing.

c. AFFF Monitor System

The AFFF monitor installation shall be given an operational test with the AFFF system lined up to recirculate back to the tank. Operation of the "Sea-Water", "AFFF", and "OFF" controls shall be demonstrated.

11.6 Bilge System

The bilge system shall be hydrostatically tested at 150 percent of working pressure.

11.7 Fuel Oil Filling, Venting, Stowage and Transfer Systems

11.7.1 Hydrostatic tests shall be conducted after cleaning. Fuel piping shall be hydrostatically tested after installation with clean fresh water or the service fluid to 150 percent of the design pressure or 50 psi, whichever is greater. Pumps in fuel stripping, transfer and service systems shall be isolated during hydrostatic tests of the system piping.

11.7.2 An operational test of the filling and transfer system shall be performed to demonstrate compliance of in-port fueling with service fluid rates.

11.7.3 Power operated system and tank valves shall be operated. Operation of the valves shall be confirmed by actual observation of each valve. Correct operation of valve position indicators shall be observed during this test.

11.8 Compressed Air System

11.8.1 Shop tests on a standard production air compressors are not required except for the usual tests performed by the manufacturer for production line units.

11.8.2 Air compressors shall be tested with the diving equipment after all necessary piping and accumulator tanks have been installed and pressure tested. Tests shall be conducted for one hour to demonstrate satisfactory operation of the compressor and its automatic controls and safety devices.

11.8.3 Compressed air piping shall be tested hydrostatically at 150 percent of maximum allowable working pressure.

11.9 Auxiliary Steam, Exhaust Steam and Steam Drains

After installation, the auxiliary steam, exhaust steam and steam drain systems shall be tested hydrostatically at 150 percent of maximum allowable working pressure. The exhaust steam shall be tested at the maximum pressure under full load conditions using the working fluid.

11.10 Distilling Plant

The distilling plant should be operated with sea water feed to demonstrate the specified capacities. The ability of the distilling plant to produce the maximum quantity and required distillate for period of not less than six (6) hours should be demonstrated in its normal underway mode of operation. Record operating data from the ship's instrumentation at 30 minute intervals for not less than six (6) hours.

11.10.1 Piping systems operating at pressures above atmospheric shall be hydrostatically tested at 150 percent of maximum allowable working pressure. Piping systems operating at atmospheric or sub-atmospheric pressure shall be tested for leakage using air at 10 psi.

11.10.2 Shipboard performance tests of 24 hour duration shall be conducted dockside and during sea trials while underway to demonstrate production of rated capacity and specified salinity. However, where the distilling units are exact duplicates of design which has passed the above tests, the duration of the dockside performance tests may be reduced to 8 hours.

11.10.3 Automatic operation of the three-way solenoid-operated valves shall be demonstrated.

11.11 Steering System

11.11.1 Shop Tests

a. The steering gear shall be completely assembled (including remote control provisions, rudder tiller and connecting links, if feasible) in a manner simulating the shipboard installation. It shall be operated at no load from hard over to hard over for at least one-half hour to demonstrate satisfactory mechanical an/or hydraulic operation and that the dimensional, control and lubrication aspects of the design are satisfactory. A check should be made for proper rate of travel, helm response, follow-up action, storage motion, hydraulic fluid and pump temperatures and, where feasible, mechanical rudder and helm indicator accuracy. Temporary piping or flexible hose may be used for ship tests.

b. Where feasible, the hydraulic, electric or pneumatic steering

control components should be assembled to demonstrate satisfactory operation as a complete system.

11.11.2 Installation Tests

a. The following preliminary checks shall be conducted:

1) Measure insulation resistance of motors and electrical steering control system including cable to remote control stations.

2) Demonstrate proper operation of relief valves.

3) Where applicable, demonstrate proper operation and setting of horsepower limiter (pressure compensator).

4) Where applicable, test replenishing system relief valves.

5) Check setting of control limit stops and copper and steel hard-over stops for proper rudder motion limits.

6) Demonstrate satisfactory operation of differential control unit for full storage motion and correct follow-up action.

b. The following operating checks shall be conducted:

1) Operate steering gear at no load for one-half hour on each power unit, moving rudder hard-over to hard-over at least five times for each steering station. Check setting of control limit stops, number of handwheel turns hard-over to hard-over and rate of rudder travel.

2) Check alignment of ship's rudder and position of rudder angle indicators on ram unit and at each steering station (where applicable).

3) Demonstrate operation of steering gear on either set of two opposed cylinders if required by design.

4) Operate steering gear from either power unit and check the rapidity of shifting from one power unit to the other. Where specified, demonstrate operation of steering gear on both power units.

5) Demonstrate operation of electrical low voltage release feature.

6) If separate servo-pump motors are utilized, demonstrate that servo-motors start before main motors and that interlocks are operating properly.

7) Demonstrate operation of overload audible and visible alarms and indicator lights.

11.12 Pumps

11.12.1 Each pump shall be operated at the normal service conditions while handling, where practicable, its normal working fluid.

11.12.2 The pumping equipment shall be operated with all governors and control apparatus in place and operating.

11.12.3 Pump tests may be conducted in conjunction with piping system tests.

11.12.4 All pumps shall be given a continuous test for a period of at least one hour, or longer if required, for the test of the source of motive power. Not less than three sets of readings at approximately equal time intervals shall be taken on all instruments and shall be recorded on data sheets.

11.12.5 All pumps shall be operated as near to the rated suction pressure, discharge pressure and capacity as practicable; for units such as main and auxiliary feed pumps and main condensate pumps, capacities obtained when the main machinery is operating under dock trial conditions will be satisfactory.

11.12.6 In addition to he continuous operating test, other tests shall be conducted on the pump and associated equipment as follows:

a. The ability of the unit to take its suction through each suction connection and to discharge through each discharge connection shall be demonstrated.

b. The ability of the unit to operate in parallel shall be demonstrated where parallel operation is required. This may take place during sea trials.

c. The operation of automatic level switches and automatic pressure switches shall be demonstrated.

d. For pumps fitted with automatic priming systems, the operation of each priming system shall be demonstrated.

e. Where pumps are specified and designed to deliver various capacities at different operating conditions or speeds, they shall be operated at the specified heads and speeds.

f. The correct settings and/or operation of the relief valves, governor valves, and recirculating valves shall be demonstrated. Where not practicable to test relief valves in the ship, they may be tested in the shop.

11.13 Navigation Equipment

All navigation equipment should be proven operational during dock trials and any calibration or adjustments necessary shall be performed during initial phases of the sea trials.

12.0 HVAC TESTING

12.1 General

The Contractor shall perform operational tests on new, repaired, overhauled, or modified HVAC systems, equipment, or components in accordance with Reference 2.1. The tests must demonstrate compliance with Work Package and contract requirements.

12.2 Test Requirements

12.2.1 General

All HVAC systems shall be balanced and operationally tested in accordance with the requirements of Reference 2.13.

12.2.2 Installation Tests

Installation tests shall be performed after complete installation and prior to sea trials, at a time when testing conditions are such that accurate, realistic data can be obtained. All readings shall be recorded at half-hour periods and coordinated with recorded data from the installed system instruments and test instruments.

TESTS, INSPECTIONS, TRIALS AND CERTIFICATES

a. Equipment Tests

Prior to testing the HVAC system as a complete system, fans, motors, coils, filters, compressors, pumps, all control devices and dampers, etc., shall be checked for satisfactory operation, adjusted for full load operating conditions; such components shall not be readjusted during tests. All related companion heating, ventilation and common trunk systems, whether intakes or discharges, shall be in simultaneous operation and all doors closed while these tests are in progress.

b. System Tests

The entire air conditioning plant shall be operated for at least 6 hours with the entire connected load at approximately the maximum design operating conditions, to verify the ability of the system to develop design load at specified temperature and pressure. All controls, regulating, modulating and expansion valves, thermostats, dampers, etc. shall be checked for proper operation.

c. Ventilation Volumetric Tests

Determine that all instruments used to conduct ventilation and system tests have been calibrated within the preceding six months.

1) The average velocity of the air passing through each supply and exhaust terminal and through the entire system shall be determined and compared with design conditions. Barometer and psychrometer readings shall be taken at the system intake and discharge.

2) All data taken shall be corrected for standard air and compared with design criteria for adequacy. The following air delivery rates are considered satisfactory unless otherwise specified.

- Each system shall be capable of handling 100 to 110 % of designed air volume.
- Air supply, recirculating and exhaust terminals shall be balanced to deliver 95 to 110 % of the designed volume.

d. Noise Level Test

1) Noise level readings shall be taken in passageways, offices, and living spaces with all vent system in operation. Readings shall be taken on American Standards Association “A” or “B” weighted network, as applicable, at a time when the ambient level without the vent systems in operation is ten decibels less than those mentioned above.

2) Primary reading (ambient noise level with vent systems secured) - At least two readings shall be taken in each place; the average reading shall be recorded for sound level with space unmanned and all equipment, including vent systems, secured.

3) Final reading (with vent systems in operation) - The average of two or more readings shall be taken at different locations, three feet from each terminal, close to but not within the airstream.

4) Sound level readings and space vent system and terminal numbers shall be recorded on the test form.

e. Draft Survey

Performance of terminals in air conditioned spaces shall be checked during the noise level survey for conformance with maximum air velocity requirements.

12.2.3 Dehumidification Systems

a. All dehumidification plants shall be operated for six hours, with the entire connected load and maintaining the temperature, humidity, and air supply to the cargo holds and or other areas.

b. The satisfactory operation of the regulating dampers shall be demonstrated.

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MILITARY SEALIFT COMMAND
GENERAL TECHNICAL REQUIREMENTS

GTR No. 4

BRAND NAME OR EQUAL

1.0 ABSTRACT

This Item establishes procedures and standards for determining equivalence of Contractor Furnished Material (CFM).

2.0 REFERENCES: None

3.0 COMMERCIAL BRAND NAMES OR EQUIVALENT EQUIPMENT

When CFM is required and specified by brand name in the contract or work item, equivalent material may be proposed. The salient physical, functional, and other characteristics which "equal" products meet shall include but are not limited to:

3.1 Compliance of proposed item, equipment, component, or material with regulatory body requirements and other design standards.

3.2 Data that demonstrates that the proposed item, equipment, component, or material meets or exceeds the specified performance requirements.

3.3 Data that demonstrates that the proposed item, equipment, component, or material has functionally equivalent:

a. Dimensions.
b. Weight.
c. Power, HVAC, cooling water, and other required services.
d. Suitability for marine service.
e. Material.
f. Maintenance features and requirements.
g. Vendor furnished training.
h. Life cycle cost and maintenance cost.
i. Structureborne and airborne noise characteristics.
j. Warranty provisions.
k. Maintenance manpower requirements.
l. Worldwide support and service infrastructure.
m. Spare parts availability.
n. Prior provisioning through the Naval Supply System.
o. Estimated spare parts costs for one year's use.
p. Compatibility with interrelated systems and arrangements.

GTR No. 4

BRAND NAME OR EQUAL

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MILITARY SEALIFT COMMAND
GENERAL TECHNICAL REQUIREMENTS

GTR No. 5

DRAWINGS, DRAWING REVIEW, AND DRAWING APPROVAL REQUIREMENTS

1.0 ABSTRACT

This Item establishes drawing preparation, review, and approval requirements.

2.0 REFERENCES

2.1 Military Sealift Command Standard Drawing 7080803, Preparation of Computer Aided Designed (CAD) Drawings for USNS Ships.

2.2 American Society of Mechanical Engineers (ASME), Y14.24M, Types and Applications of Engineering Drawings.

2.3 Military Sealift Command Standard Drawing 7079667, Preparation of Selected Record Drawings for USNS Ships.

3.0 DRAWINGS

3.1 Ship's Drawings

After contract award, MSC will provide the Contractor a copy of any ship's drawing applicable to the contract and currently in the MSC library in either conventional or digital format, as available, within fourteen days after receipt of request.

3.2 Updating Drawings

3.2.1 When updating MSC drawings, the MSC Master drawing will be provided upon request in either conventional or digital format and transmitted via a guaranteed, insured, and traceable delivery method.

3.2.2 Return all drawings provided by the Government to the Contracting Officer via a guaranteed, insured, traceable delivery method within 15 days after request by the MSCREP. If not requested earlier, return shall be made at the time of redelivery of the ship to the Government.

3.2.3 Loaned drawings shall not be altered or modified in any manner other than as specifically tasked in the contract.

3.3 Contract Guidance Drawings

3.3.1 The Contract Guidance Drawings are for guidance only. They disclose the basic technical information and performance requirements necessary for a

DRAWINGS, DRAWING REVIEW, AND DRAWING APPROVAL REQUIREMENTS

Contractor to complete the detailed design required to develop and produce a working drawing.

3.3.2 The Contract Guidance Drawings are not intended to restrict the Contractor to the procedures and details shown therein. Equivalent details and procedures which may make use of more readily available material or permit the use of Contractor's standards or procedures of equal merit are acceptable. The Contractor shall submit to the MSCREP for approval his alternate method, materials, or procedures along with documentation to substantiate the claim of merit. Approval of the drawings, methods, materials, or procedures and supporting documentation will indicate only that the general method of construction and detailing is satisfactory and will not relieve the Contractor of the responsibility for any error. The Contractor shall assume the risk and cost to remove unapproved substitutions for materials, methods, or procedures.

3.3.3 The original Contract Guidance Drawings shall not be altered by the Contractor in any manner. Where a Contract Guidance Plan is used as the basis for a new drawing, the copy shall be identified as a new drawing with a new file name.

3.4 Contract Drawings

A Contract Drawing is a MSC drawing which delineates mandatory design features of the ship. No departure from details of a Contract Drawing shall be made without specific approval of the MSCREP.

3.5 Working Drawings

3.5.1 Working drawings shall be prepared in CAD format, scaled to Size F (.71 meter X 1.01 meter (28 in x 40 in)) in accordance with Reference 2.1. The level of detail (as defined in Reference 2.2) for working drawings shall be as follows:

a. Mechanical schematic (diagrammatic) diagram.

b. Arrangement drawings.

c. Detail drawings - monodetail and multidetail (composite).

d. Assembly drawings.

e. Installation drawings.

f. Modifying drawings - altered item, selected item, and modification.

g. Layout drawings.

h. Electrical/Electronic diagrams.

i. Other Schedules/Lists required to support installations and modifications.

3.5.2 The final revision of the working drawings are "as-built" drawings and reflect the condition of all areas covered by the Work Package upon ship redelivery.

3.6 Selected Record Plans

3.6.1 Selected Record Plans represent the entire system, arrangement, layout “as is’ taking into consideration any work or modifications which the Contractor effected to that system, arrangement, or layout under the Work Package.

3.6.2 Selected Record Plans will be prepared in CAD format, in accordance with Reference 2.3.

4.0 DRAWING FORMAT

4.1 All CAD drawings shall be prepared in accordance with Reference 2.1.

4.2 Drawings shall have a COMSC title block in accordance with the title block requirements of Reference 2.1. A Contractor's title block shall be included on the bottom of the first sheet to the left of and adjacent to the COMSC title block.

4.3 The initial approval authority for all drawings shall be the Port Engineer or other on-site MSCREP.

GTR No. 5

DRAWINGS, DRAWING REVIEW, AND DRAWING APPROVAL REQUIREMENTS

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MILITARY SEALIFT COMMAND
GENERAL TECHNICAL REQUIREMENTS

GTR No. 6

CONTRACTOR FURNISHED MATERIAL AND WORKMANSHIP

1.0 ABSTRACT

This Item establishes the requirements for Contractor Furnished Material (CFM) and workmanship.

2.0 REFERENCES

2.1 American Society for Testing and Materials (ASTM), F1182, Standard Specification for Anodes, Sacrificial Zinc Alloy.

2.2 American Society for Testing and Materials (ASTM), F1053, Standard Guide for Steel Hull Construction Tolerances.

3.0 MATERIAL

3.1 All material shall be free from manufacturing imperfections and defects which adversely affect appearance, serviceability, performance, or safety. CFM shall be new. All material, machinery, and equipment shall be suitable for the intended marine service. Spare parts and services shall be readily obtainable worldwide.

3.2 Hardware shall be of manufacturer's stock material so that replacement components can be easily obtained. Material compliance with regulatory requirements shall be designated in the bill of material on the working drawings, interface drawings, or vendor drawings. Material shall comply with commercial standards instead of MIL-STDS, except in those cases where the MIL-STD is required in the absence of a commercial standard (such as UNREP equipment).

3.3 If galvanizing is required, the hot dip process shall be used. If materials cannot be hot dip galvanized, zinc silicate coating may be substituted. Zinc silicate coating should be approved by MSCREP on a case-by-case basis.

3.5 New zinc anodes shall comply with Reference 2.1.

3.6 The faying surfaces of dissimilar metals which are attached, shall be separated with a dielectric material at least 1.6 mm (0.0625 in) thick extending 6.3 mm (0.25 in) beyond the edge of the faying surface. The dielectric material shall be attached by adhesive to provide a watertight seal and also provide a barrier between the dissimilar metals.

3.7 All threaded fasteners shall be coated with anti-seize compound.

CONTRACTOR FURNISHED MATERIAL AND WORKMANSHIP

3.8 For weather exposed equipment and machinery, CRES or monel metal pressure grease fittings shall be used. Fittings shall be accessible, either with elbow bodies or extensions, and shall be threaded and suitable for use with high pressure grease guns.

4.0 WORKMANSHIP

Plate and hull fitting workmanship shall have fair lines, smooth surfaces, and sound welding with minimum distortion and warpage in accordance with Reference 2.2. Plating shall be closely fitted and free from buckles or uneven edges. Permanent shims shall not be used to correct improper fit. To avoid a patchwork effect, new and replaced shapes and plates shall be of standard mill size rather than fabricated from smaller pieces.

5.0 SAFETY

5.1 Where guards are required for personnel protection around shafting, couplings, gears, flexible shafts, and other rotating and oscillating equipment and machinery they shall be removable without dismantling the machinery. Guards shall be durable, lightweight, rigid, and constructed to minimize maintenance.

5.2 Guards shall prevent personnel from contacting energized and exposed electrical circuits, components, and terminals which present shock and high voltage hazards.

5.3 Equipment shall be installed so that the hazard of personnel brushing or being thrown against it under heavy sea conditions is minimized.

MILITARY SEALIFT COMMAND
GENERAL TECHNICAL REQUIREMENTS

GTR No. 7

GENERAL PAINTING

1.0 ABSTRACT

This Item establishes general requirements for surface preparation and painting.

2.0 REFERENCES

2.1 Steel Structures Painting Council (SSPC), Systems and Specifications, Volume II.

3.0 DEFINITIONS

3.1 Exterior - Ship surface area exposed to the weather.

3.2 Interior - Surface area inside the ship not directly exposed to the weather.

3.3 Approved System - A coating system, approved by MSC for the required service.

3.4 Surface Preparation Standards - Specified levels of surface preparation are defined in Reference 2.1 and include but are not limited to:

- Solvent Cleaning (SSPC-SP1)
- Power Tool Cleaning (SSPC-SP3)
- White Metal Blast Cleaning (SSPC-SP5)
- Commercial Blast Cleaning (SSPC-SP6)
- Brush-Off Blast Cleaning (SSPC-SP7) - Sometimes referred to as abrasive sweeping or abrasive sweep blasting.
- Near-White Blast Cleaning (SSPC-SP10)
- Spotblasting - Used with touching up or repairing small damaged areas of existing coating. The affected area is blasted to near white blast (SSPC-SP-10), in accordance with Reference 2.1 and primed and painted to match the surrounding coating. Spotblasting requires that the junction between the blasted and intact coating be tight with no visible flaking, blistering, and delamination, and that the edge of the intact coating be feathered with a disc sander or hand scraper to provide a surface to which the new paint can adhere.
- Power Tool Cleaning To Bare Metal (SSPC-SP11) - Sometimes referred to as hydroblasting or waterblasting. Standard further breaks down to water jetting levels that correspond to the abrasive blast levels above as follows:
  - WJ-1 SP5
  - WJ-2 SP10
  - WJ-3 SP6
  - WJ-4 SP7

3.5 Low Pressure Hose Washing - Normal water pressure periodically applied when a ship is dry-docked using a 38 mm (1.5 in) fire hose at normal shoremain pressure.

4.0 PAINT APPLICATION

4.1 Paint shall only be applied when the environmental conditions, including but not limited to temperature, humidity, and steel temperature are within the published limits established by the paint manufacturer.

4.2 Manufacturer's established drying times between coats shall be followed to ensure adhesion of the subsequent coats.

4.3 Each undercoat shall be of a different color to make holidays and inadequate coverage readily apparent.

4.4 Unless preparing for inorganic zinc application or unless otherwise specified, blasting shall not be used to prepare surfaces for painting.

4.5 A commercial antifouling coating that is specifically formulated for existing fiberglass or aluminum hulls shall be applied on workboats or launches that are normally wet stowed.

4.6 The airless spray paint application method shall be used when painting fiberglass.

5.0 PROHIBITIONS

5.1 Only paints that comply with all federal, state, and local volatile organic compound (VOC) and any other environmental laws and regulations shall be used.

5.2 Only paints that comply with all federal, state, and other occupational safety and health laws and regulations shall be used. Areas of concern are lead, chromate, coal tar, etc.

5.3 The following types of paint or paint products shall not be used:

5.3.1 Coatings containing organo-tin ingredients.

5.3.2 Lead based paints. (Totally "lead free" paints are generally not available because trace amounts of lead can be found in the paint's constituents. "Lead free" paint is defined by the Consumer Product Safety Commission's Ban of Lead-Containing Paint and Certain Consumer Products Bearing Lead-Containing Paint (16 CFR 1303) as containing .06 % lead by weight in the dry paint film.)

5.3.3 All coal-tar epoxies, or paints containing coal-tar derivatives.

5.3.4 All paints containing zinc chromate.

5.3.5 Inorganic or organic zinc coatings in petroleum cargo tanks.

5.3.6 Antifouling paints shall not be applied to any aluminum craft, lifeboats, workboats, or launches that are normally dry stowed (such as aboard ship).

6.0 SPECIFIC COLOR APPLICATIONS

6.1 Interior and Hot Machinery

Interior machinery (in engine room or auxiliary spaces) and hot machinery whether (exposed or interior) shall be painted as follows:

6.1.1 Interior machinery: Equipment Gray (Fed Std Color 26307); trimmed out with Black (Fed Std Color 27038).

6.1.2 Hot machinery (surface temperature in excess of 121^{o}C (250^{o}F)): Heat-resisting Aluminum.

6.2 Pump Rooms, for Tankers and Fleet Oilers

6.2.1 Two coats of polyamid epoxy, final coat shall be Terracotta Red (Fed Std Color 20109), at 5 mils DFT per coat shall be applied to bilges, deck plating, foundations, and bulkheads below the grating. These coatings shall extend to 150 mm (6 in) above the grating level.

6.2.2 Color for bulkheads and overheads shall be applied to 150 mm (6 in) above the grating level.

6.2.3 Valves and piping shall be color-coded for the particular cargo system to which they belong.

6.3 Cargo Holds

6.3.1 Bulkheads in way of cargo spaces, interior of cargo hatch coamings, cargo trunks, etc., shall be painted White (Fed Std Color 17875).

6.3.2 Wooden cargo battens shall be Dark Gray (Fed Std Color 26008).

6.3.3 Vertical ladders, and bulkheads in way of ladders, shall be Gloss Black (Fed Std Color 17038).

6.3.4 All U-bolts, D-rings, padeyes, and other fittings intended for use during cargo handling shall be painted with Gloss Red (Fed Std Color 11105), and be stenciled alongside with "ATTACH BLOCK HERE", also in Gloss Red.

6.4 Piping Systems

6.4.1 All interior piping (except fire systems) shall be painted to match surrounding areas, and stenciled with contrasting color lettering to identify flow direction and service. Valve bodies and valve wheels shall be painted in accordance with 6.4.3.

6.4.2 Steam piping on weather decks exposed to green seas shall be coated with 4 mils of inorganic zinc primer and topcoated in accordance with Work Package requirements.

6.4.3 Exterior riser plugs for shoreside connections shall be color-coded as follows:

- Fresh water: Blue (Fed Std Color 15123)
- Firemain: Gloss Red (Fed Std Color 11105)
- JP-5: Purple (Fed Std Color 17142)
- Steam: Haze Gray (Fed Std Color 26270)
- Fuel: Haze Gray (Fed Std Color 26270)
- Sewage: Gold (Fed Std Color 17043)
- Lube oil: Striped Yellow (Fed Std Color 13538) and Gloss Black (Fed Std Color 17038)

6.5 Fire and Washdown Systems

6.5.1 Firemains shall be painted to match surrounding compartment or deck colors, and stenciled in red to read "FIREMAIN" with an arrow indicating direction of flow. Firemains running through the bilge and painted red shall be stenciled to read "FIREMAIN" in a contrasting color with an arrow indicating direction of flow. All valve bodies and handles, fire cabinets and associated fittings shall be painted or trimmed with Gloss Red (Fed Std Color 11105).

6.5.2 Carbon dioxide (CO_2) piping , nozzles, valves, and control handles shall be painted Gloss Red (Fed Std Color 11105), with white stenciling "CO_2" and a white arrow indicating direction of flow. This includes nozzles, valves, and control handles.

6.5.3 For MSC ships without permanent washdown systems, washdown systems brackets for chemical, biological, and radiological (CBR) defense shall be painted International Orange (Fed Std Color 12197).

6.5.4 Halon piping shall be painted to match surrounding compartment or deck colors and stenciled in Red to read "HALON" with an arrow indicating direction of flow. Nozzles, valves, and handles shall be painted Gloss Red (Fed Std Color 11105).

6.6 Wiring Systems

Wireways, electric cabling, stuffing tubes, and similar electrical fittings shall be painted to match surrounding compartment surfaces. Where cabling runs in bilges, it shall be painted White (Fed Std Color 17875).

6.7 Decontamination Stations

Weather doors to decontamination stations shall be painted Haze Gray, (Fed Std Color 26270). Door dogs shall be Gloss Black (Fed Std Color 17038).

6.8 Deck Appurtenances

Deck appurtenances such as deck lockers, handrails, ladders, and padeyes shall be painted to match the surrounding area.

GTR No. 7

GENERAL PAINTING

7.0 COLOR CODES

Table 7.1 specifies the colors to be used for bulkheads, overheads and decks for various spaces and Table 7.2 provides the Federal Standard Color Numbers for the colors used by MSC.

Table 7.1. Interior Color Codes (Numbers Indicate FED-STD-595 Colors)

Space	**Bulkheads**	**Overheads**	**Decks**
Ammunition spaces	White, 27780	White, 27780	White, 27886
Barber shop	White, 27780	White, 27780	Dark Gray, 26008
Baths, hospital	White, 27886	White, 27886	Dark Gray, 26008
Bilges (Eng. room and Machinery spaces)			Terracotta, 20109
Cargo holds	White, 17875	White, 17875	Dark Gray, 26008
Charthouse	Green, 24585	Green, 24585	Dark Gray, 26008
Clipping rooms	White, 27780	White, 27780	Dark Gray, 26008
Control rooms, helo	White, 27780	White, 27780	Dark Gray, 26008
Galleys	White, 17875	White, 17875	Dark Gray, 26008
Gun mount enclosures	White, 27780	White, 27780	Dark Gray, 26008
Gyro rooms	Green, 24585	White, 27780	Dark Gray, 26008
Hangers, helo	White, 27780	White, 27780	Dark Gray, 26008
Laundry	White, 27886	White, 27886	Dark Gray, 26008
Machinery spaces and Eng. room	White, 27780	White, 27780	Terracotta, 20109 Extend 150 mm (6 in) up all bulkheads
Medical/dental areas*	Green, 24585	Green, 24585	Dark Gray, 26008
Offices, general	Green, 24585	White, 27780	Dark Gray, 26008
Offices, helo	White, 27780	White, 27780	Dark Gray, 26008
Pantries	White, 17875	White, 17875	Dark Gray, 26008
Passageways	White, 27780	White, 27780	Dark Gray, 26008
Pilothouse	Green, 24585	Green, 24585	Dark Gray, 26008
Pump rooms (Tankers and Fleet Oilers)	White, 27780 (Applied from 150 mm (6 in) above grating level and up)	White, 27780	Terracotta, 20109 (Final coat to bilges, deck plating, foundations, and bulkheads below grating)

*except offices

Table 7.1. Interior Color Codes (Numbers Indicate FED-STD-595 Colors) (Cont.)

Space	Bulkheads	Overheads	Decks
Quarters/mess rooms:			
Staterooms, cabins	Green, 24585	White, 27780	Dark Green, 34092
Officer, CPO	Green, 24585	White, 27780	Dark Green, 34092
Troop berth/messing	White, 27780	White, 27780	Dark Gray, 26008
Crew	White, 27780	White, 27780	Dark Gray, 26008
Radio room	Green, 24585	White, 27780	Dark Gray, 26008
Recreation rooms	Green, 24585	White, 27780	Dark Gray, 26008
Sculleries	White, 27886	White, 27886	Dark Gray, 26008
Shops	White, 27780	White, 27780	Terracotta, 20109
Store/issue rooms	White, 27780	White, 27780	Dark Gray, 26008
TACAN room, helo	White, 27780	White, 27780	Dark Gray, 26008
Washrooms, T/S areas	White, 27886	White, 27886	Dark Gray, 26008
Workshops, helo	White, 27780	White, 27780	Dark Gray, 26008
Special Compartments:			
Battery Shop	Acid-resistant White	Acid-resistant White	Acid-resistant White, Acid-resistant Dark Gray
Darkrooms	Acid resistant Equipment Gray, 26307	Acid-resistant Equipment Gray, 26307	Acid-resistant Equipment Gray, 26307
Reefer Gratings, wood			Spar varnish
Gratings, aluminum			Uncoated
Gratings, deck (Engine room/Machinery spaces			Terracotta, 20109
Gratings, platform (Engine room/ Machinery spaces			Black, 27038 or Terracotta, 20109
Light locks, light traps	Flat Black, 37038	Flat Black, 37038	Flat Black, 37038
Reefers	Orange shellac or Diamond Kote	Orange shellac or Diamond Kote	Orange shellac or Diamond Kote

GENERAL PAINTING

Table 7.2. Colors Used By MSC

Fed Std Color No.	Color
22563	Beach sand
11105	Gloss Red
24585	Pastel Green
22519	Rosewood
24516	Clipper Blue
23697	Sunglow
17875	White (High Gloss)
27886	White
25526	Pastel Blue
27780	Soft White
26307	Equip Gray
26008	Dark Gray
20109	Terracotta
34092	Dark Green
17038	Gloss Black
27780	Soft White
26270	Haze Gray
15123	Blue
13538	Yellow
27038	Black
37038	Flat Black
12197	International Orange
14062	Green
17142	Purple
12246	Orange
10324	Tan
17043	Gold

MILITARY SEALIFT COMMAND
GENERAL TECHNICAL REQUIREMENTS

GTR No. 21

JOINER WORK

1.0 ABSTRACT

This Item establishes general requirements for joiner work design, material, and construction.

2.0 REFERENCES

2.1 American Society for Testing and Materials (ASTM), F1178, Standard Specification for Enameling System, Baking, Metal Joiner Work and Furniture.

3.0 GENERAL

3.1 Materials and installation methods shall provide a finished appearance compatible with the surroundings and blending with the decor.

3.2 Joiner work shall not be installed until main piping, cables, and vent ducts are installed and their interference with the joiner work ascertained. Joiner work shall be designed and installed to eliminate sharp edges.

3.3 Support for heavy items located against joiner bulkheads shall be provided with strength members other than the bulkhead panel. Heavy items shall be through bolted to the independent strength member.

3.4 Raceways shall be the same color as the surrounding ceiling and joiner panels for concealing items including but not limited to pipe, electric cable, and fiber optic cable runs. These raceways shall be easily removable to permit inspection, maintenance, repair, or replacement of the concealed items.

4.0 BULKHEADS AND LININGS

4.1 New Bulkheads

Joiner bulkheads shall have noncombustible decorative veneer on both sides. Joiner liners shall have the unfinished veneer on the hidden side, and noncombustible decorative veneer on the exposed side.

4.2 Materials

4.2.1 Channel and mounting hardware shall be obtained from the same manufacturer. Channel and mounting hardware shall be manufacturer's standard stock items. Screws shall be self-tapping and spaced closely enough to prevent panel rattling. Joiner material and hardware shall be removable, color coordinated, and selected for ease of maintenance. To the maximum extent possible, bulkhead, ceiling, and lining fasteners shall be concealed. When joiner installation materials are exposed they shall be corrosion resistant and

have a baked enamel finish in accordance with Reference 2.1. Other joiner securing materials and deck mounted tracking shall be corrosion resistant and painted to match the surrounding area.

4.2.2 Joiner bulkheads and liners shall be installed to existing bulkheads to give a finished appearance. Liners shall be installed as close as possible to the existing bulkhead, without removing stiffener insulation. Veneers on hard core systems shall be High Pressure Plastic Laminate (HPPL) and veneers on soft core systems shall be PVC foil coated steel.

4.3 When installing joiner material in spaces without a ceiling, install 18 gage sheet metal flashing between the top of each joiner panel and the deckhead.

5.0 CEILINGS

Ceilings shall be treated galvanized steel or aluminum panels with beveled edges. Ceiling panels shall be perforated, except in wet and sanitary spaces where panels shall be non-perforated. Ceilings in galley/scullery areas shall be 20 USSG, AISI 304 stainless steel construction with satin finish.

5.1 Fasteners

All ceiling fasteners shall be non-corrosive and colored to match the ceiling.

5.2 Insulation

Where required, ceiling panels shall have approved, fireproof insulation.

MILITARY SEALIFT COMMAND
GENERAL TECHNICAL REQUIREMENTS

GTR No. 22

INSULATION AND LAGGING

1.0 ABSTRACT

This Item establishes thermal and acoustic insulation requirements.

2.0 REFERENCES

2.1 American Society of Testing and Materials (ASTM), F 683, Standard Practice for Selection and Application of Thermal Insulation for Piping and Machinery.

2.2 Society of Naval Architects and Marine Engineers (SNAME), Technical and Research Bulletin No. 4-7, Thermal Insulation Report.

2.3 Society of Naval Architects and Marine Engineers (SNAME), Technical and Research Bulletin 3-37, Design Guide For Shipboard Noise Control.

2.4 Navigation and Vessel Inspection Circular (NVIC) 12-82, Recommendations on Control of Excess Noise.

3.0 DEFINITIONS

3.1 Thermal Insulation. Thermal insulation is installed to minimize heat transfer from or to a surface that is hotter or colder than the surrounding atmosphere.

3.1.1 Hot Surface Insulation. Hot surface insulation is a type of thermal insulation installed to external surfaces which are 52^{o}C (125^{o}F) or higher to protect personnel and limit heat transfer.

3.1.2 Anti-sweat Insulation. Anti-sweat insulation is a type of thermal insulation which prevents formation of condensation and ice on surfaces.

3.1.3 Cold Fluids Insulation. Cold fluids insulation is a type of thermal insulation installed to external surfaces of components conveying cold fluids such as refrigerant and brine or chilled water to limit heat absorption by the chilled fluid and to prevent ice formation on the surfaces.

3.2 Lagging - Lagging is a protective cover for insulation.

3.3 Fastenings - Fastenings include hooks, wire, pins, retaining clips, and adhesive to secure insulation and lagging.

3.4 Reusable Covers - Reusable covers are machinery and piping insulation and lagging materials or pads which can be removed and easily reinstalled without damage.

3.5 Acoustic Insulation - Acoustic insulation minimizes airborne noise levels.

3.6 Unheated spaces - Compartments in which there are no provisions for raising the space's ambient temperature.

4.0 GENERAL

4.1 Insulation installations shall comply with References 2.1 through 2.3 and Table 22-1.

4.2 Use of asbestos or asbestos containing materials is prohibited.

4.3 Red tint lagging shall be used to indicate asbestos free insulation.

4.4 Insulation shall not be installed on decks except where:

4.4.1 A machinery space adjoins a habitability, navigation, or service space.

4.4.2 A habitability, navigation, or service space is exposed to a weather deck.

4.4.3 Required by regulatory bodies.

5.0 INSTALLATION

5.1 General

5.1.1 Insulation installations include but are not limited to installing lagging, securing fasteners, painting, sealing, and performing all work necessary to provide a finished appearance.

5.1.2 When welding or flame cutting, insulation and lagging near the hot work shall be removed. Insulation shall not be installed until paint has been touched up on disturbed areas.

5.2 Multiple Layers of Insulation

If insulation is installed in more than one layer, the insulation layers shall be staggered against the preceding layer. Each layer shall be joined with adhesives in accordance with manufacturers' recommendations.

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INSULATION AND LAGGING

6.0 COMPARTMENT INSULATION

6.1 Bulkhead and Overhead Insulation

When installing insulation to bulkheads and overheads:

6.1.1 Welding and burning shall be completed before installing insulation.

6.1.2 Studs shall be installed to support the insulation not more than 300 mm (12 in) between staggered centers and not more than 75 mm (3 in) from the edge of the insulation.

6.1.3 Tape seams with at least 25 mm (1 in) overlap on both pieces of insulation.

6.1.4 Sealer shall be applied to exposed insulation.

6.2 Thickness

The type and thickness of insulation required shall be based upon HVAC, thermal, and acoustic requirements. Thermal insulation requirements shall be calculated using Reference 2.2.

6.3 Location

6.3.1 Where insulation is required in living, working, and public spaces that have a common boundary with heat producing spaces, they shall be insulated on the heated side. Where steel lined bulkheads are fitted, the insulation shall be installed between the liner and the steel. Insulation that is installed between heated and unheated spaces, on exterior bulkheads and decks, and on shell plating, shall be installed on the interior and/or heated side.

6.3.2 Where insulation is required in double wall construction, the insulation shall be installed within the void space.

6.3.3 Where insulation is required in chill and freeze boxes, it shall be installed on the exterior (single wall construction) or within the void space (double wall construction). Insulation shall be installed on the interior of refrigerated cargo holds and other refrigerated spaces. Insulation installed in refrigerated cargo holds must meet additional structural criteria as denoted in the work specification.

6.3.4 Where insulation is required on boundaries between heated and air conditioned spaces and those areas exposed to the weather or adjacent to unheated spaces, it shall be installed on the interior side. If neither side is finished, insulation shall be installed on the hot side. The insulation shall cover the bulkhead and overhead surfaces and extend at least 300 mm (12 in) beyond the common boundary.

6.3.5 When machinery spaces are insulated, insulation shall be installed no lower than the lowest grating level above the bilge.

6.4 Insulation For Tank Bulkheads That Are Common Boundaries With Work Areas

Thermal insulation shall be installed on all common bulkheads between tanks and work spaces and between tanks and storage spaces on the work space or storage space side.

6.5 Foam Insulation

Use of foam insulation shall be limited to refrigerated areas.

6.6 Material

Insulation shall be lagged with fibrous glass cloth or painted canvas and/or contained within a joiner bulkhead. All insulation shall have a continuous vapor barrier applied on the heated side of the insulation before lagging. Stainless steel sheathing shall be used for exterior applications or in damp environments and shall be sealed at all joints and fasteners. Sheathing metal shall be 1.59 mm (No. 16 USSG) for vertical installations and 0.87 mm (No. 20 USSG) for horizontal installations.

7.0 PIPING INSULATION AND LAGGING

Thermal pipe insulation and lagging shall be installed in accordance with Reference 2.1.

8.0 VALVES, FITTINGS, MACHINERY, AND EQUIPMENT INSULATION AND LAGGING

Insulation lagging, and removable covers installed over valves, fittings, machinery, and equipment, and bent pipe, shall be installed according to Reference 2.1.

9.0 INSULATION PROTECTION

9.1 Before applying lagging, insulation exposed to the weather or to undue moisture shall be protected with 6 mm (0.25 in) weather resistant insulation, reinforced with hardware cloth and secured with No. 16 WG copper wire. Cracks or openings in the continuity of the completed insulation and lagging shall be avoided.

9.2 Insulation and lagging subject to mechanical injury shall be protected by 6 mm (0.25 in) checkered plates and heavy angles.

9.3 Where insulation may be subject to damage (e.g. mechanical or fluid) the insulation shall be sheathed with perforated aluminum, corrosion resistant steel, or galvanized sheet metal.

10.0 ACOUSTIC INSULATION

Where acoustic insulation is installed it shall be based on Reference 2.3. Acoustic insulation shall be sufficient for the area to meet the airborne noise criteria prescribed by Reference 2.4.

11.0 INSULATION FOR HVAC SYSTEMS

11.1 Thermal Insulation

Thermal insulation shall be installed on the duct exterior. Thermal insulation on rectangular ducts shall be fibrous glass board. Insulation on round and oval ducts shall be fibrous glass board and flexible blanket type. HVAC insulation shall not conceal or cover operating mechanisms.

11.2 Vapor Barriers

Vapor barriers shall be installed on insulated ducts in air conditioning systems to prevent surface condensation. The vapor seal shall be factory applied aluminum foil with a minimum thickness of 0.05 mm (0.002 in). Joints shall be lapped 50 mm (2 in) minimum or sealed with 75 mm (3 in) aluminum foil tape. To ensure integrity of the vapor barrier, joints shall be coated with a vapor sealing compound compatible with the aluminum foil vapor barrier.

11.3 Securing Insulation

Thermal and acoustic insulation shall be secured with adhesive. The adhesive shall be compatible with the insulated surface. Insulation on rectangular ducts whose length or width exceeds 300 mm (24 in) shall be further secured with metal clips or pins.

Table 22-1
Thermal and Acoustic Insulation Parameters

Max. Overall Heat Transmission Coefficient (U) for Bulkheads/Decks (cal/m^2-°C-sec)
Italicized numbers indicate design temperature difference (°C)

	Machinery	Navigation	Habitability	Service	Cargo	Refrigerated Cargo	Unoccupied	Exterior	Shell
Machinery	2.37 *0-6*	0.22 *33*	0.22 *33*	0.35 *19*	2.37 *22-28*	0.22 *39*	2.37 *22-28*	0.22 *39*	None
Navigation		2.37 *0*	0.50 *12*	0.50 *14*	0.35 *19-28*	0.22 *39*	0.35 *19-28*	0.22 *39*	0.35 *23*
Habitability			0.50 *0-14*	0.50 *14*	0.35 *19-28*	0.22 *39*	0.35 *19-28*	0.22 *39*	0.35 *23*
Service				2.37 *0-6*	0.35 *14-22*	0.22 *39*	0.35 *14-22*	0.22 *33*	0.35 *32*
Cargo					0.50 *0-11*	0.22 *39*	0.50 *0-11*	0.50 *11*	2.37 *8*
Refrigerated Spaces						0.22 *39*	0.22 *0-11*	0.22 *11*	2.37 *8*
Unoccupied							0.50 *0-11*	0.50 *11*	2.37 *8*

Insulation performance requirements include all components comprising the bulkhead/deck construction.
Unoccupied spaces include but are not limited to non-refrigerated cargo holds, voids, tanks, storerooms, and lockers unless otherwise specified.

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GTR No. 23

PIPING

1.0 ABSTRACT

This Item establishes the requirements for piping design, installation, and fabrication.

2.0 REFERENCES

2.1 American Society for Testing and Materials (ASTM), F 708, Practice for Design and Installation of Rigid Pipe Hangers.

2.2 American Society for Testing and Materials (ASTM), F1155, Standard Practice for Selection and Application of Piping System Materials.

2.3 American Society for Testing and Materials (ASTM), F1138, Specification for Spray Shields for Mechanical Joints.

2.4 American Society for Testing and Materials (ASTM), F994, Specification for Design and Installation of Overboard Discharge Hull Penetration Connections.

2.5 American Society for Testing and Materials (ASTM), F1386, Standard Guide for Construction of a Sounding Tube and Striker Plate for Tank Sounding.

2.6 American Society for Testing and Materials (ASTM), F1139, Specification for Steam Traps and Drains.

3.0 GENERAL

3.1 Installation Requirements

3.1.1 Piping systems shall have flexible joints, support points, expansion loops, and equipment connections to accommodate ship movement, thermal expansion, vibration, and changes in trim and stability.

3.1.2 Where orifices are installed, they shall be installed at flanged joints.

3.1.3 Backing rings shall be used unless open root welds are specified. The Contractor shall provide calculations which show that backing rings do not cause flow restrictions.

3.1.4 Piping installation shall permit passage along walkways and ladderways, access for equipment operation and maintenance, and access to doors, soft patches, and other openings. Where required, if it is impractical for piping to be clear of access plates, cutout

valves shall be installed on both sides of the opening to allow for piping section removal. Piping inside of tanks shall be clear of access holes and have enough clearance to permit sludge removal from tank bottom.

3.1.5 Piping shall be installed directly with a minimum number of bends, flanges, and joints. Piping shall be installed taking into account piping accessibility and maintenance.

3.1.6 Flange faces shall be perpendicular to the longitudinal centerline of the piping and connecting equipment.

3.1.7 To prevent piping damage or personnel injury, it shall be protected with removable guards, coatings, insulation, lagging, protective covers, chafing, and splash plates, spray shields, or drip pans, as appropriate for the installation.

3.1.8 Heat exchanger heads shall be removable by breaking the connecting flanges. If head removal requires piping disassembly, flanged spool pieces shall be installed for ease of disassembly.

3.1.9 Fittings, valves, and traps shall be installed so that piping may be completely drained. Drains shall be installed on low points that are not self-draining.

3.1.10 Piping hangers shall be installed in accordance with Reference 2.1.

3.2 Installation Prohibitions

3.2.1 Piping shall not be installed where it may be used for a step or grabrail.

3.2.2 Nonferrous piping shall not directly contact the ship's hull.

3.2.3. Installation of piping conveying steam or liquid shall be avoided in the following spaces, except to serve the equipment therein:

a. Fuel, lube, and oily waste tanks.
b. Chain lockers.
c. Engine room and bridge central control stations.
d. Switchboard rooms.
e. Inner bottoms and voids.
f. Potable water tanks.
g. Provisions storerooms and ship's reefer boxes.
h. Steering gear rooms.
i. Wiring trunks and enclosures.

j. CHTs.
k. Magazines.
l. Refrigerated spaces.
m. Medical spaces.
n. Chart rooms.
o. Generator rooms.
p. Battery lockers and battery charging stations.
q. Electronic spaces.
r. Dry cargo holds.
s. Food preparation spaces.
t. Mess rooms.

Piping through these spaces shall have all joints welded or brazed.

3.2.4 Mitered joints or fittings shall not be used. Lateral joints shall not be used unless pre-manufactured.

3.2.5 Galvanized piping shall not be used in potable water and AFFF systems.

3.2.6 Fiberglass or plastic piping, tubing, valves, and in-line fittings shall not be used for potable water systems.

3.2.7 Piping conveying flammable media shall be routed to avoid being located over hot surfaces, unless adequately shielded, and shall be located at least 450 mm (18 in) from high temperature steam lines.

3.2.8 The use of cocks instead of valves shall not be permitted without specific approval of MSCREP, except in gage lines.

3.2.9 Backing rings shall not be used where it causes flow restrictions.

3.3 Materials

3.3.1 Repaired or replaced piping shall as a minimum be the same as the material schedule of the existing system. If installing a new system, piping material shall comply with Reference 2.2.

3.3.2 The radius of ferrous piping bends shall not be less than 5 pipe diameters. The radius of non-ferrous piping and tubing bends shall not be less than 3 pipe diameters. Tubing shall not be thinned below the minimum wall thickness.

4.0 PIPE SLEEVES

4.1 Pipe sleeves penetrating watertight or fire zone boundaries shall be fitted with

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Schedule 80 pipe sleeves. Pipe sleeves shall extend 150 mm (6 in) on either side of the boundary.

4.2 Pipe sleeves required in wet spaces shall be Schedule 80 and shall extend 150 mm (6 in) above and 25 mm (1 in) below the plating. Pipes shall be continuously welded to the sleeve on both sides.

5.0 FLANGE SHIELDS

Flange shields shall be located on piping flanges and bolted valve bonnets and flanges. Shields shall meet the requirements of Reference 2.3. Shields shall be installed on:

5.1 Fuel lines in main and auxiliary machinery spaces where a source of ignition exists.

5.2 Lube and hydraulic oil piping if the flange is within 4.6 meters (15 ft) of electrical equipment, a hot surface, or other source of ignition.

5.3 Flanges near any surface with a temperature exceeding 204 ^{o}C (400 ^{o}F).

5.4 Fuel and lube oil strainers subject to pump discharge pressure.

6.0 SCUPPERS AND DRAINS

6.1 Drains shall be as short as possible between origin and termination.

6.2 Check valves, automatic nonreturn valves, and scupper valves shall be installed so that they open and close in a fore and aft direction and so that the flapper and hinge pin can be easily removed or replaced.

6.3 Overboard plumbing, sewage, refrigerated space, and interior deck discharge drains shall be installed above the load waterline and shall discharge overboard by gravity. Hull penetrations shall comply with Reference 2.4.

6.4 Deck drains shall be installed to prevent water from standing on the decks for all trim and list conditions which could be expected at sea or in port.

6.5 Interior deck drains shall have a trap with an integral or built in bell baffle to seal pipe odors. Where a drain trap is required, it shall be installed with an area at least twice that of the drain pipe. The drain shall have a brass, stainless steel, or reinforced plastic strainer plate. Strainers shall be secured and flush with the deck.

6.6 Coamings are required around equipment which may leak or spill oil under normal operating and maintenance conditions, a drain shall be installed. Drains shall run to an oily waste tank.

6.8 Plumbing Drains

6.8.1 Where nonreturn valves are required, they shall be installed on plumbing fixture drainpipes or deck drains which combine with other drains at higher elevation to prevent back flooding during roll and pitch conditions.

6.8.2 Soil drains from water closets and urinals shall be independent of other drains and shall be piped into mains.

6.8.3 Plumbing drain vents shall be installed to vent to the weather deck. Anti-syphonic valves shall not be used.

6.8.4 Any check valves required for plumbing system shall be the full flow type.

6.9 Weather Deck Drains

Where required, house top deck drains shall be at least 38 mm (1.5 in) in diameter. Scupper drain pipes on each lower deck shall be increased by 13 mm (0.5 in) in diameter over that of the deck above, with a 75 mm (3 in) maximum. Drains from decks above shall lead to gutterways adjacent to scuppers.

7.0 VENT, SOUNDING, AND OVERFLOW PIPING

7.1 Vent, sounding, and overflow piping that penetrates tank tops, flats, or decks shall be fitted with schedule 80 sleeves if the piping is subject to damage from physical abuse or from corrosion due to standing water. The sleeves shall be continuously welded on both sides of the plating. Sleeves shall extend 150 mm (6 in) above and 25 mm (1 in) below the plating. Piping shall be continuously welded to the sleeve at top and bottom.

7.2 Overflows and Vents

7.2.1 Overflow and vent terminals above the weather deck shall terminate close to the bulwark or deck house side with gooseneck fittings that do not interfere with equipment, cargo, boat handling, and embarkation operations. Vents from sewage tanks and waterclosets shall not terminate near portholes, doorways, normal working areas, or any location where fumes could enter the deck house. Fuel oil vents, sounding tube terminals, and fueling connections shall not terminate within living spaces.

7.2.2 Where required, vent terminal screens shall be monel or CRES and removable.

7.2.3 Flanged takedown connections shall be installed in overflow and vent lines to permit fitting of blanks to isolate tanks for individual tank air testing or as required.

7.2.4 Watercloset, lavatory, and sinks vents which terminate on the exterior of the deckhouse shall have a horizontal one half round pipe welded to the side of the house to prevent wind from blowing down the vent. The internal sectional area of the half round pipe shall be equal to the area of the vent, and the length shall be four times the diameter of the vent.

7.3 Sounding Tubes

7.3.1 Sounding tubes and striker plates shall be installed in accordance with Reference 2.5. Sounding tubes shall be at least 38 mm (1.5 in) in diameter except for fuel oil tanks, which shall be at least 50 mm (2 in) in diameter. Holes shall be drilled along the length of the tube in accordance with Reference 2.5.

7.3.2 Curving or sloping of sounding tubes shall be minimized. Slopes shall be limited so that the included angle between the centerline of the sounding tube and the vertical does not exceed 15 degrees.

7.3.3 Where flanged takedown joints are required, they shall be installed at the bottom of the sounding tube in accordance with Reference 2.5.

7.3.4 Where sounding tubes terminate flush with the deck, flush brass deck plugs shall be installed on the sounding tubes. Where sounding tubes which do not terminate flush with the deck, a self closing gate valve shall be installed in an accessible location on the sounding tubes.

8.0 PIPING ATTACHMENTS

8.1 Remote Operating Gear

Where required, valves not accessible for local operation shall have remote operating gear such as mechanical operating gear or reach rods. Operating gear, terminating on the open deck or in passageways, shall have boxes fitted with "open" and "closed" indicators. Remote operators terminating in passageways shall be close to the bulkhead. Box wrenches shall be capable of removing the deck box plug as well as operating the gear and shall be mounted near the deck plug box. Remote operating gear, not terminating in deck boxes, shall be fitted with hand wheels.

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8.1.1 Remote operating gear shall be installed with a means of disconnection at the valve to permit local operation if the gear becomes jammed.

a. Flexible shafting used for remote operation shall not exceed the manufacturer's specified bend radius. Selection of material shall be used for components in corrosive or submerged conditions.

b. Mechanical joints used for remote operation may be used as follows:

1) Universal joints shall be used only where the included angle is greater than 165 degrees.

2) Double universal joints may be used if the included angle is between 180 degrees and 165 degrees but no less than 150 degrees.

3) Where included angles are less than 150 degrees gear boxes shall be used. 90 degree gearboxes shall be used only for 90 degree changes of direction all other angles shall be obtained using the 300 degree type variable angle gearbox. Gearboxes shall not have universal joints connected directly to them to make up incremental angles.

4) Slip joints shall be added to each reach rod system to compensate for thermal expansion and ship deflections. Slip joints shall be added in each straight run of the system and at each change of direction. Slip joints shall have a minimum range of movement of 2 inches and shall be set at the mid point of the movement range to allow movement in both directions. Slip joints shall be capable of transmitting the full torque required of the system

5) Couplings shall be used to join portions of the reach rod system and may be of the pin or welded type. Consideration should be given to ease of maintenance and accessibility when selecting which type is used. All pin type couplings shall be of the double pin type.

6) Hangers shall be used to support the reach rod along its length. The distance between hangers on straight runs of rod shall not exceed 10 feet. In addition hangers shall be arranged close to universal joints to prevent deflection of the reach rod during turning of the universal joint. On vertical runs the reach rod shall have a vertical thrust bearing at the top to take the weight of the system off the deck penetration piece. All hangers shall have a bearing included in them to reduce friction, all hangers will be attached to substantial foundations welded to the ships structure to prevent deflection. Hangers in corrosive environments or where used for submerged applications shall have grease grooves in the bearing surface and be fitted with grease fittings for the application of grease.

7. Gearboxes shall be independently supported with foundations welded to the ships structure. Foundations will be carefully aligned with the axis of the gearbox to prevent inducement of stresses into the gearbox housing.

8. All joints between components in reach rod systems shall be made with either pin type or weld type joints. Pin type joints will be double pinned with the second pin being at right angles from the first. Pin type joints will be assembled using vibration proof CRES nuts and bolts rather than taper pins.

9. Materials for reach rod systems shall be selected according to the ambient characteristics of the spaces they pass through. Corrosive environments and submerged applications shall have CRES components throughout and if the rod itself is carbon steel it must be suitably coated to resist corrosion and be touched up after any drilling or welding operations. Gearboxes for use in submerged applications shall be designed to suit the depth they are to be submerged at.

10. The diameter of the reach rod shall be selected using the manufacturer's data and is based on the torque requirements of the valve.

8.1.2 Remote Operating Gear Alignment.

Alignment of the various components shall ensure that the included angles for universal joints do not exceed those listed above. In addition gearboxes of the 300 degree variable angle type shall be aligned by first finding the compound angle between the two sections of reach rod and then setting the gearbox supports to this angle without inducing stress into the housings. Slip joints must be set at the mid point of their full range of movement to allow for ship deflection and thermal growth. Functional testing of components should be made after completion of installation in the conditions that the system is expected to function in when the ship is in service.

8.2 Valves and Fittings

8.2.1 Steam traps shall be in accordance with Reference 2.6.

8.2.2 Flanged waster pieces shall be installed between ferrous and nonferrous material. Waster pieces shall be at least 300 mm (1 ft) long and two schedules heavier than the system design pressure would dictate. Waster pieces shall be accessible and capable of being easily replaced. Waster pieces shall be installed inboard of shell valves.

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8.2.3 Valves

a. Reducing and regulating valves shall be designed to be fail safe and permit manual adjustment, inspection, and maintenance without removal from the line.

b. Relief and drain valve discharges shall be piped to avoid personnel injury.

c. Check valves shall be installed where flow reversals would be detrimental to operational requirements, equipment, or personnel. Stop check valves shall be installed where flow reversals could flood a space. Swing check valves shall be installed in a fore and aft direction.

e. Threaded or flanged ball valves may be installed in saturated steam lines as follows:

- Where pressure does not exceed 2070 kPa (300 psi), and
- Where steam lines are 50 mm (2 in) or less in diameter.

f. Reducing and modulating control valves shall:

- Have removable disks and seats.
- Permit inspection and adjustment without removal from the line.

g. Gate and globe valve stem glands shall seal when the valve is open. Globe and angle valves shall have seating surfaces which are regrindable.

h. Gate valves with nonrising stems shall be fitted with indicators.

i. Gate and butterfly valves shall not be used for throttling services. Globe valves shall be installed to minimize flow turbulence and pressure drop and where regulating flow is of primary concern.

j. Butterfly type valves shall be suitable for use with all types of flanges and in locations requiring “shut-off” for joint “breakdown” for maintenance without interruption of service to the rest of the system(s). The valves shall be flange or lug type, with fastening to each mating flange, or be equipped with adjacent flanged spool piece connecting the equipment or flanged joint.

k. The use of butterfly valves in fuel oil systems shall be avoided except where space constraints do not allow any other type. Only USCG Category “A” type valves are allowed. USCG Category “A” type valves are not allowed as a positive shut-off valve.

9.0 ALLOWABLE VELOCITIES

The maximum fluid velocity for a system is determined by minimum required inlet pressure of machinery and components under maximum flow conditions and the limitations on inlet velocities of machinery and components. System design velocities shall be based on Table 23-1.

GTR No. 23

PIPING

Table 23-1. Design Fluid Velocities for Piping[1,d]

SERVICE	FLUID VELOCITY, fps	
	Nominal [a]	Limit
Condensate pump suction	$\sqrt{d}$	3
Condensate pump discharge	$3\sqrt{d}$	8
Condensate drains	$.3\sqrt{d}$	1
Hot-water suction	$\sqrt{d}$	3
Hot-water discharge	$3\sqrt{d}$	8
Feedwater suction	$1.3\sqrt{d}$	4
Feedwater discharge	$4\sqrt{d}$	10
Cold freshwater suction	$3\sqrt{d}$	15
Cold freshwater discharge	$5\sqrt{d}$	20
Lube-oil service pump suction	$\sqrt{d}$	4
Lube-oil discharge	$2\sqrt{d}$	6
Heavy-fuel service suction	$\sqrt{d}$	4
Heavy-fuel service discharge	$1.5\sqrt{d}$	6
Heavy-fuel transfer suction	$\sqrt{d}$	6
Heavy-fuel transfer discharge	$2\sqrt{d}$	15
Distillate-fuel suction	$2\sqrt{d}$	7
Distillate-fuel discharge	$5\sqrt{d}$	12
Hydraulic-oil suction	$1.5\sqrt{d}$	8
Hydraulic-oil discharge	$8\sqrt{d}$	20
Seawater suction	$3\sqrt{d}$	12 [b, c]
Seawater discharge	$5\sqrt{d}$	12 [b, c]
Steam, high pressure	$50\sqrt{d}$	200
Steam exhaust, 215 psig	$75\sqrt{d}$	250
Steam exhaust, high vacuum	$75\sqrt{d}$	330

Notes: 1 - Roy L. Harrington, ed., Marine Engineering (Jersey City, NJ: The Society of Naval Architects and Marine Engineers, 1992), pg. 796.
a - *d* is the pipe internal diameter in inches.
b - 9 fps for galvanized steel pipe.
c - Seawater velocity in titanium and GRP piping may exceed these limits without detrimental erosion; however, friction losses, turbulence, and noise may still be limiting factors.
d - For 9010 Cu Ni and for galvanized piping, max velocity = 8 fps.

MILITARY SEALIFT COMMAND
GENERAL TECHNICAL REQUIREMENTS

GTR No. 24

MANUFACTURER'S REPRESENTATIVES

1.0 ABSTRACT

This Item establishes the requirements for manufacturer's and authorized manufacturer's representatives.

2.0 REFERENCES: None

3.0 TECHNICAL REPRESENTATIVES

3.1 Manufacturer's technical representative and authorized technical representative are directly employed by the manufacturer or authorized by the manufacturer, respectively, to perform maintenance, repair, service, troubleshooting, installation, and modification on the equipment or machinery specified in the work item.

3.2 Technical representatives who are not authorized by the manufacturer to perform maintenance, repair, service, troubleshooting, installation, and modification on the equipment or machinery specified in the work item shall have the following minimum qualifications:

3.2.1 At least five years' experience which includes formal training in a field service organization as an authorized manufacturer's technical representative for the type of equipment or systems being serviced, repaired, installed, modified, or relocated.

3.2.2 At least two years' experience as an independent authorized technical representative for the type of equipment or systems being serviced, repaired, installed, modified, or relocated.

3.2.3 References from at least three different clients for whom service was provided on the type of equipment or systems being serviced, repaired, installed, modified, or relocated.

3.2.4 Ability to procure parts and access to manufacturer's drawings for the equipment or machinery specified in the work item.

4.0 REPORT

The manufacturer's representative's report shall fully state the manufacturer's representative's observations and recommendations, evaluate required repairs and parts, and state that the equipment and/or system has been installed, repaired, modified, adjusted, disassembled, reassembled, and tested in accordance with the manufacturer's requirements. The manufacturer's representative's report shall specifically approve the Contractor's work as satisfactorily meeting warranty requirements, and explicitly enumerate existing deficiencies.

MILITARY SEALIFT COMMAND
GENERAL TECHNICAL REQUIREMENTS

GTR No. 25

STRUCTURE AND FOUNDATIONS

1.0 ABSTRACT

This Item establishes the general requirements for the design and construction of structure and foundations.

2.0 REFERENCES

2.1 American Society for Testing and Materials (ASTM), F1053, Standard Guide for Steel Hull Construction Tolerances.

2.2 Mil-Std-1399, Sect. 301A, Interface Standard for Shipboard Systems, Ship Motion and Attitude.

3.0 GENERAL

ABS Grade steel suitable for the application shall be used to make structural installations, repairs or modifications or to manufacture foundations. Interfaces between two steel surfaces shall not be of dissimilar metals.

4.0 BULKHEADS AND DECKS

4.1 Projections, interferences, and obstructions shall be minimized to ensure that clear and unobstructed use of the space is achieved. Structural members shall be part of steel divisional bulkheads where possible. Steel bulkheads shall not be substituted for joiner bulkheads to avoid using pillars and girders. New bulkheads and decks shall be fair without buckles, kinks, or other irregularities in accordance with Reference 2.1.

4.2 Outside corners of interior steel bulkheads, in working spaces and wherever they present a hazard to personnel, shall have a radius of at least 75 mm (3 in).

5.0 COAMINGS

The following design criteria shall be used when installing coamings.

5.1 Coamings around new deck openings for vertical access, including openings in trunks not protected by hatch covers, shall be at least 100 mm (4 in) high.

5.2 Coamings around stair and ladder companionways shall be 75 mm (3 in) above the plating or deck covering and 75 mm (3 in) below the plating and shall be cut flush in way of inclined ladders and stairs to avoid a tripping hazard.

STRUCTURE AND FOUNDATIONS

5.3 Coamings around new and modified weather decks which surround deckhouses shall be at least 75 mm (3 in) high.

5.4 Watertight coamings around joiner bulkheads surrounding wet spaces, including but not limited to showers, decontamination stations, deck gear lockers, galleys, toilets, and laundries shall be 150 mm (6 in.).

6.0 FOUNDATIONS

6.1 All new foundations shall provide complete support against static, dynamic, vertical, and racking loads independent of the casing, frame, bedplate, or other parts of the supported unit. Foundations shall be installed to provide support against loads due to ship motion which shall be estimated using Reference 2.2. Foundations for electronic equipment shall have a natural frequency of at least 10 Hz. The foundations supporting heat producing units shall be designed to limit thermal stresses to allowable levels. Foundation construction shall permit access for cleaning, maintenance, and equipment operation. Unless otherwise specified, the allowable bending stress shall not exceed 124,000 kPa (9 tons/sq. in.), and the shearing stress shall not exceed 0.6 times the allowable bending stress.

6.2 Foundations shall be installed so that the equipment mounting surfaces are parallel or normal to the ship's baseline.

6.3 Auxiliary machinery shall be secured to foundations without the use of collision and shifting chocks.

MILITARY SEALIFT COMMAND
GENERAL TECHNICAL REQUIREMENTS

GTR No. 26

INTERIOR DECK COVERINGS

1.0 ABSTRACT

This Item establishes the general requirements for preparing interior decks and applying deck coverings.

2.0 REFERENCES

2.1 National Shipbuilding Research Program (NSRP) 0354, The Standard Practice for the Selection and Application of Marine Deck Coverings.

2.2 American Society for Testing and Materials (ASTM), D178, Specification for Rubber Insulated Matting.

3.0 GENERAL

3.1 Deck covering shall not be installed until all required testing for watertightness and all fastening of machinery, equipment, furniture, etc. has been completed. Deck covering shall not be painted to hide stains and discolorations.

3.2 Deck covering appropriate for the service shall be selected from Reference 2.1.

4.0 DECK PREPARATION AND DECK COVERING INSTALLATION

4.1 Deck covering shall not be installed under built-in furniture, but shall scribe and fit it up to sub-bases. The Contractor shall not install deck coverings over other deck appurtenances, including but not limited to furniture tie downs and deck drains.

4.2 Coving shall be 100 mm (4 inch) high around the perimeter of newly floored spaces and areas.

5.0 VINYL TILES

5.1 All tile of a particular style should come from a single manufacturer with the same dye lot and date of manufacture.

5.2 Through pattern tiles - In through pattern tile, the pattern shall be distributed and worked throughout the thickness of the tile. In mottled and marbleized tile, the marbleizing and mottling shall be worked throughout the thickness of the tile.

5.3 Surface pattern tiles - The pattern need not extend through the entire thickness of the tile, and may be decorated, embossed, or both. The appearance of the tile, when the wearing layer has been removed to a depth of 0.25 mm (0.010-inch), shall compare favorably for decoration with the tile's original appearance. The depressed areas of embossed tile shall involve no more than one-third of the original, flat tile surface area prior to embossing as

measured on a full tile. On embossed tile, there shall be no depressed area into which a 16 mm (0.625 in) diameter circle can be placed, except that this shall not apply to tiles that have an overall embossed surface, such as brick, slate, or other textures.

5.4 Size - The tile shall be 230 by 230 mm (9 by 9 in) or 300 by 300 mm (12 by 12 in). A tolerance of ± 0.40 mm per 300 mm (0.016 in/ft) shall be permitted. All tiles in any one space shall be of the same size. Vinyl plastic tile shall be 3 mm (0.125 in) thick. A tolerance of ± 0.127 mm (0.005 in) shall be permitted.

5.5 Adhesive

5.5.1 The adhesive shall be a water-based latex.

5.5.2 The adhesive shall be free from grit, lumps, and skins and shall be suitable for application with a trowel without heating or the addition of other ingredients.

6.0 TERRAZZO

6.1 Material Requirement

6.1.1 The aggregate, including marble, shall be of a suitable size for application of the deck covering in a 6 mm (0.25 in) thickness in one coat.

6.1.2 The adhesive shall be a water-based latex, free of all ingredients which may negatively affect its serviceability or have a deleterious effect on metal or resilient deck covering. The adhesive shall be free from grit, lumps, and skins and shall be suitable for application with a trowel. The adhesive shall be suitable and effective for the purpose intended without heating or the addition of other ingredients.

6.1.3 The underlayment selection shall comply with Reference 2.1.

6.1.4 The terrazzo deck covering shall have continuous deck material to provide an integrated base cove 100 mm (4 in) high along the bulkheads. Where the terrazzo ends in open deck areas, it shall be feather-edged to the adjacent deck. The terrazzo after installation shall be ground smooth to expose the binder, marble chips (aggregate), and sealer. The surface of the finished terrazzo shall be of a uniform color.

6.2 Sealer

At least two coats of an approved sealer shall be applied to the finished terrazzo allowing two hours between coats.

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INTERIOR DECK COVERINGS

7.0 ELECTRICAL GRADE MAT OR SHEET

7.1 Rubber Matting shall comply with Reference 2.2.

7.2 Rubber matting shall be gray, non-conductive, diamond tread. The matting shall be made from a compound utilizing synthetic rubber, reclaimed rubber, polyvinyl chloride, a copolymer of polyvinyl chloride and polyvinyl acetate, or a combination thereof. The use of ingredients which would tend to emit objectionable odors in service are prohibited. Reclaimed rubber shall be used to the maximum extent possible. The back side shall be finished with a cloth fabric or a cloth imprint.

7.3 The mats shall be secured with cement except in way of removable floor plates or gratings. Matting shall be installed with a minimum of seams. When rubber matting is required in a space where another deck covering is also specified, the other deck covering shall be installed outside the area of the rubber matting. Overlay shall be used to provide a smooth transition between rubber matting and other deck covering. If rubber matting covers one-half or more of the clear deck area of a space, the other covering shall be omitted and rubber matting installed over the entire deck area of the space.

7.4 Rubber matting shall be rated for a minimum dielectric strength of 30,000 Volts/cm^2. Its overall thickness shall be 4.5 mm (0.1875 in) minimum and its width shall be at least 1 meter (3 ft).

8.0 SAFETY TREADS

Safety treads shall be of the fiberglass reinforced resin or metal abrasive insert type and shall be weather resistant with a nonskid surface. Treads shall be located at the head and foot of all inclined ladders, and shall cover each step on inclined ladders. Treads shall not be installed where nonslip material such as rubber matting or grating is required or where nonslip decking is required.

9.0 CARPET

Installed carpet shall be wool or man-made fiber (USCG Class A fire retardant) and be bulkhead-to-bulkhead, and glued with a manufacturer's approved adhesive.

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INTERIOR DECK COVERINGS

9.1 General Material Specification

9.1.1 The carpet fiber shall be thoroughly scoured carpet type fiber which has never been reclaimed from any woven, tufted, knitted, or felted product.

9.1.2 The backing material used in the construction of the primary backing of tufted carpet shall be one customarily used and accepted by the trade.

9.1.3 The backing reinforcement shall be woven or knitted fabric weighing not less than 170 g/sq. m (6.0 oz/sq. yd) or non-woven polypropylene weighing at least 100 g/sq. m (3.5 oz/sq. yd).

9.1.4 Pile Specification

The following requirements are established for carpet pile:

	OFFICES/STATEROOM/CABIN	**HEAVY TRAFFIC AREAS**
Type	Single level cut pile	Single level loop pile woven through back
Tufts/sq. cm (per sq. in.)	8.9 (58/sq in)	9.2 (60/sq in)
Pile height	Min: 13 mm (0.5 in) Max: 16 mm (0.625 in)	Min: 5.3 mm (0.210 in) Max: 7.9 mm (0.310 in)

9.2 Rubber Cushion Specification

Carpet shall have attached rubber cushioning. The compound used in making the cushioning shall be made from natural or synthetic latex or a mixture of natural and synthetic lattices. The cushioning shall be free of objectionable odor and shall have a skin on the floor side when affixed to the carpet. Rubber cushioning used under carpet shall meet the following requirements:

9.2.1 Cushioning shall average at least 5 mm (0.1875 in) thick.

9.2.2 The weight per square meter (sq. yd) shall be between 1.6 kg (3.50 lbs.) and 1.9 kg (4.25 lbs.).

9.2.3 The compressibility shall be between 2.3 kg (5 lbs.) and 4.1 kg (9 lbs.).

9.2.4 The compression set shall be not more than 15 percent.

INTERIOR DECK COVERINGS

9.3 Seaming

Standard seamless broadloom width shall be used unless seaming is required. Seams shall be kept to the minimum practicable. Seams, where required, are to be sewn or taped (or both) as required. Tape used in making seams shall be a minimum of 63 mm (2.5 in) wide. For seams on carpets with attached rubber cushioning, the edges shall be brought together to ensure good contact. Secure seams by tape or adhesive, or a combination of these. Such tape or adhesive shall be those recommended by the carpet manufacturer, or equal. The finished seams shall be secure and able to withstand conventional commercial rug cleaning processes.

9.4 Underlayment

Before the carpet is installed, the decks shall be faired with underlayment over irregularities, including but not limited to weld seams, depressions, etc., to prevent high spots and other irregularities from showing through the carpet and causing premature wear.

9.5 Installation

Carpet shall be fitted closely to the bulkhead, built-in furniture bases, and around pipe and deck fixtures.

10.0 POLYURETHANE-BASED PRODUCTS

Polyurethane-based deck coverings shall be approved for use on a case-by-case basis and installed in accordance with manufacturer's instructions.

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INTERIOR DECK COVERINGS

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MILITARY SEALIFT COMMAND
GENERAL TECHNICAL REQUIREMENTS

GTR No. 27

HEATING, VENTILATION AND AIR CONDITIONING (HVAC)

1.0 ABSTRACT

This Item establishes HVAC system design and construction requirements.

2.0 REFERENCES

2.1 Society of Naval Architects and Marine Engineers (SNAME) Technical and Research Bulletin No. 4-16, Calculations for Merchant Ship Heating, Ventilation and Air Conditioning Design.

2.2 Society of Naval Architects and Marine Engineers (SNAME) Technical and Research Bulletin No. 4-7, Thermal Insulation Report.

2.3 HVAC Systems Duct Design, Sheet Metal and Air Conditioning Contractors National Association, (SMACNA).

2.4 U.S. Public Health Service and MARAD's Joint Publication No. P 161019 "Ratproofing of Ships".

3.0 GENERAL

3.1 HVAC system design heating and cooling load calculations shall be based on meeting the temperatures, relative humidity (RH) limits, and ventilation rates in Reference 2.1. Heat transfer coefficients shall be based on Reference 2.2. Pressure drop calculations shall be developed using Reference 2.3 as guidance.

3.2 HVAC systems shall include but not be limited to filters, fans, fan coil assemblies, fan coil units, air filters, screens, duct work, steam preheaters, convection electric heaters, cooling coils, electric and steam reheaters, unit heaters, sound attenuation boxes, silencers, diffusers, terminals, closures, louvers, splitters, turn vanes, dampers (fire, diverting, and balancing), thermostatic controls, drains, insulation (thermal and acoustic), vapor sealing and lagging, label plates, operating instructions and all other items that are necessary for safe system operation and satisfactory performance.

3.3 HVAC system design shall minimize compartment pressure with respect to surrounding spaces and to the weather.

3.4 Odor producing spaces and spaces with toxic or explosive fumes and with Class A bulkheads shall have a slight negative pressure of 0.06 kPa (0.25 in water) achieved by duct design. Negative pressure in spaces with B or C Class bulkheads shall be achieved by natural supply through louvered doors and/or mechanical exhaust.

3.5 System design shall eliminate condensation under design conditions for both heating and cooling seasons.

3.6 Duct sections, cooling coils, and fan coil units shall not be installed over the following types of equipment:

- Computers.
- Control panels.
- Electronic equipment.
- Generators.
- Generator terminals.
- Power distribution panels.
- Switchboards.
- Transformer terminals.

If no alternative to installing ducting over such equipment is possible, the ducting shall be watertight or driptight. Ducts shall be installed to preclude duct connections over such equipment.

3.7 Where coils are installed, drains shall be installed at both ends of the pan. System drains shall be designed for list conditions of up to 15 degrees.

3.8 Chilled water cooling coils (Navy Standard) shall be selected for use with 7 ^{o}C (45 ^{o}F) chilled water at a flow rate of 14 liters (3.6 gal)/minute/ton of refrigeration. All other cooling coils shall be sized according to the manufacturer's requirements.

3.9 Fan rooms used as plenums for air conditioning systems shall not be subject to a positive pressure and shall be limited to no more than 0.12 kPa (0.5 in water) negative pressure.

4.0 THERMOSTATIC CONTROLS AND THERMOMETERS

4.1 Steam preheaters shall be equipped with control valves or other mechanism to prevent the coils (heating and cooling) from freezing.

4.2 Design Requirements

4.2.1 When duct bulbs are installed downstream of the coils, they shall be located at least 2.4 meters (8 ft) from the discharge face of the controlled coil and away from splits or branches. Duct bulbs shall be shielded from the effects of radiant heat.

4.2.2 Thermostats shall be bulkhead mounted about 1.5 m (5 ft) above the deck to sense the return air temperature of the space or positioned so that they are not affected by localized cold or heat sources. Thermostats shall regulate space temperature and read temperature in degrees Fahrenheit.

5.0 TRUNKS AND DUCTS

5.1 Air Velocities

5.1.1 Air velocities of HVAC systems and their components shall comply with Table 27-1.

5.1.2 Maximum air velocity at head end of berths shall not exceed 0.1778 m/s (35 FPM); elsewhere, velocity shall not exceed 0.254 m/s (50 FPM).

5.1.3 Decibel readings shall be limited to 55 decibels for living and office spaces, and 70 decibels for passageways based on measurements taken three feet away from the terminal.

5.2 Trunk and Duct Construction

5.2.1 Trunks, ducts, covers, louvers, and other HVAC items exposed to the weather, shall be at least 3.2 mm (0.125 in) steel plate and shall be watertight.

5.2.2 Vertical trunks or ducts subject to damage shall be at least 3.2 mm (0.125 in) thick.

5.2.3 Built in trunk construction shall not be used for ducts that have a cross section of less than 0.09 sq. meter (1 sq. ft).

5.2.4 Ducts shall be airtight. Duct seams shall be constructed by any of the following methods:

- Riveted seams sealed with hot solder or fire resistant high velocity duct sealer.
- Welded, hooked seams and laps.
- Spot welded on 25 mm (1 in) centers with external seams and joints sealed by a 25 mm (1 in) wide strip of duct sealer.

5.2.5 Ducts shall be airtight before applying duct insulation. All other ducting shall be made of hot dipped galvanized sheet steel. The minimum thickness of the material shall be determined by the diameter of round ducts or the greatest dimension of rectangular ducts as follows:

- Vertical exposed ducts: No. 16 USSG (1.5 mm).
- Horizontal or concealed vertical ducts of dimension greater than 760 mm (30 in): No. 16 USSG (1.5 mm).
- Horizontal or concealed vertical ducts of dimensions 470 to 760 mm (18.5 to 30 in): No. 18 USSG (1.2 mm).
- Horizontal or concealed vertical ducts of 320 to 460 mm (12.5 to 18 in): No. 20 USSG (0.9 mm).
- Horizontal or concealed vertical ducts less than 320 mm (less than 12.5 in): No. 22 USSG (0.8 mm).
- Horizontal or vertical ducts passing through stairtowers or passing through but not serving a space with a Class "A" bulkhead: No. 11 USSG (3.2 mm).

5.3 Access Openings, Installation

5.3.1 Access holes with bolted plate covers shall be provided as follows:

- In sizes as large as possible between 8 inches by 9 inches minimum and 24 inches by 24 inches maximum. Where located in transitioning sections from round to rectangular, the projected opening shall be rectangular or trapezoidal.
- On both sides of heaters that have large dimensions of 24 inches or greater.
- On the entering side of heaters that have large dimensions less than 24 inches.
- On both sides of axial flow fans of diameter up to 24 inches (minimum opening 12 inches by 12 inches)
- On the inlet side of all centrifugal fans.
- On trunks and non-removable ducts (maximum spacing 6 feet) to allow cleaning of all interior surfaces.
- At the impeller end of axial flow fans of diameter larger than 24 inches.

5.4 Additional Ducting Requirements

5.4.1 Ducts shall be concealed by sheathing or located in recesses.

5.4.2 Duct joints shall be installed where duct section removal is required for access to piping, cabling, and other equipment. Duct joints may be flanged, clamp type, or sleeve type and sealed with duct sealer and tape. Flanged connections or flanged spools shall be installed if the duct is installed in the weather or in machinery spaces.

5.4.3 Elbows in ducts and trunks shall be at least one half the standard throat radius. When the throat radius is less than the one half standard, baffles and concentric turning vanes shall be installed to provide quiet operation. Small radius turning vanes shall not be used in elbows unless structural considerations require using miter throat radii. Turning vanes or grids shall be installed to achieve uniform air flow to registers, grills, and diffusers.

5.4.4 Converging transition pieces shall have a taper which does not exceed 20 degrees on a side. Diverging transition pieces which have a taper that exceeds 10 degrees, shall have splitters fitted to reduce the expansion angle to less than 10 degrees.

6.0 TERMINALS, GRILLS, WIRE MESH SCREENS AND DAMPERS

6.1 Damper and register linkages, bearings, pins, shafts, and similar working parts shall be bronze.

6.2 Terminals and Grills

6.2.1 Diffuser terminals shall be used in air conditioned spaces. Supply terminals in working and machinery spaces shall have integral or separate throttling dampers for manually controlling the volume of air flow.

6.2.2 Terminals shall be installed so that they properly ventilate the space served. Diffusers shall be equipped with adjustable equalizing deflectors within the neck of the diffusers to provide uniform terminal throat velocities and internal means for adjusting the discharge. The thickness of material used for cones and orifices shall be at least No. 22 USSG (0.8 mm). Other sheet steel parts shall be at least No. 20 USSG (0.9 mm). Heavier gages of material shall be required when aluminum alloy is used. The air flow rate handled by each terminal shall not exceed 14 cu meters (500 cu ft)/minute. Air terminals shall conform to the following requirements:

a. Intakes, exhausts, and outlets shall be protected by ratproof screening unless the opening is equipped with a louver in which no slot or hole is greater than 13 mm (0.5 in). Insect screening shall not be used in place of ratproof screening.

b. Ventilating hoods and canopies shall terminate flush with the deckhead and shall be screened. Pipes, cables, air ducts, and similar features over tops of hoods shall be grouped so that spaces or pockets, inaccessible for inspection, are not formed. If such spaces are formed, they shall be closed completely with sheet metal of No. 18 USSG (1.2 mm),

No. 20 USSG (0.9 mm), or No. 22 USSG (0.8 mm).

c. Diffusing adjustable blast terminals shall be used in galleys, pantries, and similar ventilated and heat producing spaces with joiner ceilings.

6.2.3 If register and diffuser parts are not furnished with a prime coat of paint, they shall be hot dipped galvanized or cadmium plated to prevent corrosion before painting. Lever operators, multilouver blades, and similar parts shall be zinc or cadmium plated. Connecting bars, bearings, rivets, springs, washers, nuts and similar parts shall be made of bronze. Turning surfaces shall be bronze on bronze.

6.2.4 13 mm (0.5 in) wire mesh screens or return air diffusers shall be installed on return air terminals.

6.2.5 Exhaust terminals shall be of the bellmouth or expanded cone type (rectangular or round) fitted with 13 mm (0.5 in) wire mesh screens. Exhaust terminals shall be located close to heat or fume source.

6.3 Air Conditioning System Terminals

6.3.1 Diffuser terminals shall be installed flush with the ceiling panels in air conditioned spaces. The air flow handled by each diffuser shall not exceed 10 cu meters (350 cu ft)/minute. The diffuser decibel rating shall not exceed 50 on the A scale.

6.3.2 Diffuser terminals serving air conditioned spaces shall be constructed so that moisture cannot be formed on the cones.

6.3.3 Balancing dampers, when built into diffuser terminals or installed adjacent to terminal inlets, shall be opposed acting and single group operated, equalizing the air flow over the terminal and throttling air flow. After the system is balanced, dampers shall be tack welded to secure the dampers permanently in the balanced position.

6.3.4 Balancing dampers fitted with position type indicators shall be used in splitter ducting where required. After the system is balanced, dampers shall be tack welded to secure the dampers permanently in the balanced position.

6.4 Fire Dampers

Fire dampers shall be constructed and installed in accordance with USCG rules. They shall have an indicator showing damper position. They shall have a combined adjusting and locking device located for accessibility and visibility. Damper control shall be from fully open to fully closed.

6.5 Weather Terminals

6.5.1 Weather intakes shall be the self draining air lift type to prevent water and spray from entering during washdown, rough seas, or inclement weather.

6.5.2 Weather openings shall be designed to minimize the effects of wind velocity and weather, and have watertight covers as required by ABS.

6.5.3 Covers for weather openings shall be rattleproof when secured in the open position.

6.5.4 Terminals shall be of hot dipped galvanized, cadmium plated, or corrosion resistant material. Nuts, washers, springs, rivets, bearings, journals, and similar parts shall be bronze or corrosion resistant material. These fittings may be constructed of integrally colored, glass reinforced polyester resin, except for the multivane adjustable louvers. Sheet metal parts shall be not less than No. 20 USSG (0.9 mm) material.

6.5.5 Weather intake or discharge openings which cannot be airlifted shall be furnished with gooseneck or mushroom ventilators.

7.0 RATPROOFING

7.1 HVAC system ratproofing shall be accomplished in accordance with Reference 2.4 to enable the ship to maintain its Deratization Exemption Certificate and Certificate of Sanitary Construction.

7.2 Ratproofing shall not be accomplished if ducts are within ratproof double bulkheads or deckheads or in fan rooms which have ratproof boundaries and doors marked "KEEP CLOSED."

7.3 In cargo spaces, the ratproofing material shall be at least the next heavier even numbered gauge than the space sheathing.

7.4 Natural supply and exhaust openings shall be ratproofed. Ratproofing shall be installed for ventilation systems which serve a single space on the end which is most effective in preventing rat harborage. Ducts extending from the weather deck directly to the cargo holds,

engine room, and boiler rooms, with no horizontal extensions, do not require ratproofing at either end.

TABLE 27-1

AIR VELOCITIES OF SYSTEMS AND THEIR COMPONENTS

FEATURE	MAX. VELOCITIES m/min (ft/min)
Adjustable blast terminals, machinery spaces	1068 (3500)
Adjustable blast terminals, ventilated spaces	763 (2500)
Air filters, face velocity (Outside Air Supply Systems)	244 (800)
Air filters, face velocity (AC Systems)	213 (700) *
Cooling coils, face velocity (without moisture eliminators)	159 (520)
Cooling coils, face velocity (with moisture eliminators)	213 (700)
Diffusing terminals, throat velocity (commercial flush ceiling type) air conditioned spaces	183 (600)
Ducts and bellmouth terminals (throat velocity), mechanical ventilation or recirculation (rectangular)	915 (3000)
Ducts and bellmouth terminals (throat velocity), mechanical ventilation or recirculation (round)	1068 (3500)
Supply and exhaust grill, operating room	229 (750)
Exhaust commercial grill, other	458 (1500)
Expanding cone terminals	915 (3000)
Heating coils, face velocity	549 (1800)
Return air velocities in passages	122 (400)
Weather openings, intake face velocity	610 (2000)
Weather openings, exhaust face velocity	763 (2500)
Passageways, shower spaces, and wash rooms	122 (400)
Notes: * Do not exceed moisture eliminators design requirements	

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MILITARY SEALIFT COMMAND
GENERAL TECHNICAL REQUIREMENTS

GTR No. 28

ELECTRICAL AND ELECTRONIC SYSTEMS

1.0 ABSTRACT

This Item establishes the minimum requirements for ship's electrical and electronics systems.

2.0 REFERENCES

2.1 IEEE Standard 45, Recommended Practice for Electric Installations on Shipboard.

2.2 National Electrical Manufacturers Association, NEMA 250, Enclosures for Electrical Equipment (1000 volts maximum).

2.3 American National Standards Institute (ANSI)/Underwriters Laboratory (UL), 486A - 1991, Wire Connectors and Soldering Lugs for Use With Copper Cables.

2.4 MIL-STD-1680 (Series) (SH), Installation Criteria for Shipboard Secure Electrical Information Processing Systems. (Confidential-Used when applicable)

2.5 American National Standards Institute (ANSI)/Underwriters Laboratory (UL), 62-1991, Standard for Safety for Flexible Cord and Fixture Wire.

2.6 MIL-C-176 (Series), Cables, RF, Flexible and Semi-rigid, General Specifications for.

2.7 MIL-HDBK-299 (SH), Cable Comparison Handbook, Data Pertaining to Electric Shipboard Cable.

2.8 DOD-STD-1399 (NAVY), Interface Standard for Shipboard Systems, Section 300A.

2.9 MIL-STD-1310 (Series) (SH), Shipboard Bonding, Grounding, and Other Techniques for Electromagnetic Compatibility and Safety.

3.0 EQUIPMENT INSTALLATION

3.1 Installations shall comply with the requirements of Reference 2.1 unless otherwise noted.

3.2 Equipment which depends upon forced ventilation for cooling must be provided with an imbedded temperature device that will initiate an alarm to indicate that the internal temperature of the equipment has risen above design limits.

4.0 EQUIPMENT DESIGN AND CONSTRUCTION

4.1 Voltage and Frequency Range

4.1.1 Power consuming equipment shall operate within 5% of rated voltage and 3% of rated frequency in accordance with Table 28-1. Unless otherwise specified, 60 Hz power shall be Type 1 and 400 Hz power shall be Type 2. To ensure power quality and reduce harmonic effects, physical and electrical isolation should be provided between electronic systems and power systems which supply large numbers of solid state devices, or significantly sized solid state motor controllers.

4.1.2 Source power for electronic equipment shall be Type 1 per Table 28-1.

4.2 Enclosures

4.2.1 Connection boxes, outlet boxes, junction boxes, and similar devices and fixtures exposed to the weather, condensation, or excessive dampness shall comply with Reference 2.2. Steel enclosures may be used in dry locations.

4.2.2 Enclosures in the weather must meet as a minimum the requirements of NEMA 250 Type 4X. Enclosures in interior locations exposed to dripping liquids or falling objects must meet as a minimum NEMA 250 Type 2. Other interior locations must meet as a minimum NEMA 250 Type 1. Enclosures in interior locations exposed to water spray, mist or splashing water must meet NEMA 250 Type 4X as a minimum. Control equipment enclosures should meet as a minimum NEMA Type 2. Watertight distribution panel cabinets should be cast or welded construction with external mounting lugs and externally operable switches.

4.2.3 Any penetration into an enclosure shall not affect the degree of protection of the enclosure.

4.2.4 Enclosures, foundations, and base plates shall not be made of wood or materials with a flame point below 1000 °F.

4.3 Corrosion Protection

Ferrous components of equipment subject to corrosion shall be galvanized or similarly treated before painting. Painting is an acceptable corrosion resistant treatment for switchboard panels, distribution cabinets, and similar enclosures.

4.4 Terminal Boards

External wires for electrical equipment (except motors and lighting fixtures) shall have terminal boards or blocks. Terminal boards are not required in motor terminal boxes. The leads shall be equipped with lugs for direct connection to lugs on ship cables and provide adequate contact, low voltage drop, low temperature rise, and mechanical strength to resist pullout and withstand shipboard vibration. For motors, lighting fixtures, and vital electrical equipment crimp type connectors shall be used that conform to Reference 2.3. Connections shall be wrapped in insulating tape. All connections shall be made within an enclosure.

5.0 DISTRIBUTION SYSTEMS

5.1 Supply power (voltage, phase, frequency) shall be from a switchboard, load center, or distribution panel and shall comply with Reference 2.1 and Table 28-1.

5.2 The power distribution system, lighting distribution system, interior communications, and electronics distribution systems shall be maintained as separate distribution systems fed from the ship service generator and emergency generator switchboards.

5.3 Weather deck and cargo hold floodlights permanently installed above the deck may operate at 440 volts.

6.0 ELECTRONIC EQUIPMENT ARRANGEMENT

6.1 Electronic equipment shall be arranged and installed to comply with Reference 2.1 or 2.4 for secure communications.

6.2 On the navigation bridge (pilothouse), equipment shall be grouped into navigation, maneuvering, communication, and monitoring functions. Communication equipment shall be located as high in the vessel as practicable.

7.0 ELECTRIC CABLE

7.1 General

7.1.1 Cable containing asbestos shall not be used.

7.1.2 Only low smoke cable complying with Reference 2.1 shall be used.

7.1.3 Special cable or conductor types, such as coaxial cables, shielded twisted pairs, and antenna connections shall be used as recommended by equipment manufacturers.

7.1.4 Portable cords shall have two current carrying conductors and one ground

conductor and shall be heavy duty rubber jacketed except where used for small appliances that contain heating elements. For these applications, a heat and flame resistant portable cord shall be used. The minimum size of conductors for portable cords shall be No. 16 AWG and meet the requirements of Reference 2.5. Portable cords shall not be used for permanent installations.

7.1.5 Connectors exposed to the weather shall be suitable for the installation and be wrapped with plastic electrical tape at least 38 mm (1.5 in) beyond the connector. The connector shall be covered with a durable weather tight jacket of the heat shrink or cold shrink type. Before installing connectors, threaded sections shall be coated with an anti-seize compound if permitted by the manufacturer.

7.1.6 Cable armor shall be electrically and mechanically grounded to the metal hull at the supply end of final sub-circuits and grounded to the metal hull at each end for other circuits. Single conductor AC cables shall have their armor grounded at the midpoint only. Armor may not be used as the system or safety ground.

7.1.7 Power cables wherever practical shall be installed in a single bank. Where double banking is unavoidable, cable current values are to be derated by 80%. Bunching of cables is not permitted.

7.1.8 Cable banding shall be installed in accordance with Reference 2.1.

7.1.9 Electronic and RF cables shall be installed to obtain the best possible operation and to reduce losses and interference in accordance with References 2.1, 2.4, 2.6, 2.7, 2.8, and 2.9.

7.1.10 Fiber optic cable shall be of type four (4) fiber, (OFNP) rated Plenum, Fiber Optic Breakout cable and comply with Reference 2.1.

7.2 Cable Installation

7.2.1 Cable runs shall be direct and installed according to References 2.1, 2.4, and 2.6.

7.2.2 Cables shall be kept at least 1 meter (3 ft) from surfaces dissipating extreme heat. Where it is not possible to avoid installing cables near heat dissipating surfaces, heat insulating barriers shall be used. Cables shall not be installed adjacent to piping or other apparatus which may leak or drip condensation. If such proximity is unavoidable, the cables shall be mechanically shielded. Cables should not be located in cargo tanks, ballast tanks, fuel tanks, or water tanks except to supply equipment specifically designed for such locations and whose functions require it to be installed in the tank. Cable installation in refrigerated spaces or hazardous spaces is not permitted unless no other routing is possible. Cable installation in refrigerated spaces, where unavoidable, shall be stepped away from the flat surfaces and shall

never be installed behind or within the insulation. Cables shall be installed in existing cableways to the maximum extent practicable.

7.2.3 Cable runs shall not be exposed to the weather unless weather exposure is unavoidable. Cables for fixtures and equipment located in the weather shall be installed on the inside surface of house structures and other structures that support the fixtures.

7.2.4 Cables shall not to be installed on gratings or walkways in engine rooms, in bilges, or in spaces exposed to oil. If running of cables under gratings or walkways is unavoidable, the cables shall be on the underside of drip proof galvanized metal pans that have side flanges at least 13 mm (0.5 in) wide.

7.2.5 Cable runs shall keep external magnetic fields to a minimum and shall be protected from excessive external magnetic fields in accordance with References 2.1, 2.6, and 2.7. Cable runs shall be continuous between outlet boxes, connection boxes, switchboards, and panelboards. Where a box or wiring device is not grounded to the ship's structure by its mounting arrangement, a separate grounding conductor grounded at the panelboard shall be installed.

7.2.6 Circuits containing nonlinear currents, such as thyrister drive cables, shall be separated from other circuits according to Reference 2.1. Low level signal and control cables and wires shall not be run in the cableways or wire bundles containing other cables and wires. Wireways with cables carrying nonlinear currents shall be separated by 1 meter (3 ft) from those containing other cables.

7.2.7 Interior Communications (IC)

a. Cable size for communications circuits shall allow for possible future system expansion. At least 10% additional wires or circuits, based on the actual number of conductors used, shall be provided in IC cables that have five or more conductors. Four conductor IC cables shall have at least one spare conductor.

b. Voltage drop for interior communication circuits shall not exceed 5%.

8.0 PANELBOARDS

Distribution panelboards shall comply with Reference 2.1 requirements and shall be the circuit breaker type with at least 50 ampere frame size circuit breakers. Distribution panelboard buses shall be three phase. Drip proof cabinet fronts for panel boards shall have one hinged door for access to the circuit breaker handles. Dead front distribution panels shall be used.

9.0 ELECTRICAL PROTECTIVE DEVICES

Circuit breakers used in local distribution panelboards shall be the commercial marine molded case type, quick make, quick break, with inverse time tripping characteristics on overloads and an instantaneous trip device for short circuits.

10.0 MOTORS

Motors rated over 1/4 horsepower shall be AC squirrel cage induction type, designed for the ship's distribution system, typically 440 volts, 3 phase, 60 hertz, and continuous duty. Small appliances and fractional horsepower motors less than 1/4 horsepower shall operate on 115 volts AC. Motors shall be single speed unless the application of driven equipment requires a two speed motor. Two speed motors shall be the two winding type. Motors shall be equipped with sealed antifriction bearings to meet thrust and radial load requirements. Fractional horsepower motors, less than 1/4 horsepower may be equipped with sleeve bearings. Shaft seals on the above motors shall be of the nonrubbing labyrinth type. Round frame motors shall be provided for axial flow and propeller fans. No type of silicone varnish, compound, rubber, grease, laminate, or binder shall be used in enclosed DC motors or enclosed AC motors that have collector rings within the motor enclosure.

11.0 ANTENNAS

11.1 Antennas should be mounted as high as practicable. Radar antennas and satellite system antennas shall be positioned to minimize shadowing. Antennas shall be physically separated to reduce electrical interaction and to avoid physical contact due to antenna deflection caused by ice loading, wind or sea conditions.

11.2 RF cable installation shall comply with Reference 2.6. All hardware used to secure antennas and couplers shall be stainless steel.

12.0 MOTOR CONTROLLERS

Motor controllers shall have nonresettable hour-meters. Motor controllers shall be across the line magnetic type. Controllers shall have integral disconnect circuit breakers. Whenever several motors are installed in close proximity to one another, their controllers shall be grouped on a bulkhead or framework at an accessible location near the motors, or a motor control center shall be used. Heaters shall be installed for motors with insulation resistance monitors and

motor controllers located in the weather. The heater circuits shall be interlocked with motor control circuits to prevent moisture condensation when the motors and controllers are deenergized.

13.0 BONDING AND GROUNDING

All equipment bonding and grounding shall be in accordance with Reference 2.9. This includes but is not limited to:

- Work benches
- Machinery and equipment
- Exterior doors, hatches, ladders and stairs
- Metal handrails
- Exterior vent hood covers, access covers, and soft patches
- Antennas, waveguides, and cables
- Rigging and load lifting davits

If secured to the metal deck, equipment foundations may be considered as an effective bonding arrangement to the hull.

GTR No. 28

ELECTRICAL AND ELECTRONIC SYSTEMS

TABLE 28-1

POWER SYSTEM CHARACTERISTICS AT INTERFACE

CHARACTERISTICS	TYPE 1	TYPE 2	TYPE 3
VOLTAGE			
(a) Nominal User Voltage	460 or 115 volts rms	460 or 115 volts rms	460, 115 or 115/200 volts rms
(b) User Voltage Tolerance			
(1) Average of the 3 line-to-line voltages	± 5%	± 5%	± 2%
(2) Any one line-to-line voltage including (b)(1) and line voltage unbalance tolerance	± 7%	± 7%	± 3%
(c) Line Voltage Unbalance	3%	3%	2%
(d) Voltage Modulation	2%	2%	1%
(e) Voltage Transient			
(1) Voltage transient tolerance	± 16%	± 16%	± 5%
(2) Voltage transient recovery time	2 seconds	2 seconds	0.25 second
(f) Voltage Spike (peak value, includes fundamental)	±2500 volts (460 V sys) ±1000 volts (115 V sys)	±2500 volts (460 V sys) ±1000 volts (115 V sys)	±2500 volts (460 V sys) ±1000 volts (115 V sys)
(g) Maximum Departure Voltage resulting from (b)(1) and (d) combined, except under transient or emergency conditions	± 6%	± 6%	± 2½%
(h) Worst Case Voltage Excursion from nominal user voltage resulting from (b)(1), (d), and (e)(1) combined, except under emergency conditions	± 20%	± 20%	± 5½%
WAVEFORM (VOLTAGE)			
(i) Maximum Total Harmonic Distortion	5%	5%	3%
(j) Maximum Single Harmonic	3%	3%	2%
(k) Maximum Deviation Factor	5%	5%	5%

TABLE 28-1 (Cont.)

POWER SYSTEM CHARACTERISTICS AT INTERFACE

CHARACTERISTICS	TYPE 1	TYPE 2	TYPE 3
FREQUENCY			
(l) Nominal Frequency	60 Hz	400 Hz	400 Hz or 60 Hz
(m) Frequency Tolerances	± 3%	± 5%	± ½%
(n) Frequency Modulation	½%	½%	½%
(o) Frequency Transient Tolerances	± 4%	± 4%	± 1%
(p) Frequency Transient Recovery Time	2 seconds	2 seconds	0.25 second
(q) Worst Case Frequency Excursion from nominal frequency resulting from (m), (n), and (o) combined, except under emergency conditions	5 ½%	6 ½%	1 ½%
EMERGENCY CONDITIONS			
(r) Frequency Excursion	-100 to + 12%	-100 to + 12%	-100 to + 12%
(s) Duration of Frequency Excursion	Up to 2 minutes	Up to 2 minutes	Up to 2 minutes
(t) Voltage Excursion	-100 to + 35%	-100 to + 35%	-100 to + 35%
(u) Duration of Voltage Excursion			
(1) Lower limit (-100%)	Up to 2 minutes	Up to 2 minutes	Up to 2 minutes
(2) Upper limit (+35%)	2 minutes	0.17 second	0.17 second

GTR No. 28

ELECTRICAL AND ELECTRONIC SYSTEMS

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GTR No. 29

IDENTIFYING MARKINGS

1.0 ABSTRACT

This Item establishes the requirements for identifying markings. Identifying markings are labels, notices, certificates, instruction plates, warning signs, documents, and other indications required for space and item identification and unit operation.

2.0 REFERENCES

2.1 American Society for Testing and Materials (ASTM), F992, Standard Specification for Valve Label Plates.

2.2 IEEE Standard 45, Recommended Practice for Electric Installations on Shipboard

3.0 GENERAL

3.1 All Contractor and Government furnished equipment, machinery, doors, furniture, rigging, and systems shall have identifying markings. Identifying markings and documents for display shall be framed. Identifying markings shall be in English.

3.2 Identifying markings and other documents shall be protected during the availability.

4.0 NOMENCLATURE OF SPACES AND STATIONS

4.1 To ensure standardization, the approved designation of spaces as listed in the following paragraphs shall be used. Abbreviations shall comply with paragraph 4.3 of this GTR.

4.2 Similarly Named Spaces

Two or more similarly named spaces shall be designated by the space name followed by a number, as follows:

4.2.1 Numbers shall be assigned consecutively (such as Radar room No. 1, Radar room No. 2), starting with No. 1, by applying the following rules in the order given:

- From top, down
- From forward, aft
- From starboard to port.

4.2.2 The forward bulkhead of a space shall be used for designating a space's longitudinal location within the ship. After the numbers are assigned, modifications which add additional spaces which would fall within a number group already assigned shall be assigned the number of the space immediately preceding it, followed by the letter "A" (for example, an additional radar room occurring between Radar Room No. 2 and Radar Room No. 3 shall be designated Radar Room No. 2A). If a space number precedes the space numbered 1, it shall be assigned the number 1 preceded by the letter "A" (such as Radar Room No. A1). If

possible, rooms shall be renumbered in logical sequence.

4.3 Space Names and Abbreviations

The following standard space names or abbreviations shall be used:

4.3.1 Berthing, Messing, and Lounging Spaces

AUDITORIUM
CHAPLAIN'S STATEROOM (CHAPL SR)
CHIEF ENGINEER'S OFFICE (CH ENGR OFC)
CHIEF ENGINEER'S STATEROOM (CH ENGR SR)
CHIEF STEWARD'S STATEROOM (CH STW SR)
COMMANDING OFFICER'S MILITARY DEPARTMENT CABIN (CO MIL DEPT CAB)
CHIEF PETTY OFFICER'S MESSROOM (CPO MESS RM)
CREW'S BERTHING (CR BERTH)
CREW'S DAY ROOM (CR DAY RM)
CREW'S LIBRARY (CR LBRY)
CREW'S MESSROOM (CR MESS RM)
CREW'S PANTRY (CR PAN)
DUTY MESSROOM (DUTY MESS RM)
ENLISTED MEN'S LOUNGE (EM LOUNGE)
ENLISTED MEN'S MESSROOM (EM MESS RM)
1st ASST. ENGINEER'S STATEROOM (1st ASST ENGR SR)
1st OFFICER'S STATEROOM (1st OFF SR)
GYMNASIUM (GYM)
LIBRARY
LOUNGE
MASTER'S CABIN (MA CAB)
MASTER'S STATEROOM (MA SR)
OFFICERS' LOUNGE (OFF LOUNGE)
OFFICER’S MESSROOM (OFF MESS RM)
PASSENGER’S STATEROOM (PASS SR)
PILOT'S SEA CABIN (PLT SEA CAB)
PANTRY (PAN)
PETTY OFFICER’S MESSROOM (P O MESS RM)

SENIOR SCIENTIST'S STATEROOM (SR SCIENTIST SR)
SENIOR UNIT COMMANDER'S CABIN (SR UN CDR CAB)
SENIOR UNIT COMMANDER'S STATEROOM (SR UN CDR SR)
TECHNICIAN'S STATEROOM (TECH'S SR)
TRANSIENT OFFICERS' LOUNGE (TRANS OFF LOUNGE)
TRANSIENT OFFICERS' STATEROOM (TRANS OFF SR)

4.3.2 Commissary Spaces

BAKERY (BAK)
CREW'S SCULLERY (CR SCLY)
DAIRY
FISH
FRUIT & VEGETABLE (FRT & VEG)
MAIN GALLEY (MN GALY)
MEAT
MILK
SCULLERY (SCLY)
THAW ROOM (THW RM)
VEGETABLE PREPARATION ROOM (VEG PREP RM)

4.3.3 Electronic Spaces

BATTERY ROOM (BAT RM)
CRYPTOGRAPHIC ROOM (CRYPTO RM)
INTERIOR COMMUNICATIONS ROOM (IC RM)
RADAR ROOM (RDR RM)
RADIO ROOM (RAD RM)
TELEPHONE CONTROL ROOM (TEL CONT RM)

4.3.4 Machinery and Associated Spaces

ACCESS TUNNEL (ACS TNL)
AIR COMPRESSOR ROOM (AIR COMPR RM)
ANCHOR WINDLASS ROOM (WINDLASS RM)
BATTERY CHARGING ROOM (BAT CHG RM)
BOILER ROOM (BLR RM)
BOW THRUSTER TRUNK (BOW THR TRK)
CAPSTAN MACHINERY ROOM (CPSN MCHRY RM)
CHLORINATION/BROMINATION EQUIPMENT ROOM (CHL/BRO EQPT RM)

CARBON DIOXIDE ROOM (CO_2 RM)
COMPACTOR ROOM (COMPACTOR RM)
COMPRESSOR ROOM (COMPR RM)
DEGAUSSING ROOM (DEGUSG RM)
DIESEL FIRE PUMP ROOM (DSL F PMP RM)
DIFFUSER ROOM (DIFFUS RM)
ELECTRICAL DISTRIBUTING ROOM (ELEC DISTR RM)
ELEVATOR SHAFT (ELEV SFT)
ELEVATOR MACHINERY ROOM (ELEV MCHRY RM)
EMERGENCY GENERATOR ROOM (EMERG GEN RM)
ENGINE ROOM (ENG RM)
ESCAPE TRUNK (ESC TRK)
EVAPORATOR FLAT (EVAP FLAT)
FAN ROOM (FAN RM)
FIRE PUMP ROOM (F PMP RM)
FUEL OIL FILLING STATION (FO FILL STA)
GENERATOR ROOM (GEN RM)
GYRO ROOM (GYRO RM)
INTERNAL COMMUNICATIONS MOTOR-GENERATOR ROOM (IC MG RM)
INCINERATOR ROOM (INCIN RM)
LIFEBOAT CONTROL ROOM (LB CONT RM)
MACHINE SHOP (MACH SHOP)
MOTOR ROOM (MTR RM)
PUMP ROOM (PMP RM)
REFRIGERATOR MACHINERY ROOM (REFR MCHRY RM)
REFRIGERATOR FLAT (REFR FL)
RESISTOR ROOM (RES RM)
SEWAGE TREATMENT DEVICE ROOM "OR" SPACE (SEW TRTMT DVC RM "OR" SP)
SHAFT ALLEY (SFT A)
STEERING GEAR ROOM (STRG GR RM)
WINCH CONTROLLER ROOM (WN CONT RM)

4.3.5 Medical Spaces

BACTERIOLOGICAL LABORATORY (BACT LAB)
BATTLE DRESSING STATIONS (BD STA)
BOTTLE WASH AND STERILIZING ROOM (BTL WASH & STER RM)
CREW WARD (CR WD)
DISPENSARY

DENTIST'S OFFICE (DENTIST'S OFC)
DENTAL CLINIC
DOCTOR'S OFFICE (DOCTOR'S OFC)
EXAMINING ROOM (EXAM RM)
GENERAL WARD (GENL WD)
ISOLATION WARD (ISLN WD)
MEDICAL RECORDS OFFICE (MED RCD OFC)
MEDICAL STORES (MED ST)
NURSE'S STATION (NURSE'S STA)
OFFICERS' WARD (OFF WD)
PHARMACY
QUIET ROOM (QUIET RM)
STERILIZING ROOM (STER RM)
SURGICAL SCRUB ROOM (SURG SCRUB RM)
SURGICAL WARD (SURG WARD)
UTILITY ROOM (UTIL RM)
WARD
WOMEN'S WARD
X-RAY ROOM (X-RAY RM)
X-RAY DARK ROOM (X-RAY DK RM)

4.3.6 Offices (Hospital Area Offices Excluded)

CHIEF COOK'S OFFICE (CH COOK OFC)
CHIEF STEWARD'S OFFICE (CH STW'S OFC)
COMMANDING OFFICER MILITARY DEPARTMENT OFFICE (CO MIL DEPT OFC)
DECK YEOMAN'S OFFICE (DK YEO OFC)
ENGINEERING YEOMAN'S OFFICE (ENGNR YEO OFC)
MILITARY DEPARTMENT OFFICE (MIL DEPT OFC)
PURSER'S OFFICE (PURSER'S OFC)
SPECIAL SERVICES OFFICE (SPS OFC)
STEWARD YEOMAN'S OFFICE (STW YEO OFC)

4.3.7 Ship Control and Associated Spaces

CHART ROOM (CHART RM)
CONNING STATION (CON STA)
CROW'S NEST (CRO NST)
DAMAGE CONTROL CENTRAL (DC CTR)

ICE NAVIGATING STATION (ICE NAV STA)
ICE PILOT STATION (ICE PLT STA)
LOOKOUT STATION (LKT STA)
LEADSMAN'S PLATFORM (LD'S PLATF)
NAVIGATING BRIDGE (NAV BRDG)
STEERING STATION AFT (STRG STA AFT)
TOP OF WHEELHOUSE (TOP WH)
WHEELHOUSE (WH)

4.3.8 Shops

BATTERY REPAIR SHOP (BAT RPR SHOP)
CARPENTER SHOP (CPNTR SHOP)
ELECTRICAL SHOP (ELEC SHOP)
ELECTRONICS SHOP (ELEX SHOP)
MACHINE SHOP (MACH SHOP)
PLUMBER SHOP (PLMB SHOP)

4.3.9 Storerooms, Issue Rooms, and Lockers

ACCESS HATCH (ACS H)
ACID LOCKER, LEAD-LINED (ACID LKR)
BAKERY STORES (BAK ST)
BOSUN'S LOCKER (BOSN LKR)
BOSUN'S STORES (BOSN ST)
CARGO GEAR LOCKER (CAR GR LKR)
CHAIN LOCKER (CH LKR)
CHAPLAIN'S STORES (CHAP ST)
CHEMICAL, BIOLOGICAL, AND RADIOLOGICAL GEAR LOCKER (CBR LKR)
CONDIMENT LOCKER OR ROOM (COND LKR) OR (COND RM)
DAMAGE CONTROL LOCKER (DC LKR)
DECK LOCKER (DK LKR)
DECK STORES (DK ST)
DECK YEOMAN'S LOCKER (DK YEOMAN'S LKR)
DENTAL STORES (DNTL ST)
DRY STORES (DRY ST)
ELECTRICAL STOREROOM (ELECT STRM)
ENGINEERS' STORES (ENGR ST)
FILM LOCKER (FILM LKR)
FIRST-AID LOCKER
FLAG LOCKER (FLAG LKR)
FOUL-WEATHER GEAR LOCKER (FOUL WEA GR LKR)

IDENTIFYING MARKINGS

FRESH-WATER HOSE STOWAGE (FW HOSE STWG)
GASKET STOWAGE (GSKT STWG)
GEAR LOCKER (GR LKR)
GENERAL STORES (GEN ST)
INSTRUMENT LOCKER (INSTR LKR)
LIFEBOAT SPARES (LB SP)
LINEN LOCKER, CLEAN OR SOILED (LN LKR)
LINE THROWER BOX (LINE THWR BX)
MEDICAL STORES (MED ST)
MILITARY STORES (MIL ST)
PAINT ROOM OR PAINT LOCKER (PNT RM OR PNT LKR)
PAINT-MIXING ROOM (PNT MXG RM)
PLUMBER'S LOCKER (PLMB LKR)
PROVISION ISSUE ROOM (PROV ISS RM)
PYROTECHNIC LOCKER (PYRO LKR)
REFRIGERATED STORES (REFRD ST)
REPAIR LOCKER (RPR LKR)
ROPE LOCKER (ROPE LKR)
SHIP'S STORE
SMALL ARMS LOCKER (SA LKR)
SPECIAL SERVICE STORES (SPS ST)
STATIONARY LOCKER (STA LKR)
STEWARD DRY STORES (STW DRY ST)
STEWARD GENERAL STORES (STW GEN ST)
STEWARD LINEN STORES (STW LN ST)
SUPPLY STOREROOM (SPLY STRM)

4.3.10 Utility Spaces (Does Not Include Hospital)

BARBER SHOP
CLEANING GEAR LOCKER (CG LKR)
CREW LAUNDRY (CR LAU)
DUMBWAITER (DW)
GARBAGE DISPOSAL ROOM (GBG DSPL RM)
INCINERATOR ROOM (INCIN RM)
LAUNDRY (LAU)
LAUNDRY ISSUE ROOM (LAU ISS RM)
LAUNDRY RECEIVING ROOM (LAU RCVG RM)
MOTION PICTURE PROJECTION ROOM (PROJTN RM)
OFFICER'S LAUNDRY (OFF LAU)

IDENTIFYING MARKINGS

4.3.11 Sanitary Spaces

BATHROOM
CREW'S SHOWER (CR SH)
CREW'S WASHROOM (CR WR)
DECONTAMINATION STATION (DECONTN STA)
ENGINEER'S SHOWER (ENGR SH)
ENGINEER'S WASHROOM (ENGR WR)
MEN'S BATH
MEN'S SHOWER (MEN'S SH)
MEN'S WASHROOM (MEN'S WR)
SHOWER
STEWARD'S SHOWER (STW SH)
STEWARD'S WASHROOM (STW WR)
TOILET (T)
TOILET AND SHOWER (T & S)
TRANSIENT OFFICERS' SHOWER (TRANSIENT OFF SH)
TRANSIENT OFFICERS' TOILET (TRANSIENT OFF T)
TRANSIENT OFFICERS' WASHROOM (TRANSIENT OFF WR)
WOMEN'S SHOWER (WOMEN'S SH)
WOMEN'S WASHROOM (WOMEN'S WR)

4.3.12 Tanks and Voids

AFTER PEAK TANK (AP TK)
COFFERDAM (COFF)
DEEP TANK (D TK)
DIESEL OIL TANK (DO TK)
DISTILLED WATER TANK (DW TK)
DOUBLE BOTTOM TANK (DB TK)
FORE PEAK TANK (FP TK)
FRESH WATER TANK (FW TK)
FUEL OIL TANK (FO TK)
LUBE OIL SETTLING TANK (LO SETLG TK)
LUBE OIL STORAGE TANK (LO STOR TK)
MAKE UP FEED WATER TANK (FD WTR TK)
POTABLE WATER TANK (POTW TK)
RESERVE FEED WATER TANK (RFW TK)
SETTLING TANK (SETLG TK)
SEWAGE HOLDING TANK (SEW HLDG TK)

SLOP TANK (SLOP TK)
SUMP TANK (SM TK)
VOID (VD)
WING TANK (WG TK)

4.4 Special Project Spaces

The MSC fleet contains special project ships with spaces used for unusual purposes. It is not possible to specify how each space shall be named. If space names or abbreviations are not included in the above list, the spaces CAN be identified by their function using recognizable abbreviations to shorten the label's length to a reasonable size. Since ships' personnel need to quickly orient themselves to shipboard arrangements, compartments may be identified in general terms such as:

- BIOLOGY LAB instead of MARINE BIOLOGY LABORATORY
- RADAR ROOM NO. 3 instead of BALLOON TRACKING RADAR ROOM.

5.0 SPACE IDENTIFICATION

5.1 Purpose

Compartments shall be numbered to facilitate their location and damage control operations. The compartment's number shall indicate its location by deck, frame, and relation to centerline.

5.2 Compartment Definition

A space shall be assigned an independent compartment number when the space is enclosed by horizontal and vertical boundaries. Compartments which extend vertically through more than one horizontal division boundary such as machinery spaces, deep tanks, and other similarly constructed spaces shall be numbered by the lowest horizontal boundary.

5.3 Subdivisions

Separate compartment numbers are not required for areas within large spaces if their function is identical to that of the major space.

5.4 Compartment Numbers

Compartment numbers shall consist of three parts separated by hyphens as follows: deck number - frame number - relation to ship's centerline.

IDENTIFYING MARKINGS

5.4.1 Deck Number

The Main Deck shall always be assigned number 1. The first horizontal division below the Main deck shall be assigned number 2. The second horizontal division below the Main deck shall be assigned number 3, etc. Where a compartment extends down to the tank tops or shell plating, the deck number assigned to the lowest horizontal division shall be used. The first horizontal division above the Main Deck shall be assigned number 01. The second horizontal division shall be assigned number 02, etc. The deck number becomes the first part of the compartment number.

5.4.2 Frame Number

The frame number at the most forward bulkhead of a compartment shall be its frame location number. If the forward boundary is between frames, the most forward frame number within the compartment shall be used. Fractional numbers shall not be used unless the frame spacing exceeds 1.2 meters (4 ft). The frame number is the second part of the compartment number.

5.4.3 Relation to Ship's Centerline

When the centerline of the ship passes through the compartment, the number 0 shall be assigned to the compartment. Compartments located completely to starboard of centerline shall be given odd numbers. Those located completely to port of centerline shall be given even numbers. Where two or more compartments have the same deck and frame numbers and are entirely starboard or entirely port of centerline, they shall have consecutively higher odd or even numbers, numbering from the centerline outboard. In this case, the first compartment outboard of the centerline to starboard shall be 1, the second compartment 3, etc. Similarly, the first compartment outboard of the centerline to port shall be 2, the second 4, etc. Cases may arise in which the centerline of the ship passes through more than one compartment, all of which have the same forward bulkhead number. In this case, the compartment with the forward bulkhead through which the ship's centerline passes shall carry the number 0, and the others shall carry the numbers 01, 02, 03, etc. These numbers indicating relation to the centerline shall become the third part of the compartment number.

5.4.4 Example

The following example illustrates the above principles:

3-75-4

- The number 3 indicates a compartment on the third deck.
- The number 75 indicates that its forward boundary is on or immediately forward of Frame 75.
- The number 4 indicates the second compartment outboard of the centerline to port.

6.0 LABELS, NOTICES, WARNING SIGNS, AND OTHER IDENTIFYING MARKINGS

6.1 General

6.1.1 Items including but not limited to furniture, fans, motors, rooms, doors, hatches, manholes, and warning lights shall have labels, notices, warning signs, and other identifying markings. Identifying markings shall be:

- Plastic, or
- Engraved on metal.

6.1.2 Plastic label plates and instruction plates shall be constructed of laminated phenolic having a black exterior and a white center. Engraving shall be a 90 degree maximum included angle of sufficient depth to expose the white center.

6.1.3 Label plates shall be attached with stainless steel screws or approved adhesives. Aluminum plates shall be insulated to prevent contact with dissimilar materials.

6.1.4 Warning signs shall be constructed of laminated phenolic having a red exterior and a white center. Engraving shall be a 90 degree maximum included angle of sufficient depth to expose the white center. Warning signs shall be provided in spaces containing electrical equipment (such as radio rooms), delicate instruments (such as telephone switchboards or electronic spaces), or an explosive atmosphere (such as pyrotechnic lockers) and shall prohibit the use of paints, polishing waxes or cleaning agents, unless the equipment is effectively sealed or secured.

6.1.5 Lettering shall be clear and concise with a minimum of abbreviations. Abbreviations shall comply with Section 4 of this GTR.

6.2 Stateroom Labels

6.2.1 Staterooms shall have labels affixed on the doorframe centered above the

door or on the bulkhead on the exterior knob side of each stateroom door 1.6 meters (5.25 ft) above the deck. They shall be 50 mm (2 in) high and 3.2 mm (0.125 in) maximum thickness. The stateroom labels shall not be attached to the door.

6.2.2 Officer and crew staterooms shall have label plates according to section 6.3, designating room occupancy ratings on the first line and the compartment number on the second line.

6.3 Service and Other Space Labels

6.3.1 Spaces not required to be labeled elsewhere in this GTR shall have identification plates at least 25 mm (1 in) wide. In general, letters shall be 13 mm (0.5 in) high. If plates are brass, they shall be 1.3 mm (0.05 in) thick, the characters shall be engraved 0.5 mm (0.02 in) deep and filled with black engraver wax. If designating flammable material storage, the wax shall be red.

6.3.2 The inscription on the identification plate shall give the compartment name on the first line and the compartment number on the second line. For example:

Deck Stores
4-14-2

6.3.3 Labels shall be centered above the door.

6.4 Furniture and Fabric Markings

Portable furniture shall have small embossed metal or plastic plates secured in an inconspicuous place or adhesive barcoded identification tags marked with deck and space in which it belongs.

6.5 Door, Hatch, and Manhole Markings

6.5.1 Special purpose doors, such as watertight doors, fire doors in main vertical zone bulkheads, or stairway enclosures (except from individual rooms, such as staterooms, fan rooms, lockers), and weather doors required to be closed for chemical, biological, and radiological (CBR) washdown purposes, shall have an etched label plate marked at the center on both sides in characters 3 mm (0.5 in) high, designating the type of door and deck, frame, and location number. If stencils are used, letters and figures shall be at least 25 mm (1 in) high. For example:

WTD 3-24-2

If the identification number cannot be seen with the door open, marking shall be on the frame or immediately adjacent to the door. Watertight door remote control stations shall be marked in

the same manner, and the direction of operation of the level or wheel to open and close the door shall be conspicuously marked.

6.5.2 If a hatch, scuttle, or manhole cover hinges against a bulkhead, the label plates shall be located on the bulkhead just above the hinged up position of the cover, so that the label can be read with the cover in the open or the closed position. If a hatch, scuttle, or manhole cover does not hinge against a bulkhead (i.e., hinged 180^{o} to open or close), the label plates shall be fitted on the top and the bottom of the cover, 150 mm (6 in) from the cover's edge, on the side opposite the hinges. Hatch, deck scuttle, and manhole labels shall indicate the compartments served by the hatch, scuttle, or manhole. For example:

HATCH 1-54-0 To Store Spaces 2-50-1 2-50-2

MANHOLE 5-95-1 To Fuel Oil Tank 6-90-0

6.5.3 Scuttles in doors and hatches shall be assigned the same number as the door or hatch in which they are located. Both sides of the scuttle shall be labeled to name the compartment to which it provides passage.

6.5.4 Portable hatch covers shall have markings to indicate the deck and hatch to which they belong and their position. Covers that are interchangeable are not required to have position markings.

6.5.5 The weather side of the door to decontamination stations shall have a label with 75 mm (3 in) black letter stenciling "DECONTAMINATION STATION ENTRANCE". The interior side of the same door shall be stenciled "EXIT TO WEATHER". Interior doors to decontamination stations shall be painted to match surrounding area, with the stenciled captions "DECONTAMINATION STATION ENTRANCE/EXIT TO INTERIOR".

IDENTIFYING MARKINGS

6.6 Access Openings

6.6.1 Label plates for access openings serving a number of compartments shall indicate compartments served. The name and number of the first compartment shall be highest on the label, and the compartments entered from the first compartment shall be listed under the first compartment's label and indented.

6.6.2 The topmost hatch and the highest point of trunk entry through a door shall have a label with the names and numbers of the compartments for which access is provided. The hatch or closure labels for closures below these topmost closures shall indicate the closure number and the name and number of the compartment below.

6.6.3 If there is more than one door or opening from a trunk on one level, the doors providing access to other compartments on that level or lower levels shall have labels with 6 mm (0.25 in) letters, "TO COMPT" and list compartments entered via that door. The compartment shall be grouped by levels and shall be separated by double vertical spacing between groups of compartments on different levels.

6.6.4 Stairwell landing labels shall show the deck level on the first line and list the compartments served below.

6.6.5 Access panels and openings in joiner work and overheads for access to components including but not limited to piping cleanout connections, wiring, ducts, vents, piping, air conditioning controls, filters, heaters, valves, ducting access plates, and other such items shall have labels clearly identifying the concealed equipment.

6.7 Embarkation Direction Signs to Lifeboats

6.7.1 Passageways, stairways, etc., throughout the ship in areas normally accessible by the crew, shall have direction signs showing the shortest route to the lifeboats. Commercially available vinyl, reflective, self adhesive, or metal reflective signs may be used. The letters on the sign shall be at least 25 mm (1 in) high with arrows and read:

TO BOATS

6.7.2 Signs near embarkation deck exits shall be similar to the above, and shall indicate the boat stations nearest the exit. For example:

TO BOAT STATIONS
Nos. 1, 3, 5

6.7.3 Each lifeboat station shall have a sign with 75 mm (3 in) letters located on the deck beams or suspended athwartship from the overhead at each lifeboat station reading, "LIFEBOAT STATION NO. 1," 2," 3," etc. If there is insufficient head room or no overhead structure at a boat station, a sign shall be permanently installed where it shall be readily seen.

6.8 Transverse Frame Labels

6.8.1 At regular intervals frames shall have identifying label plates spaced every 7 meters (24 ft) on weather decks, hangar decks, and in compartments over 7 meters (24 ft) in fore and aft length.

6.8.2 On weather decks, or decks where there are no overhead beams, frame number label plates shall be located on bulwarks, superstructure, or other structure.

6.8.3 Frame labels on long stretches of deck without erections (except helicopter platforms) shall have labels plates 63 mm (2.5 in) high with only frame numbers (i.e. without the word "frame").

6.9 Bulkhead Labels

6.9.1 Bulkhead label plates shall be located at the midwidth of the compartment indicating the type and frame location of the bulkhead. If a compartment or hold is more than one deck in height, the plates shall be about 1.7 meters (5.5 ft) above the deck. Bulkhead plate letters shall be 50 mm (2 in) high. Examples are: WT BHD 123 or MVZ BHD 54.

6.9.2 Each major transverse bulkhead shall have a label on the centerline at each deck and on both sides to indicate its type and frame location.

6.9.3 Watertight (WT) bulkheads shall have labels for the full vertical extent of the bulkhead including those in the superstructure and where passageways intersect the bulkhead.

6.9.4 Nonwatertight (NWT) bulkheads shall have labels if they extend the full beam of the ship or if the NWT bulkhead label replaces a frame label.

6.9.5 Bulkhead label plates are not necessary in tanks, voids, or on nonstructural, wire mesh, or similar bulkheads.

6.10 Heating, Ventilation, and Air Conditioning Systems

Labeling shall comply with the requirements in the following sections.

IDENTIFYING MARKINGS

6.10.1 Ventilating, heating, and air conditioning system labels shall identify their function and location. Major components shall be identified and labels shall indicate the compartment numbers of spaces served.

6.10.2 The system number shall be the location number of the fan for mechanical systems and the location number of the weather opening for natural systems.

6.10.3 The function of each system shall be identified by prefixing the system number with the word SUPPLY, EXHAUST, or RECIRCULATING. Natural exhaust or supply systems shall be identified as NAT. EXHAUST or NAT. SUPPLY. Air conditioned spaces do not require additional labeling, but the letters AC may prefix the system name. On small labels, the letters S or E may be used for SUPPLY or EXHAUST.

6.10.4 Fans shall have label plates located adjacent to or on the fan showing the system name and number, followed by the words "SERVES COMPT" and the compartment numbers. Next to this label or on the same label, the system major components shall be named and location given. These components are:

a. Coils such as preheater (PHR), reheater (RHR), or cooling coil (CC).

b. Closures serving a specific system.

c. Air conditioning control dampers (ACD) and ventilation fire dampers. Ventilation fire dampers shall have a label with the words "VENTILATION FIRE DAMPER," the fire damper number, and position. Words shall be 13 mm (0.5 in) red day-light-reflecting letters and numerals.

d. Filters, only when in system ducts.

6.10.5 Components shall have a label plate secured on or next to the component. Labels for components in system branches serving only a portion of the system compartments shall list the compartments served by the component and the component name, location, and system name and number.

6.10.6 Natural ventilation systems shall have the system label posted next to the weather opening. The label shall contain information similar to that required for mechanical systems.

6.10.7 Weather openings serving fan rooms, plenum chambers, or exhaust systems shall be labeled by function, such as INTAKE or DISCHARGE followed by location number. On the following lines, the compartment (i.e., fan room) and ventilation systems served shall be listed by name and number. Compartments served by the systems shall not be listed. Where

adjacent openings serve the same fan room, only one label is required. Closures for weather openings shall be marked with the opening number only if necessary for identification.

6.10.8 Each ventilation duct passing through a compartment, unless identified by other labels in that compartment, shall carry the same system number. Ducts that cannot be seen shall have label plates located on access covers serving the ducts.

6.10.9 Ventilation terminals in a space shall have labels showing the system initial and number. Where several terminals of one system serve one space, only one label placed in a conspicuous location is needed.

6.10.10 Equipment installed for heating and cooling which is not part of a ducted system, such as convectors, unit heaters, gravity type cooling coils, etc. shall have labels naming and locating the equipment.

6.10.11 The following are examples of ventilating, heating, and air conditioning labeling:

a. Weather opening label showing opening location, area served, and ventilating systems served. The closure is installed at the opening and is not normally labeled. If needed, the label would read "CLOSURE 02-77-1":

INTAKE 02-77-1
SERVES FAN ROOM 02-73-0
SUPPLY 02-76-1
SUPPLY 02-78-1

b. Vent system and component list labeling:

VENT FAN SUPPLY 02-76-2 SERVES COMPT

01-76-0	01-81-1	01-84-2	1-91-2
01-76-1	01-84-2	01-84-2	01-94-2

CONTROLLER 02-74-2
REMOTE CONT. FC. RM. 02-53-0
PHR 01-90-2
CC 01-89-2
FIRE DAMPER 01-91-2
AC DAMPER 01-75-2

IDENTIFYING MARKINGS

c. Preheater coil label showing system in which it is installed and shows the compartments served:

PHR	02-95-2
SUPPLY	02-76-2
SERVES	02-65-0

d. Reheater coil label. Reheater is located in a branch supply system and shows the compartments served:

RHR	01-78-1
SUPPLY	02-76-2
SERVES	01-76-1, 01-76-2

e. Ventilation fire damper label for supply system 02-76-2 showing compartment protected. Separate labels are required showing the open and closed positions. The words "VENTILATION FIRE DAMPER," fire damper designation, and the position indication words shall be 13 mm (0.5 in) red daylight-reflecting letter numerals.

VENT FIRE DAMPER	01-91-2
SUPPLY	02-76-2
SERVES	01-76-1, 01-76-2

f. Label identifying the remote control station and the controller serving ventilation system SUPPLY 02-76-2:

REMOTE CONTROL	CONTROLLER	02-74-2
SUPPLY 02-76-2	SUPPLY	02-76-2

6.11 General, Piping Systems

6.11.1 Piping shall be identified with stenciled lettering, using contrasting stencil paint to indicate the contents. Lettering shall be 32 mm (1.25 in) high, except on small pipe sizes (under 50 mm (2 in) diameter) on which lettering shall be reduced proportionally to present a good appearance. Flow direction shall be indicated by arrows.

6.11.2 Overflows and vent terminals shall have marked labels of engraved brass plates indicating the tank or space served.

6.11.3 Sounding tube label plates shall be located in an easily readable position on an adjacent bulkhead for tubes terminating on the deck plates or attached to the self closing valve.

IDENTIFYING MARKINGS

6.12 Fire Systems

Fire systems shall have markings as in the following:

6.12.1 The control cabinets or spaces containing valves or manifolds for the various fire extinguishing systems shall be distinctly marked in conspicuous red letters at least 50 mm (2 in) high - "STEAM FIRE APPARATUS," "CARBON DIOXIDE FIRE APPARATUS," "FOAM FIRE APPARATUS," OR "WATER SPRAY FIRE APPARATUS," as appropriate.

6.12.2 Firemain cut out valves shall be numbered by deck, frame and side on a metal plate, with 50 mm (2 in) high red letters. Plates shall be located adjacent to valve where clearly visible from the deck:

FMCOV
3-120-1

6.12.3 Shore connections for firemain system shall have a label plate with 50 mm (2 in) high letters:

FIREMAIN SHORE CON

6.12.4 The branch line valves of fire extinguishing systems shall have plain and permanent markings indicating the spaces served.

6.13 Firehose Stations

Each fire hydrant shall be identified in red letters and figures at least 50 mm (2 in) high "FIRE STATION" followed by the station number. Example:

FIRE STATION NO. 3-24-2

The number identifies the deck, frame, and location of the Fire Station. Hoses not stowed in the open or behind glass where they can be readily seen, shall be identified so that they can be readily seen from a distance.

6.14 Valves and Closing Appliances

Valves, closing appliances, and other mechanisms required for damage control purposes, shall be conspicuously marked with letters at least 25 mm (1 in) high identifying the control and the direction of operation. Indication shall be provided to show whether the control is open or closed.

IDENTIFYING MARKINGS

6.15 Propeller Signs

The aft end of the ship shall have a propeller warning sign fastened port and starboard to the deck handrails or bulwark above the propeller or propellers. Signs shall be wood or plastic. Each sign shall read "DANGER-PROPELLER-KEEP CLEAR" in block letters. Signs shall have white background with black letters except that the word "DANGER" shall be red. The minimum area of each sign shall be 1 sq. meter (1 sq. yard) with lettering at least 150 mm (6 in) high.

6.16 Manual Alarm Boxes

Manual alarm boxes shall be clearly and permanently marked "IN CASE OF FIRE BREAK GLASS." Existing boxes not marked with the same or equivalent wording, shall be labeled on the box or adjacent bulkhead in 13 mm (0.5 in) high letters "IN CASE OF FIRE BREAK GLASS." Manual alarm boxes shall have red numbers at least 13 mm (0.5 in) high labeled on the adjacent bulkhead indicating the zone number.

6.17 Fire Detecting and Manual Alarm, Automatic Sprinkler, and Smoke Detecting Alarm Bells

The fire detecting and manual alarm, automatic sprinkler, and smoke detecting alarm bells in the engine room shall be labeled with at least 25 mm (1 in) red lettering indicating "FIRE ALARM," "SPRINKLER ALARM," OR "SMOKE DETECTING ALARM," as appropriate. Where alarms on the bridge or in the fire control station are part of an easily identifiable alarm cabinet, the bells shall be identified by at least 25 mm (1 in) red lettering.

6.18 Ventilation Alarm Failure

Alarms indicating ventilation loss in spaces specially suited for vehicles, shall be marked with a conspicuous sign in at least 25 mm (1 in) high letters indicating "VENTILATION FAILURE IN VEHICULAR SPACE."

6.19 Safety and Damage Control Items

Safety and damage control items shall be marked as follows:

6.19.1 Supervised patrol clocks or key stations shall be numbered with plates of 25 mm (1 in) high letters. For example: "KEY STA 8, RTA."

IDENTIFYING MARKINGS

6.19.2 Lockers or spaces containing equipment for the use of emergency personnel shall be marked in 50 mm (2 in) high red letters: "DAMAGE CONTROL LOCKER #".

6.19.3 Lockers or spaces containing self-contained breathing apparatus or emergency escape breathing devices shall be marked in 50 mm (2 in) high red letters: "SELF-CONTAINED BREATHING APPARATUS" or "EEBD" unless the locker is also a damage control locker. Lockers or spaces containing CBRD equipment or CBRD gas masks shall be marked in 50 mm (2 in) high red letters: "CBRD LOCKER".

6.19.4 Portable fire extinguishers shall be marked with the stowage location number at least 13 mm (0.5 in) high. Example: "FE 3-24-2" indicates the fire extinguisher is on the third deck, port side, at Frame 24. Photoluminescent markers indicating "Fire Extinguisher" shall be placed by each extinguisher.

6.19.5 Emergency lights shall be marked with a letter "E" at least 13 mm (0.5 in) high, next to the light.

6.19.6 Firehoses and axes shall be marked with the ship's name in 25 mm (1 in) high letters.

6.19.7 Portable magazine chests shall be marked in contrasting colors in letters at least 75 mm (3 in) high: "PORTABLE CHEST - FLAMMABLE - KEEP LIGHTS AND FIRE AWAY."

6.19.8 Magazine van and magazine chest labels shall be 75 mm (3 in) block type lettering. Letters shall be red or white, whichever provides the better contrast against the background. On small chests, the label size may be reduced to that consistent with the size of the chest so that the inscription may be placed entirely on the side or top.

a. Access doors to magazine and magazine vans shall bear the inscription:

MAGAZINE
KEEP OPEN LIGHTS AND FIRE AWAY
KEEP DOOR CLOSED

REMOVE MATCHES AND LIGHTERS
PRIOR TO ENTERING

b. Magazine chests shall be marked in a conspicuous location, preferably the top, with the inscription:

MAGAZINE CHEST
KEEP OPEN LIGHTS AND FIRE AWAY

c. Magazine chests used for blasting caps, detonators, or boosters shall be marked in a conspicuous location with the appropriate inscription:

BLASTING CAP LOCKER
or,
DETONATOR LOCKER
or,
BOOSTER LOCKER
KEEP OPEN LIGHTS AND FIRE AWAY

d. Magazine vans except portable magazine vans shall bear the additional statements on each side:

MAGAZINE

WARNING
DO NOT LIFT WITH CONTENTS

e. Control locations for magazine sprinkler systems shall bear the inscription:

MAGAZINE SPRINKLER CONTROL

6.19.9 Damage control markings not designated in this GTR shall be stenciled in 13 mm (0.5 in) minimum letters and numbers at eye level (1.7 meters (5.5 ft) above the deck).

6.20 Access doors to chemical and scientific laboratories on Oceanographic Vessels shall be labeled "CHEMICAL LABORATORY," or "SCIENTIFIC LABORATORY," as applicable.

6.21 Special Systems, Fittings, and Appliances

Special systems, fittings, and appliances shall be marked identifying its function, location, or other special requirement.

6.21.1 Gasoline systems, foam fire extinguishing systems, and elevators shall have instruction plates with descriptions of valve, system, and appliance function and operation. Lettering shall be 13 mm (0.5 in) high red letters and figures.

6.21.2 Tank air escapes shall have a label plate identifying the tank by name and its number. For example:

AIR ESCAPE 03-112-1
No. ___ F.O. TK. STBD

6-110-1

This identifies a vent whose terminus is located at 03-112-1 serving tank number 6-110-1. This plate shall be located on or next to the vent at each deck level through which it passes.

6.21.3 Refrigerated spaces shall have a label plate located near the breather plugs where fitted. Label plates shall read in 6.3 mm (0.25 in) letters:

KEEP PLUG OUT EXCEPT WHEN DEFROSTING,
WASHING DOWN OR AIR TESTING SHEATHING

6.21.4 If a fitting requiring a damage control classification is located within a normally closed compartment, there shall be a label plate at the access to the closed compartment indicating that a fitting is located inside.

6.21.5 Doors to air conditioned areas from weather, heat producing spaces, and ventilated spaces, shall have a label plate on the upper halves of both sides of the door and read:

WARNING
AIR CONDITIONED BOUNDARY
KEEP DOOR CLOSED

6.21.6 The main access to spaces containing escape scuttles that are required to be unlocked shall have a label plate. The label plate shall read:

ESCAPE SCUTTLE SERVING THIS SPACE IS TO BE UNLOCKED
AT ALL TIMES WHEN THE SPACE IS OCCUPIED.

6.22 Rudder Orders

Steering stations shall have a label plate with 13 mm (0.5 in) high letters and suitable arrows on the wheel or device, or in other position to be in the helmsman's line of vision, indicating the direction the wheel or device must be turned for "right rudder" and for "left rudder."

6.23 Instructions for Changing Steering Gear

Instructions and system schematic drawings shall be posted in the steering room providing the steps to switch over steering gear power pumps, line up and operate emergency hand pumps, engage the trick wheel, rig block and tackle, or perform any other normal or emergency mode of steering gear operation. Instructions shall have letters at least 13 mm (0.5 in) high and identify key valves, clutches, and links required for changeover. Key valves shall be identified on schematics and identified by label plates on the steering gear equipment.

IDENTIFYING MARKINGS

6.24 Life Preservers, Ring Life Buoys, and Other Buoyant Apparatus

Life preservers, ring life buoys, and other buoyant apparatus shall be marked.

6.25 Decals

Decals, due to their poor durability and susceptibility to being painted over, shall not be used for permanent markings. However, since they are readily renewed, they may be used for general warning and instruction signs. Examples are:

NO SMOKING
or
WASH HANDS BEFORE LEAVING

6.26 Fuel Jettison Racks

Fuel jettison racks shall have labels clearly identifying the releasing mechanism.

6.27 Cargo and Lifting Gear Safe Working Load

Cargo gear, cranes, and lifting apparatus shall have labels clearly identifying the Safe Working Load and date tested.

6.28 Valves

Valves shall have labels in accordance with Reference 2.1 unless other valve labeling requirements are stated in this GTR.

6.29 Machinery Space Lifting Gear, Fixtures, and Securements

Machinery space lifting gear, fixtures, and securements, including but not limited to permanently installed hoists, trolley systems, machinery lifting fixtures, padeyes, tie down rings, etc., shall have a CRES label plate attached stating the Safe Working Load and date tested.

IDENTIFYING MARKINGS

6.30 Bulkhead Mounted Repair Parts

Bulkhead mounted spares shall have a clearly marked placard affixed adjacent to the location of the spare part. The placard shall identify the part's name, NSN, part number, manufacturer, and the APL and equipment nomenclature.

6.31 Photoluminescent Exit Signs

Exit signs posted along escape routes and at exits shall have photolumeniscent properties.

6.32 High Noise Hazard Signs

Spaces or equipment emitting continuous or intermittent noise levels in excess of 84 dB(A) shall have warning signs posted in the space and on or adjacent to the equipment.

6.33 Eye Hazard Signs

Spaces or equipment where eye injury can occur shall have eye hazard warning signs posted in the space and on or adjacent to the equipment.

6.34 Berth Cards

All members of the crew shall have a berth card describing emergency duties and a duty station. The cards shall be index sized cards mounted in an aluminum frame adjacent to the berth.

7.0 OPERATING INSTRUCTIONS, SAFETY PRECAUTIONS, AND FRAMED NOTICES

7.1 General

Newly installed equipment shall have safety precautions, operating instructions, and other notices for newly installed equipment and machinery.

7.1.1 Operating instructions shall list the steps for starting, operating, and securing equipment, a component, or a system. Operating instructions shall include as a minimum maintenance instructions, lubricating charts, piping and wiring diagrams, and the location of important switches and controls not mounted on or near the equipment or the equipment's control point. Detailed preventive maintenance routines shall not be included.

7.1.2 Safety precautions shall provide operation and handling guidance for equipment, components, systems, or material which present a hazard to ship's security or personnel safety. Safety precautions shall be combined with operating instructions on a single placard. Some cases shall require individual danger, caution, directional, or informational signs.

7.1.3 Ship's certificates, officers' licenses, stability letters, other notices required to be displayed, and miscellaneous interior mounted instructions shall be displayed in CRES or aluminum frames. Frames shall be glazed with a hinged front and lock, and be compatible with the surroundings. Glass or Plexiglas face shall be 3 mm (0.125 in) thick and shall be used to display instructions. If one frame displays more than one document, the frame's construction shall permit the individual document replacement without affecting the display of others in the same frame.

7.2 Fabrication

Safety precautions, operating instructions, and other notices shall be fabricated on poster, plastic, or metal material and shall be printed and sized as stated in the following paragraphs.

7.2.1 The print shall be clear and simple with proportionally larger print for titles and paragraph headings. Lettering shall be black, except safety precautions and warning signs which shall have red headings.

7.2.2 Operating instructions and safety precautions shall be 200 mm (8 in) x 260 mm (10.5 in). Smaller or larger sizes, preferably 200 mm (8 in) x 130 mm (5.25 in) or 400 mm (16 in) x 260 mm (10.5 in) may be used when suitable for proper display.

7.2.3 Operating instructions and safety precautions shall be combined on one placard where possible.

7.3 Mounting

Safety precautions, operating instructions, and other notices shall be mounted conspicuously on or near the component's control point using the following methods, listed in order of preference:

7.3.1 Direct mounting to bulkheads or other surfaces with stainless steel screws or adhesives. Aluminum plates shall be insulated to prevent contact with dissimilar materials.

7.3.2 Standard card holders 200 mm (8 in) x 270 mm (10.5 in), or 200 mm (8 in) x 130 mm (5.25 in), or 400 mm (16 in) x 270 mm (10.5 in).

7.3.3 Multiple hinged leaf card holders where it would be impractical to make separate displays.

7.3.4 Glass faced metal frames for ship's certificates and licenses.

8.0 PAINTED MARKINGS

8.1 Personnel Hazards

Personnel hazards, such as low structural beams, high hatch coamings, and other "strike against, stumbling, tripping, and equipment hazards," shall be painted with alternate bands of Black (Fed Std Color #27038), and Brilliant Yellow (Fed Std Color #13538). Band stripes shall be from 38 mm to 100 mm (1.5 in to 4 in) wide, depending upon size of the area to be painted (small areas shall have narrow stripe widths). On interior stairways, Brilliant Yellow shall be applied on top and bottom risers. Cargo hold ladder handrails shall be painted solid yellow from the deck up 1.8 meters (6 ft) minimum and from the top down 0.3 meter (1 ft) minimum. Top and bottom ladder rungs shall be painted solid yellow. Self adhesive vinyl film backed safety tape may be used.

8.2 Lifeboats, Davits, and Associated Equipment

Lifeboats, lifeboat davits, lifeboat oars, lifeboat mechanical disengaging apparatus levers, lifeboat thwarts, lifeboat sea painter locations, liferafts, liferaft oars, and buoyant apparatus shall be marked and painted.

8.3 Work Boats and Utility Boats

Work boats, rescue boats, and utility boats shall have markings in accordance with the following standards:

8.3.1 The ship name shall be plainly marked or painted on each side of the bow in letters at least 75 mm (3 in) high.

8.3.2 The boats shall be numbered from forward to aft with odd numbers assigned to boats on the starboard side and even numbers assigned to boats on the port side.

IDENTIFYING MARKINGS

8.4 Damage Control Lockers and Equipment

Distinctive markings of damage control lockers and the equipment stowed therein is necessary to identify and avoid misplacement or misuse of equipment. In order that the identifying paint markings for all damage control lockers and equipment in MSC ships shall be standardized, the following markings are prescribed:

8.4.1 The inner and outer sides of damage control locker doors shall be painted international orange (Fed Std Color #12197). The outer side of Damage Control Lockers No. 1, 2, and 3 shall have one, two, or three black stripes, respectively, 25 mm (1 in) wide painted under the door label, the same length as the label.

8.4.2 Handles or other parts of tools and other equipment stowed in damage control lockers shall be painted international orange (Fed Std Color #12197) and marked with one, two, or three black stripes to indicate whether the tools or equipment belong to Damage Control Locker 1, 2, and 3 respectively. Ships having only one repair locker shall omit the black stripe on door and equipment.

8.5 Highline Transfer Equipment

For ready identification, exterior nonworking surfaces of padeyes, links, pelican hooks, blocks, and the bridle shall be painted with white enamel.

8.6 Official Number and Net Tonnage

The ship's official number and net tonnage shall be marked permanently on the ship's main beam according to U.S. Customs Regulations.

9.0 HULL MARKINGS

The underwater hull shall have markings and labels in accordance with the standards listed in the following sections.

9.1 Repainting Hull Markings

Hull markings (including draft marks, oil tight and watertight bulkhead identification, frame numbers, Plimsoll marks, bulbous bow, and bow thruster markings) shall be reapplied on repainted or replaced hull steel. If the underwater hull is repainted, hull marking paint shall be reapplied. Markings shall be painted black above the upper limit of the boottopping and white below. Hull markings shall be outlined by a weld bead.

9.2 Plimsoll Marks

When the underwater hull around the Plimsoll mark is repainted, the Plimsoll mark

shall be repainted. Plimsoll marks shall be painted white. Plimsoll marks shall not be changed unless a new Load Line Certificate is issued by the American Bureau of Shipping.

9.3 New Hull Markings

New hull markings shall be outlined with weld beads and shall be Black (Fed Std Color #27038) unless otherwise indicated.

9.3.1 Ships Longer Than 61 Meters (200 Feet)

On ships longer than 61 m (200 ft), except Naval Fleet Auxiliary Ships, the ship's name shall appear on both the bow and stern in lettering 380 mm (15 in) and 48 mm (1.875 in) nominal thickness. Above the name shall be captioned "US NAVAL SHIP" in letters 254 mm (10 in) high and 32 mm (1.25 in) thick. At the bow, this caption shall be spaced 150 mm (6 in) above the ship's name. At the stern, this caption shall be spaced 600 mm (2 ft) above the name.

9.3.2 Naval Fleet Auxiliary Ships

Naval Fleet Auxiliary Ships longer than 61 m (200 ft) shall have stern markings identical to those in paragraph 9.3.1 above, but no name or caption on the bow. Instead, bows shall have Navy hull numbers (white with black shadowing).

9.3.3 Ships Shorter Than 61 Meters (200 Feet)

Ships shorter than 61 m (200 ft) shall have name or hull number appearing on both the bow and stern in letters 300 mm (12 in) high and 50 mm (2 in) thick. Above this shall be the caption "US NAVAL SHIP" in letters 225 mm (9 in) high and 32 mm (1.25 in) thick. At the bow and stern , this caption shall be spaced 300 mm (12 in) above the ship's name.

9.3.4 Hull Projection Draft Marks

Ships with hull projections, such as sonar domes, transducers, propellers, etc., projecting more than 150 mm (6 in) below the keel shall have projection draft marks. A separate set of Arabic numeral draft marks shall be painted and outlined in weld bead to the port and starboard hull representing the draft from the bottom of the projection. These marks shall continue 1.5 meters (5 ft) above the boottopping. "PROJ" shall be weld lettered 150 mm (6 in) above the uppermost mark. If two projections are less than 10% of the ship's length between perpendiculars apart, only the deeper projection is required to be marked. These marks shall also be applied if hull steel in way of these marks is replaced or repainted.

9.3.5 Draft Marks

Ships shall have draft marks on the port and starboard sides at the bow,

amidships, and stern. Numbers shall be Arabic 150 mm (6 in) high and spaced 150 mm (6 in) vertically). The bottom of the number shall coincide with the draft it represents. These marks shall extend 0.9 m (3 ft) above the boottopping at the bow and stern, and 2 m (6 ft) above the boottopping amidships. Numbers above the boottopping shall be black. Numbers within and below the boottopping shall be an antifoulant of the same type (but contrasting color) as the underwater hull coating. All marks shall extend in a vertical line perpendicular to the baseline. Bow marks shall not follow the rake of the stem.

10.0 ELECTRICAL EQUIPMENT IDENTIFICATION

10.1 Electrical equipment shall have labels in accordance with the following paragraphs. In addition, special precautions or maintenance and operating instructions shall be on a separate plate attached to the equipment in a visible location. Equipment connected to more than one electrical power source such as connection boxes, switches, motor controllers, and similar electric enclosures or units shall be identified with a visible red warning plate.

10.2 Switchboard and distribution panel buses shall be marked in a readily visible location with their polarity or phase identification. Color coding of installed conductors shall be consistent. Black, white, and red are reserved for phases A, B, and C respectively and for conductors 1, 2, and 3 of multiconductor cables. Synthetic tubing marked with the conductor identification shall be used at conductor ends where colors are not indicated. Terminal blocks and strips in the ship's interior communications, exterior communications, and ship's navigating aid systems shall be numbered to comply with the cable color code indicated in Reference 2.2. Designations and labels shall match designations on drawings. Wire markers shall match the elementary wiring diagrams, wiring tables, or other MSCREP approved wire numbering scheme.

10.3 Electrical System Designation and Markings.

Electrical circuits, switchboards, and distribution and control equipment shall have markings in accordance with the following standards:

IDENTIFYING MARKINGS

10.3.1 Switchboards.

Switchboard identification and notices shall be fastened to a part which would not likely be replaced during its service life. Plates with the following information shall be provided at or near the top of the front enclosure of each switchgear section or for each unit if acquired individually:

- Name or functional designation of item
- Manufacturer's name
- Manufacturer's drawing number
- NAVSEA drawing number, if assigned
- Stock number, if assigned
- NAVSEA technical manual number, if assigned
- Year manufactured.

10.3.2 Circuit Designations. Circuits shall be identified as follows:

a. Motor Controllers - System designation, per circuit number.

b. Power Panels, Lighting Panels, Group Control Centers, and Other Distribution Equipment - These shall have phenolic labels identifying the circuit designation, port or starboard location, and the deck and frame location (such as Group Control Center P450 (4-80-2)). Phenolic branch circuit labels shall be identified from left to right, top to bottom in ascending circuit number sequence. The branch circuit labels shall identify the circuit, equipment served, load, and protective element sizes in three lines, such as:

1P450
SHAFT TURNING GEAR
5 amp LD, 15 amp EL

c. Generator and Bus Tie Circuits - (P-0400 to P-0450): Cables connecting generators to the switchboard and bus tie cables shall have a zero before the numeral designating the voltage followed by one numeral/system, suffixed with alpha-numerics for the associated controls. Emergency systems shall be prefixed "EP" instead of "P". For example:

- P-0402 indicates cable No. 2 connecting 480 volt ship service generator to the switchboard
- EP-415 indicates feeder cable No. 15 for 480 volt emergency power service.

IDENTIFYING MARKINGS

d. Branch circuit cables emanating from distribution panels or boxes shall have the panel or box feeder cable designation prefixed by the circuit breaker or fuse number servicing the branch. Circuit breakers or fuses shall be numbered “1” for the upper left, “2” for the next right, and so on. For example:

- P-404 indicates feeder cable No. 4 for 480 volt power service
- L-105 indicates feeder cable No. 5 for 120 volt lighting service panel.

e. Branches - Assign a numerical prefix to the feeders associated with the branches. For example, 2L-103 indicates a branch circuit cable from circuit breaker No. 2 of a panel fed from the No. 3 feeder cable for 120 volt lighting service.

f. Control cabling shall be prefixed with the letter "K", followed by two or three letters that identify the system suffixed with numerals starting with "1" For example, K-1DG10 indicates a control circuit (K), diesel generator control circuit (DG), the tenth cable in the circuit (10).

10.3.3 Cable Designations.

Installed, modified, and relocated cable shall have stamped aluminum strip cable tags in the following locations:

- On each side of watertight deck and bulkhead penetrations
- Every 15 meters (50 ft).
- At each termination point.

10.3.4 Each panel, junction, or distribution box supplying isolated receptacle circuits shall be inscribed as follows:

CAUTION
DO NOT CONNECT ADDITIONAL FIXTURES
OR RECEPTACLES TO THIS CIRCUIT

11.0 NAMEBOARDS

Ships shall have port and starboard nameboards constructed of varnished teak. Lettering shall nominally be 300 mm (12 in) high and 48 mm (1.875 in) wide. The letters and border shall be painted gold using commercial paint.

GTR FEEDBACK FORM

This form is intended to facilitate feedback on recommended changes to MSC's General Technical Requirements (GTRs). Comments will be evaluated and retained for future incorporation. To forward comments, this page should be photocopied, completed, signed, and returned to the following address:

COMMANDER, MILITARY SEALIFT COMMAND
901 M STREET SE
WASHINGTON DC 20398-5540
ATTN: COMSC N7

GTR NO.:	GTR TITLE:
COMMENT:	

JUSTIFICATION: _____

_____

_____

SUBMITTED BY: _____ DATE: _____

ORGANIZATION: _____

RECEIVED BY: _____ DATE: _____

RECOMMENDED ACTION:

INCORPORATE INTO NEXT REVISION:

STUDY FURTHER (Indicate steps to further evaluate, additional information needed, etc.):

_____

_____

REVISION NOT RECOMMENDED (Indicate reason): _____

_____

_____

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REVISION NOT RECOMMENDED (Indicate reason): _____

MILITARY SEALIFT COMMAND
WORK ITEM PREPARATION
GUIDE

DRAWN BY:	CHECKED BY:	
JJMA-WMF	JJMA-MTM	

D. P. RUSSELL Head, Policy Branch	DATE 16 May 97	DEPARTMENT OF THE NAVY MILITARY SEALIFT COMMAND WASHINGTON D.C., 20398
J. C. BOHR Head, Project Coordination	DATE 16 May 97	MILITARY SEALIFT COMMAND WORK ITEM PREPARATION GUIDE
ROBERT E. VAN JONES Director, Technical Division	DATE 16 May 97	
K. D. BAETSEN Deputy Engineering Director	DATE 22 May 97	
APPROVED FOR COMSC T. G. CONNORS	DATE 23 May 97	

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REVISION SHEET

REV	REVISION DESCRIPTION	APPROVED

CONTENTS

SECTION SHEET

CONTENTS (Cont.)

SECTION SHEET

Guide for MSC Work Item Preparation

1. INTRODUCTION

1.1 Summary. This document provides guidance for the preparation of MSC Work Items. MSC work items are contractual documents and therefore must be carefully written to avoid errors/conflicts. The guidance provided includes specifics on the organization, content and format of work items prepared for MSC. Examples are provided showing a standardized work item format, required tasking statements and completed work items. Additionally, comments are provided on the approach to writing the technical content, on usage of standard language and phraseology, and on which articles of a work item are always used and which are rarely used. The purpose of this document is to standardize the MSC work item format and the presentation of the technical content and tasking, and to provide an easy-to-use reference document for those developing MSC work items.

1.2 Changes to MSC Work Item Preparation Guide. It is expected that this document will be dynamic. Any omissions, discrepancies, or suggestions for improvements to this document shall be forwarded to COMSC N7 using the Feedback Form at the end of this Guide. All feedback will be retained and thoroughly evaluated for incorporation into subsequent revisions to the Guide. Originators will be advised of action on their proposed change.

2. WORK ITEM CONTROL

2.1 Work Item Copies. There should only be one version (master) of a work item maintained in the electronic files. Otherwise, it becomes difficult for someone other than the author to identify the correct file. This single master file must be maintained so it can be easily located if the author is unavailable due to illness, travel, etc. When changes are made to an item, the existing master should be replaced with the changed item. There is generally no need to save old versions of work items. If for some reason the old version must be saved, it should be put in a separate subdirectory named "OLD".

2.2 Saving Work Items. There should be a standard convention for saving work items. The work items for a particular ship should be saved in an appropriate subdirectory. The file should be given the name of the ship and the work item number followed by .DOC. For example, Work Item 515 for AFS 6 would be saved as **X:\MSC\WIS\AFS-6\515.DOC**. If this work item is revised and the author desires to save the old version, the old version could be saved as **X:\MSC\WIS\AFS-6\AFS6-OLD\515-XXXX.DOC**, where XXXX represents the month and day the item was saved to the old file. The date at the top of the work item must be updated every time the work item is modified. For multi-ship solicitations, separate files of work items should be maintained for each ship, even though they are similar or identical. After the work item has been delivered to MSC, it should be filed in a delivery file and no further changes made unless directed by MSC. See Section 3.11 for guidance on amendments to work items.

3. GENERAL

3.1 Introduction. Work items are the contractual vehicle for tasking a shipyard to do work. A work item is an integral part of a contract describing specific work to be accomplished. It is not a stand alone document. It relies on the other components of the contract to fully state the requirements. These other parts include, but are not limited to, FARs, CDRLs, GTR, drawings, ABS/USCG/USPHS regs., POA&M, NAVSEA MSRA, etc. The work items are usually provided in Section J of the contract as an attachment. The other parts of Section J include the CDRL, TMCR, ILS, and PTD. The GTR is usually invoked by Section C. Collectively, all items in the contract, including the 000 items, M&R work items, and CIVMOD work items, must form a consistent, integrated work package which is unambiguous and enforceable.

A work item is used to convey to the Contractor a clear understanding of the work necessary to achieve a desired result. This will allow the Contractor to accurately bid, plan and execute the work in an efficient and effective manner. The work item provides "tasking" to the Contractor. The associated drawings that are developed along with the work item are provided to the Contractor as "guidance".

Work items are prepared using Microsoft Word for Windows.

3.1.1 Work Item Content. A work item provides a contractual tasking statement for installations, modifications, removals, etc. The work item will generally reference a drawing or a figure. A work item may state, "Install system 'x' using References 2.1, 2.2, and 2.3 as guidance", where References 2.1, 2.2, and 2.3 are guidance drawings. As much information as possible should be put on drawings. No additional taskings should be put in the drawing or general notes. When using a drawing to supplement a work item, make reference to the drawing and include only such additional wording as is required to integrate the drawing and the work item. Do not attempt to describe in the work item the work defined by the drawing (or figure). It will not only be redundant but it may lead to errors. All tasking, along with the equipment salient characteristics, should be included in the work item. Technical description which does not lend itself well to a drawing should be included in the work item. The work item and its referenced drawings should tell the shipyard clearly, unambiguously and succinctly what is to be accomplished. All work items in a package for a specific ship must be consistent in format, wording, and level of detail for similar items.

3.1.2 Ambiguities. Ambiguities must be avoided when writing work items. The most frequently encountered reason for Contractor claims against the Government are alleged ambiguities in work items. In general ambiguities are read against the drafter, i.e. the Government. The legal principle called the "Rule of Ambiguities" was stated by the Court of Claims as follows:

> "Where one of the parties to a contract draws the document and uses therein language which is susceptible to more than one meaning, and the intention of the parties does not otherwise appear, the meaning will be given the document which is more favorable to the party who did not draw it. This rule is especially applicable to Government contracts where the Contractor has nothing to say as to its provisions."

3.2 Figures. Drawings are critical to most work items and are generally preferred over figures. The use of drawings ensures that the information is properly stored and easily retrieved for future use. Figures attached to work items are not assigned numbers, and may not be kept in the central MSC filing system. Figures are used only when the amount of information to be conveyed is considerably less than the amount required to fill a drawing. If more than three or four figure sheets are needed to describe the work for an item, create a new guidance drawing.

Drawings shall be developed in accordance with MSC Standard Drawing 303-7080803; Military Sealift Command Computer Aided Designed (CAD) Drawing Standard. Figures shall be developd in AUTOCAD. If a figure is developed for a work item, the figure should be saved to an appropriate sketch file. When the work item is reviewed, the figure should be converted to a ".PLT" file and inserted into the work item. This will allow the figure to become a permanent part of the work item and not a separate attachment. Each work item figure shall have the words "**FOR GUIDANCE ONLY**" in all caps centered above the figure and shall contain sufficient legends, notes, symbol lists, etc. to ensure that the figure is clearly understood.

3.3 General Technical Requirement (GTR)/Regulatory Requirements. The GTR sets technical standards on how various work should be accomplished and is referenced in the contract. The GTR does not automatically task the Contractor. It must be invoked, or "triggered", by the use of key operative words or phrases in the work item. Complete understanding of the GTR is critical to successfully and efficiently develop, review and interpret a work item. All involved in writing and reviewing work items must know what is in the GTR and what GTR's apply to each work item; work items must not repeat information stated in the GTR.

Similarly, the applicable regulatory body requirements must not be repeated in a work item. Before drafting an item, make sure that the regulatory body requirements which apply are known and avoid conflicts or duplications in the work item.

3.4 Writing. Avoid the following common mistakes:

- Incorrect format (per this Guide), spelling (use a spell checker for each work item), grammar, and punctuation
- Unfamiliar or inconsistent abbreviations
- No page numbers or incorrect page numbers (incl. figures in the page count)
- Inconsistent quantities and units
- Use of undefined words or phrases (e.g. fabricate and install, new).

Avoid "umbrella" phrases. The use of phrases such as "to suit", "as necessary", "as required", "as needed", and "as directed by" should not be depended upon to ensure that work will be performed by the Contractor. These phrases are often the result of a writer not knowing what is needed. The writer cannot expect Contractors to satisfy requirements which are not clear.

Redundancy is detrimental to clarity. Do not include anything that is not absolutely necessary to describe the required work. The work item's wording should be as concise as possible without impact on clarity. Each requirement should stand by itself and should not be repeated in subsequent paragraphs.

In general, a period should be used only after a complete sentence. Phrases or single words are not to be followed by a period.

Use active voice, e.g. "Perform the work using Reference 2.1 as guidance." Appendix A contains a listing of active verbs and their MSC definitions for use when tasking work in the work item.

When referring to a specific ship compartment, state the compartment name with first letters capitalized followed by the compartment number in parentheses, "Sewage Pump Room (4-19-5-E)", for example. When referring to a space without using an assigned name, state the function (uncapitalized) and the compartment number without parentheses, i.e. "fuel tank 5-144-0-F".

3.5 Regulatory Body Approvals. At the time of actual installation, all regulatory body approvals are needed. This is typically the shipyard's responsibility. The work item author's responsibility is to obtain ABS approval at the guidance level and to have ABS perform USCG consultative review at the guidance level. This is required before the final item is incorporated into a work package. Work items requiring ABS approval shall include the term, ABS, at the end of the title (see Section 4.1).

3.6 Guidance Level. Work items are performance oriented; the shipyard determines how to do the work. Enough guidance is provided by MSC to bring forth any critical information that the shipyard needs to know. The shipyard is responsible for shipchecking all aspects of the work item. The burden is on the shipyard to provide a fully designed, approved and functional system. However, the drafter of a work item/guidance drawing must ensure that the design conceptually shown will work. For that reason, validation shipchecks by the guidance drawing drafter may be required.

The Contractor is responsible for design and implementation of a fully functional system, for compliance with all applicable GTRs, for overcoming interferences not shown on the contract guidance drawings but which would be visible on a reasonable shipcheck or should be anticipated by a competent shipyard, for overcoming variations between actual ship conditions and those shown on the guidance drawings to the extent they would be visible on a reasonable shipcheck or should be anticipated and would amount to necessary implementing detail, and, finally, for omissions of details from the work package that are necessary to fulfill the intent of the specifications. For the design approach conceptually presented on the guidance drawings, MSC is responsible for the accuracy of parametric data shown on the guidance drawings and that the specified equipment and materials satisfy cognizant regulatory body requirements. Parametric data includes, but is not limited to, flow rates, amperage rates, linear measurements, etc.

3.7 Calculations. All design calculations must be clearly documented and maintained by the cognizant engineers in design notebooks, along with appropriate notes on the design approach, assumptions and resolutions of key issues. The calculations shall be submitted to MSC when the work items are delivered.

3.8 Salient Features. When specifying equipment, MSC cannot sole source to a specific vendor (absent written justification and approval). Identify the preferred equipment item (Brand Name or Equal) and list the salient features which will define the minimum requirements should the shipyard proposes another item meeting "form, fit and function". Say "Install pump and motor, Worthington Model 3LR-9, or equal", and then list the salient features required such as 250 GPM at 50 ft., bronze body, monel shaft and impeller, and mechanical seals, for example. State the salient features unambiguously. See Section 4.3, Article 7.0, Salient Characteristics, for more details on how to list salient features.

3.9 Cut Sheets. For every item of preferred equipment called out in a work item, a "cut sheet" from an up-to-date version of the manufacturer's equipment catalog shall be copied by the cognizant engineer. These cut sheets, along with point-of-contact information (including company name, address, telephone number and name of contact) and lead time information, shall be submitted to MSC when the work items are delivered. Where a vendor's item is particularly complex or forms a major part of a system (e.g. MSD plant), the system diagram should be sent to the vendor for review.

3.10 Other. Do not duplicate information on the drawing and in the work item. This can lead to conflicting information. Get as much information as you can out of the work item and onto the drawing.

Define acceptance criteria. Avoid statements such as "To the satisfaction of the MSCREP", "In accordance with good marine practice" or "To the maximum extent possible".

For Category B items only, the total quantity required may be included in the work item so that the Contractor can provide "unit price" bids.

Pipe sizes and power cable sizes shall be shown, or, if no drawings or figures are used, called out in Article 7.0 of the work item.

Do not tell the shipyard to make "temporary access" or how to remove something. The work item author's responsibility is to ensure that it can be done. The shipyard is responsible for providing a finished product.

Do not call out the same item in two places in the work package, e.g. callouts for the same thermostat by both the HVAC and electrical work items; the shipyard may include the price twice in their bid.

Understand the terms "Install" "Remove", "Replace", “Temporarily Remove”, and "Relocate" as defined by General Requirements Item No. 001 (see Appendix A).

Use commercial marine standards for requirements, acceptance, materials, etc. whenever possible. Avoid the use of MIL-SPECS/STDS.

When you have completed a work item, ask yourself the following questions:

- Can it be built or installed?
- Is the work to be done clearly defined?
- Can it be bid?
- Is it enforceable?
- Is the item consistent regarding format, language, and level of detail - both internally and externally with respect to other items in the work package?

3.11 Work Package Amendments and Work Item Modification. After a work item has been developed, reviewed and "completed" and issued for bids, it sometimes becomes necessary to modify it, e.g. to incorporate updated information or to reflect changes made to another, but related, portion of the work package. The work item revisions are highlighted by vertical bars in the right hand margin, placed in way of the text changes. Every page of the modified work item has an amendment number typed at the bottom to indicate to which amended work package it belongs. Last, the date on the work item header is changed to the delivery date of the amended work package. Note that an amended work item only indicates (by the margin bars) changes from the previous version of the work item. Thus a work item which has been amended several times will not identify all of the changes made since the original version.

When modifying an existing work item that has been previously submitted to MSC, be sure that you are working from the same version of the file as the previous submittal to MSC. Verify with the MSC TPOC that the work item was not subsequently modified internally by MSC. If the item has been previously issued to a shipyard by MSC for bidding, it is imperative that only approved changes (as directed by the MSC TPOC) be made to the file of that version issued to the shipyard. If in doubt about the version of an item that requires change, verify with the TPOC which is the correct version.

3.12 Work Item Quality Control. Sample work item quality control process documentation is provided. The process should begin when a cognizant engineer begins work on a task or sub-task. Two forms are recommended for use to document this process: the Technical Documentation Deliverable - Quality Control Route Sheet, and the Work Item Format and Guidelines Checklist. Sample copies of both forms are located in Appendix C.

The quality control route sheet and the checklist should be attached to each work item as it is started and checked off and initialed, as appropriate, as it progresses to completion. The project engineer and the program manager should sign off on all work items before submittal to MSC, in addition to draftspersons, designers and engineers, as appropriate. This sign-off process applies to preliminary versions of work items as well as later versions. Each work item shall be transmitted by letter. Copies of the completed route sheet, check list and transmittal letter, along with the work item itself, should be maintained by the LOE Contract Administrator.

3.13 Disclaimer. Each preliminary work item, figure, table and drawing (all pages and sheets) must be stamped with the disclaimer that it is a preliminary item and not to be used for bidding purposes. This should be done prior to making copies for distribution. Final deliverable work items, figures, tables and drawings do not get this stamp.

4. SPECIFIC GUIDANCE

This section provides specific guidance for each of the articles in the standard work item outline. Appendix D is the MSC Standard Format for Work Items with explanatory notes. Appendix E is a sample work item containing examples of an enclosure, a table and a figure. The work item is not ment to be technically correct, but is designed to show various format examples which are used within a work item. Appendix F is an example of the work item format with format guidance in each section. Use these examples for help in getting started. The font type for work items is Courier 12 point and work items have one inch page margins all around. Tab settings for work items are 0.5 in., 1.0 in., 1.38 in., 1.75 in., 2.13 in., and 2.5 in. Appendix G is an outline, or template, for a work item.

4.1 Header. The header should be as shown in the work item example, Appendix F, or the sample/template, Appendix G. Header margins are one inch and the font is 12 point Courier bold. All letters are in caps except the month and the word "Category" which are in both upper and lower case. For the ship's name and hull designation, use center justification. The formats for the ship name and hull designation are as follows:

- The SHIP NAME is of the form USNS HAYES, USNS WATERS, etc.
- The (HULL DESIGNATION) is of the form (T-AG 195), (T-AGS 45), etc.

For the remaining header lines, use right justification with a center tab at 3.25 inches and a right tab at the right margin, or 6.5 inches. Remember to have one blank line at the end of the header. This will ensure at least one blank line will separate the header from the text of the work item on all pages.

The header SECTION TITLE is taken from the section titles in the MSC Standard Work Package Index, a copy of which is contained in Appendix H. The index generally follows the SWBS breakdown except in the areas of HVAC, Drydocking and UNREP Gear. The header SECTION TITLE is the Appendix H title listed for Section 000, 100, 200, 300, 400, 500, 600, 700, 800, 900, or 1000. For example, the SECTION TITLE for an item installing a new structural bulkhead would be HULL STRUCTURE. The SECTION TITLE for an item installing a ventilation supply fan would be HVAC.

The RFP NUMBER is the MSC number for the solicitation and will be provided by the MSC TPOC. An example of the correct format is "RFP NO. N62387-96-R-3001". If the number is unknown, then X's can be substituted in preliminary work items.

During the development and review period prior to the Reading Session Review, the header DATE should be the current date, automatically printed to the work item. This is accomplished by selecting

the Insert/Date and Time function in Microsoft Word and selecting the date format of DAY MONTH, YEAR. Thus, the work item with the latest date will always be the current version of the work item. After review comments and changes are incorporated into the work item, the DATE should be changed to reflect the delivery date of the work package. This date will be provided by the MSC TPOC for each project.

The ITEM NUMBER will be assigned by the MSC TPOC. The first digit is the one-digit level section number for the work; see Appendix H. For example, the first digit for a Hull Structure item is "1". The second two digits are consecutive numbers for items on a given program. Always include the first digit. If the rest of the number is unknown, then "XX" can be substituted for the last two digits for preliminary items.

The CATEGORY is usually "A", which identifies items where the scope of work is well defined and biddable. CATEGORY "B" items are those for which the scope of work is usually defined on a "per unit" basis such as steel renewal or pipe replacement. The MSC TPOC will provide project specific guidance if an item is to be CATEGORY "B".

The names and initials at the top should always be LOE Company Initials/AUTHOR'S LAST NAME/MSC TPOC'S INITIALS, e.g. JJMA/BEAUBIEN/WFZ.

The TITLE is the title of the task to be performed: INSTALL FIRE PUMP, or REPLACE BULKHEAD 87. At the end of the title include in parentheses any applicable TRANSALT, BASELINE, or INSURV Card numbers. If the work being tasked by the work item requires ABS approval and/or inspection, include in parentheses the term, ABS, at the end of the title.

4.2 Footer. The footer is as shown on the sample/template. The work item number and page number are centered (center justification) in the footer. Work item footer margins are 0.7 inch.

4.3 Work Item Sections. This section addresses individual article numbers as they appear in the work item.

- **1.0 ABSTRACT**

This article provides a clear, concise description of the work to be done. It must NOT be written to task the Contractor. For example, "This item describes the installation of a new potable water system". Do not use a tasking statement such as "Install a new potable water system". Do not give space names, quantities, or locations. Just describe what the item is accomplishing. One sentence is usually sufficient.

- **2.0 REFERENCES/ENCLOSURES**

General. REFERENCES are the guidance drawings specifically prepared to conceptually show the work to be accomplished by the work item or are other drawings or documents necessary for the shipyard to perform the work. All references (and enclosures, if utilized) must be cited in the work item text, normally in Article 7.0. It is difficult to enforce a reference or enclosure if you do not cite it and say how it is to be used. The order of the references is the order in which they first appear in the work item. Avoid referencing Technical Manuals or similar lengthy guidance documents. Pull out of such documents the pertinent data (make sure the data is technically correct, i.e. not out of date) and put it into the body of the work item, make it a figure or put it on a drawing. Do not list existing ship drawings just because they might contain good information for the shipyard to use to bid the job. These drawings may not be up to date. Assume that the shipyard will perform a shipcheck when bidding the job. When the work item is submitted to MSC for review, all enclosures must be attached and a copy of all associated references developed with the work item must be provided. Figures or tables that are part of the work item are NOT to be listed as references or enclosures.

MSC is responsible for ensuring that all references are either sent out with the work package or are otherwise readily available to the Contractors. Therefore, do not list a reference unless you know that it is available. Do not list the CFR, ABS or other regulatory body rules as references. These are covered by the contract boiler plate. Note: There may be instances within Article 7.0 where you specifically cite a regulation. For example, "Install in the Chartroom a Global Positioning System meeting 49 CFR 162.116.".

If the list of reference drawings and their revisions will be provided as a J Attachment to the RFP, then DO NOT identify the drawing revision when writing out the reference, e.g. do not write "Rev A", for example. This is to avoid having to check and update all the work item references as drawing revisions are made.

Do not reference COMSCINSTs with the exception of the GTR. These are normally internal to MSC and should not be used to place an obligation on the Contractor. You can excerpt from them and attach as figures, work the excerpts into Article 7.0 of the work item, or create a drawing.

Program Manager standard items should be referenced in individual work items as appropriate. A “J Attachment” will be provided listing the standard items and providing them as enclosures.

Reference/Enclosure Format. If the work item includes both references and enclosures the title is as follows: “2.0 REFERENCES/ENCLOSURES”. Only include "ENCLOSURES" in the title if the work item has an enclosure. Most work items will not have an enclosure. If there are no references or enclosures, then the title should be "2.0 REFERENCES: None".

References are numbered starting with 2.1 (or 2.1.1 if enclosures are also used) in the order that they are cited in Article 7.0 of the work item. Enclosures, if used, are listed separately following the references and are numbered consecutively starting with "2.2.1". Enclosure titles contain the work item number followed by a hyphen and the enclosure number (e.g.101-1, 101-2, etc.). For example, if there are five references and one enclosure for Work Item 111, the title for the enclosure would be "2.2.1 Enclosure 111-1, List of Pertinent Information". Where cited in the work item, refer to the enclosure as, "using Enclosure 2.2.1 as guidance". Enclosures must be attached to the work item.

The format for listing references when no enclosures are contained in the work item is as follows:

2.0 REFERENCES

2.1 MSC Drawing

2.2 MSC Drawing

The format for listing both references and enclosures in a work item is as follows:

2.0 REFERENCES/ENCLOSURES

2.1 References

2.1.1 MSC Drawing

2.1.2 MSC Drawing

2.2 Enclosures

2.2.1 Enclosure 111-1, List of Pertinent Information

References as Interfaces. References are also used to flag the interfaces between the work being tasked in a particular work item and related work being tasked by other work items and their reference drawings. To ensure that the work items collectively effect a complete job, drawings defining related work necessary to properly execute the subject removal, modification/relocation, or installation shall also be listed in Article 2.0 and cited in Article 7.0 in the appropriate removals, modifications/relocations or installations paragraph. This defines the interfaces between the specific work item and other applicable work items. For example, a work item installing a new system requiring potable water, waste drains, air conditioning and electricity would reference drawings showing the existing system removal and new system installation, as well as the drawings defining the interfaces with related work: potable water system installation, soil and waste drain installation, HVAC system installation, and the as-converted electrical one-line diagram.

Drawings can be referenced in more than one work items. For example, an Electrical One-Line Diagram may be referenced in several work items.

3.0 ITEM LOCATION/DESCRIPTION

This article must always have two paragraphs, "3.1 Location/Quantity" and "3.2 Item Description/Manufacturer's Data".

3.1 Location/Quantity. This paragraph must always have two parts, "3.1.1 Location" and "3.1.2 Quantity".

3.1.1 Location.

a. List the general areas where the work will be performed. The primary purpose is to allow the shipyard to understand the scope of work involved. If work is to be done in a tank or specific compartment, then it should be identified by name and number; see Section 3.4.

b. If there is only one location, list it directly after the title: "3.1.1 Location: Emergency Diesel Generator Room (2-XXX-X)".

c. If there is more than one location where the work is being performed, use the term "Various", such as "3.1.1 Locations: Various". If the locations are not shown in the reference drawing, or there is no reference drawing, the locations must be stated in the appropriate paragraph of Article 7.0, Statement of Work Required.

3.1.2 Quantity. This category is for Government Furnished Items or existing items to be repaired or overhauled. Normally "None" (placed directly after "Quantity:" on the same line) unless the work item is describing a Government Furnished Item or an existing item to be repaired or overhauled. In either latter case, list the number of units to be provided or repaired/overhauled, e.g. "two main feed pumps", "one trash compactor", etc.

3.2 Item Description/Manufacturer's Data. This paragraph provides a bill of materials for items being installed in the work item, provides information on the quantities and type of material in the bill of materials, and provides for the description of equipment/systems to be repaired or overhauled (M&R items). If there is no bill of materials or description of equipment/systems to be repaired or overhauled, then "None" is placed directly after "Data:" on the same line as follows: “3.2 Item Description/Manufacturer's Data: None”.

Bill of Materials. Normally the bill of materials would be included in the installation drawing referenced in the work item. However if there is no drawing referenced in the work item or if the referenced drawing(s) does not include the bill of materials for the material being installed, then a bill of materials is required in each work item as Paragraph 3.2.1. The bill of materials shall provide information for large items, cabling, piping and tubing. Fasteners, consumables, connectors, fittings, etc. are not to be included. The bill of materials will include columns for PC No., Quantity, and Description. Note, the bill of materials does not eliminate the requirement to provide salient characteristics for specified equipment in Article 7.0, STATEMENT OF WORK REQUIRED, in the work item. The format for the bill of materials is as follows:

3.0 ITEM LOCATION/DESCRIPTION

3.2 Item Description/Manufacturer’s Data

3.2.1 Bill of Materials

PC NO.	QTY	DESCRIPTION
1	1	Junction box
2	50	Transformers, 50 amp, 240/480 VAC to 24 VAC

Disclaimer for Quantities and Type of Material in Bill of Materials. The bill of materials is an estimate of the required material for that work item and does not contain such items as fasteners, consumables, connectors, fittings, etc. Paragraph 3.2.2 shall follow the bill of materials stating the quantities provided in the bill of materials is an estimate only and that certain consumables have been omitted. Wording and format for Paragraph 3.2.2 is as follows: (Note: The listing of consumable material shall be tailored for each specific work item.)

3.0 ITEM LOCATION/DESCRIPTION

3.2 Item Description/Manufacturer's Data

3.2.1 Bill of Materials

PC NO.	QTY	DESCRIPTION

3.2.2 Quantities are considered estimates. The Contractor shall provide the exact quantities and additional material such as miscellaneous pipe fittings, elbows, caps, valves, pipe hangers, weld material, cable hangers, cable tags, buswork, etc., which are not included in the List of Materials, in order to install a fully functional system which meets the requirements of this specification.

Description of Equipment/Systems. This information is provided only if the work item is describing equipment/systems to be repaired or overhauled as in M&R items. Then the manufacturer's data may be provided.

- **4.0 GOVERNMENT FURNISHED EQUIPMENT/MATERIAL/SERVICES**

This article is used to list anything to be provided by the Government. If there is nothing being provided by the Government, the title is followed by "None" placed on the same line after "SERVICES:". The Contractor generally supplies all equipment, material, services and information except in unusual circumstances. If the Government is providing equipment, or material, or services, or information, then all the Paragraphs, 4.1 through 4.4, must be included even if one or more of them are "None".

For example, if the Government is providing a pump as GFE, list it as "One ABC Co. Feed Pump, Model 3342". Do not list every piece of material such as valves, piping, gages, etc. If such detail is needed, it should be provided as text within Article 7.0, in a figure or enclosure, or in a referenced drawing. An example follows:

4.0 GOVERNMENT FURNISHED EQUIPMENT/MATERIAL/SERVICES

4.1 Government Furnished Equipment (GFE)

One ABC Co. Feed Pump, Model 1234

4.2 Government Furnished Material (GFM): None

4.3 Government Furnished Services (GFS): None

4.4 Government Furnished Information (GFI): None

If there is more than one item for a sub-heading, use 4.1.1, 4.1.2, etc.

Be sure to check the availability of Government Furnished Equipment (GFE) and Material (GFM).

Specify Government Furnished Services (GFS) in Paragraph 4.3 when a manufacturer's or authorized technical representative is provided and paid for by the Government as

mentioned in Article 7.0. Verify the availability and scheduling of the specified services.

Paint as Government Furnished Material (GFM). When paint is being provided by the Government, the amount provided is enough to complete the specific work item tasking and no more. If the provided paint/paint system requires thinner for spray viscosity control, thinner is also provided. Standardized notes providing guidance on thinner use and the amount of paint and thinner provided have been developed. The tasking for the use of this paint is in Work Item Paragraph 7.8, Painting. The following example provides the format for paint as GFM and the standard notes:

4.0 GOVERNMENT FURNISHED EQUIPMENT/MATERIAL/SERVICES

4.1 Government Furnished Equipment (GFE): None

4.2 Government Furnished Material (GFM)

4.2.1 25 Gallons Amercoat D9FT (Primer)

4.2.2 115 Gallons Amercoat 385 (Midcoat)

4.2.3 25 Gallons Amershield (Topcoat)

4.2.4 Thinner

a. 10 Gallons Amercoat 65

b. 5 Gallons Amercoat 923

Notes: (1) Thinner is for spray viscosity control only, not for equipment clean-up.

(2) Any additional paint or thinner necessary to complete this work item shall be furnished by the contractor.

- **5.0 NOTES**

In general, only state here relevant information about the item which does not fit elsewhere in the work item format. Do not task in the notes. Thus, do not use the term "shall". Do not say that the item should be worked in conjunction with specific work items. We do not want to tell the shipyards how to do their job. However, if the tasked work is supported by the work of another work item or if the work item supports work being tasked in anther work item, then a statement that this work item supports or is supported by that work item. In this instance use the title of the other work item and not the work item number. For example, “Structural modifications necessary to support HSL Davit Installation are installed in accordance with the HSL Sideport Installation Work Item”.

If there is more than one note, use sub-headings: 5.1, 5.2, etc.

If there are no notes, then the title should be followed by "None".

Required Work Item Notes. Every work item shall include two notes, numbered 5.1 and 5.2, to provide the specific GTR used in the work item tasking and the specific "000" Work Items applicable to the work item. These notes are to assist shops and subcontractors in determining all applicable requirements These required notes with sample GTR and "000" Work Items are as follows.

5.0 NOTES

5.1 The contractor and all subcontractors, regardless of tier must consult the General Technical Requirements (GTR) to determine applicability to this work item. In performance of this work item, the contractor and all subcontractors regardless of tier must comply with the requirements of all applicable GTR's including but not limited to GTR's 1 through 7, 22, 23, 24, 28, and 29.

5.2 The contractor and all subcontractors, regardless of tier are advised to review other work items under this contract, including but not limited to Work items 009, 010, and 015, to determine their effect on the work required under this work item. Many of the definitions relating to performance of this work item are found in Work Item 001.

Note, if there are no GTRs numbered 20 or higher which apply to a work item, Paragraph 5.1 shall read as follows:

5.1 The contractor and all subcontractors regardless of tier shall consult the General Technical Requirements (GTRs) to determine applicability to this work item. In performance of this work item, the contractor and all subcontractors regardless of tier must comply with the requirements of all applicable GTRs including but not limited to GTRs 1 through 7.

Standardized Space Numbering Note. When the work is tasked in a specific space (i.e. Crew Living Space, 1-118-1-L) and spaces are being relocated, redesignated, and/or renumbered throughout the ship, the contractor/sub-contractors/shops need to know if the space name and number for the tasked work is an existing or new space name and number. This information is provided in a note using the following standardized wording: "Existing compartment names and numbers are used for the removals work. New compartment names and numbers are used for the modification and installation work.". This note is to be included in the work item only when required.

- **6.0 QUALITY ASSURANCE REQUIREMENTS**

This article should contain any quality assurance requirements which are beyond the normal requirements of ABS, the GTR, etc. If there are additional QA requirements, Paragraphs 6.1 through 6.3 must all be included. State material certification requirements in Paragraph 6.1. Specify exceptional requirements for personnel qualifications (e.g. welder qualifications) or process certifications beyond those detailed in the GTR in Paragraph 6.2. Paragraph 6.3 is used to specify requirements for conducting/reporting inspections and tests beyond the GTR and regulatory body requirements.

If there are no additional QA requirements, the title should be followed by "None additional" placed on the same line after "REQUIREMENTS:" and the sub-headings eliminated.

- **7.0 STATEMENT OF WORK REQUIRED**

General. All biddable work must be tasked in Article 7.0. All ten paragraphs at the two digit level are always included (7.1, 7.2, etc.). These paragraphs are as follows:

- 7.1 Arrangements/Outfitting
- 7.2 Structural
- 7.3 Mechanical/Fluids
- 7.4 Electrical
- 7.5 Electronics
- 7.6 Preparation of Drawings/Documentation
- 7.7 Inspection/Test
- 7.8 Painting
- 7.9 Marking
- 7.10 Manufacturer's Representative

It is essential that the paragraphs be technically correct and that all work necessary to satisfy the Government be described.

Identify known or suspected long lead time CFE/CFM and advise the MSC TPOC.

Tasking Statements. Each tasking paragraph should begin with an active verb such as "Install", "Remove", "Relocate", etc. There are very specific definitions for these verbs which are provided in General Requirements Item No. 001. These are included in Appendix A for information. All work item writers must review, understand, and use these definitions.

When using the term "Remove", DO NOT list ancillary removals such as associated foundations and cabling. They are taken care of by the MSC definition of "Remove".

If an item is being removed and a new one of similar form, fit, and function is being installed in its place, use "Replace" rather than "Remove" and "Install". If a new item is "similar" but requires additional piping, wiring, foundations, etc., then "Remove" and "Install" should be used.

When using "Install", DO NOT list the removal or relocation of any interferences. They are taken care of by the MSC definition of "Install". If there is a reference drawing, use a tasking statement of this form: "Install the refrigeration monitoring system using Reference 2.1 as guidance." This is all that needs to be said. If there is also a power hook-up and a reference drawing has been developed, the tasking statement should read: "Install the refrigeration monitoring system using References 2.1 and 2.2 as guidance," where Reference 2.2 is the as-converted electrical one-line diagram. Make sure the required power interface is shown on the one-line. (See Section 4.3 of this Guide, Work Item Article 2.0, References as Interfaces for more information on references in the work item.)

Task the shipyard to do the work on the drawings with simple tasking statements. It is not necessary to tell the shipyard to install each of the components, cabling, support, services, etc. These elements are all shown on the referenced drawings and/or included in the shipyards requirement to provide a fully functional installation.

Salient Characteristics. When installing an item of CFE/CFM, always tell the shipyard what to install, provide the "Brand Name or Equal" for the preferred equipment, and list the salient characteristics. The make and model number of the preferred equipment must always be followed by the words "or equal". It is essential to state the salient technical characteristics of the equipment, as discussed in Section 3.8 of this Guide. The salient characteristics must either be listed in tabular form on the reference drawing or listed in the work item using bulletized format. The salient characteristics define the performance and other technical features which a proposed alternative equipment item must possess in order to be judged "equal" to the preferred make and model. An example of specifying the installation of a piece of equipment and identifying its salient characteristics in bulletized format follows:

"Install a safe, Mosler Model No. 1234 or equal, in the Master's Stateroom, using Reference 2.1 as guidance, with the following salient characteristics:

- 24" x 24" x 36"
- Right hand door
- UL TL-30 rated
- 1S lock"

Unacceptable Phrasing. All tasking must be bounded so that it is biddable. Do not use opened ended words and phrases such as "as appropriate", "as required", "to suit", or "etc.".

Do not use the phrase "as directed by the MSCREP", it is acceptable to say "The exact location shall be approved by the MSCREP." Always use the term "MSCREP" when referring to the MSC on-site staff.

Other words to be avoided in the work item text include:

- "New" in reference to material or equipment to be installed. The material is already required to be new by the 000 Items.
- "Perform" in reference to accomplishment of a test in Paragraph 7.7 of the work item. Simply list the specific test(s) required.
- "Arrival" in reference to the vessel's availability at the contractor's facility. The correct word is "delivery" as noted in Appendix A.
- "Specification" in the text of the work item. The work item is itself a part of the specification.

Wording When There Is No Tasking. If there is no tasking within a paragraph, then follow the paragraph title with the words "None additional", such as "7.2 Structural: None additional". The phase “None additional” means that there is no additional tasking of this type besides that required by the specific tasking and the GTR. From the example "7.2 Structural: None additional", none additional means there is no additional structural work other than that which may be required by the GTR to complete the tasking within the work item. The exception is Paragraph 7.10. For Paragraph 7.10, use "None" when there is no tasking such as, "7.10 Manufacturer's Representative: None".

Reports. For work on existing equipment/systems, task the contractor to submit reports on as-found/as-released conditions, measurements, clearances, etc.

Tables and Figures. Where a paragraph would contain repetitive tasking statements, turn them into a table or tables. A prime example is the furnishings for staterooms and offices. Another example is the equipment in shops. Tables may be cited in Article 7.0 of the work item or included in a drawing. If cited in the work item, the table numbers are based on the work item number. For example, tables contained in Work Item 101 are identified as Table 101-1, Table 101-2, etc. Depending on the length of the table, tables are placed in the work item immediately following the tasking statement or at the end of the work item. Tables at the end of the work item receive consecutive page numbers as part of the work item. These tables must have the same header data as the body of the work item. The desired table format is attached; see Appendix I.

Any Figures that have been prepared must also be cited in Article 7.0 and be placed at the end of the work item. As with tables, figure numbers are based on the work item number, e.g. Figure 201-1, Figure 201-2, etc. Figures receive consecutive page numbers as part of the work item and must contain the same header information as the body of the work item. The desired figure format is attached; see Appendix J. Figures must be prepared using AutoCAD and must be imported into the work item file (see Section 3.2). Figures must contain the notation **"FOR GUIDANCE ONLY"** in all caps centered above the figure. Figures must also contain sufficient legends, notes, symbol lists, etc. to ensure that the figure is clearly understood.

Referencing. Always use the words: "...using Reference 2.1 as guidance" not "... in accordance with Reference 2.1", or "...as shown on Reference 2.1".

If a figure is being referenced, say "...using Figure XXX-1 as guidance."

All references, figures, and enclosures must be cited in Article 7.0.

Format. Paragraphs 7.1 through 7.5 (Arrangements/Outfitting, Structural, Mechanical/Fluids, Electrical, and Electronics) can have up to three major tasking paragraphs each, i.e. Removals, Modifications/Relocations, and Installations, always in this order. Only tasking paragraphs or paragraphs with action required shall be listed in the work item. For example, under "7.2 Structural", if there are only Installations and no Removals or Modifications/Relocations, only the Installations paragraph is listed and the paragraph title does not have a number. If two types of action are required, such as Removals and Installations, the paragraphs are numbered "7.2.1 Removals" and "7.2.2 Installations". Examples of various tasking paragraphs are as follows:

(a) One tasking paragraph (installation) with a single task:

7.0 STATEMENT OF WORK REQUIRED

7.2 Structure

Installations

Install bulkheads using Reference 2.1 as guidance.

(b) One tasking paragraph (installation) with two tasks:

7.0 STATEMENT OF WORK REQUIRED

7.2 Structure

Installations

7.2.1 Install bulkheads using Reference 2.1 as guidance.

7.2.2 Install interior and exterior doors using Reference 2.2 as guidance.

(c) Two tasking paragraphs (removals and relocations) with one or more tasks in a paragraph:

7.0 STATEMENT OF WORK REQUIRED

7.2 Structure

7.2.1 Removals

a. Remove deck coamings, railings and hatch covers using Reference 2.1 as guidance.
b. Remove vent intake covers using Reference 2.2 as guidance.

7.2.2 Relocations

Relocate Jacob's ladder on 01 Level using Reference 2.3 as guidance.

Use bullets or letters to list items in tasking statements within the tasking paragraph.

Paragraph 7.3 "Mechanical/Fluids" HVAC Required Phrasing. In work items tasking a redesign or significant modification of the existing HVAC system or the installation of a new HVAC system, the following statement is required as the first tasking statement in the Installations sub-paragraph of the Mechanical/Fluids paragraph:

The number of fire dampers shall be minimized by using heavier gauge sheet metal ducting where allowed by the regulatory bodies.

Paragraph 7.6 "Preparation of Drawings". There are three types of drawings that one deals with in work items: Contract Guidance, Working, and Selected Record. These three drawing types are defined in MSC Standrad Drawing No. 803-7080803.

Contract Guidance Drawings. Contract Guidance Drawings are provided by MSC with the work items to the bidding shipyards. They are drawings which show the work to be accomplished and are for guidance only. They disclose the basic technical information and performance requirements necessary for a Contractor to complete the detailed design required to develop and produce a working drawing.

Working Drawings. Working Drawings are developed by the shipyard so that the purchasing department can order the proper quantities of material, the regulatory bodies and MSC can approve the proposed installation, the shipyard shops can install the system, and finally, MSC can be given an as-built copy for its records. There is no intent for MSC to revise these drawings at a later date to reflect subsequent modifications to the ship.

The Contractor shall prepare Working Drawings in CAD format, scaled to Size F (.71 meter X 1.01 meter (28 in x 40 in)) in accordance with MSC Standard Drawing 7080803, necessary for accomplishing the work required by the Work Package. The level of detail (as defined in American Society of Mechanical Engineers (ASME), Y14.24M, Types and Applications of Engineering Drawings) for working drawings shall be as follows:

a. Mechanical schematic (diagrammatic) diagram.

b. Arrangement drawings

c. Detail drawings - monodetail and multidetail (composite).

d. Assembly drawings.

e. Installation drawings.

f. Modifying drawings - altered item, selected item, and modification.

g. Layout drawings.

h. Electrical/Electronic diagrams.

i. Other Schedules/Lists required to support installations and modifications - (similar to Figure 33 of Reference 2.1).

The final revision of the working drawings are "as-built" drawings and reflect the condition of all areas covered by the Work Package upon ship redelivery.

Selected Record Drawings. Selected Record Drawings (SRDs) are drawings which are ship specific and are periodically updated throughout the life of the ship so that they reflect the current ship configuration. The primary purpose of SRDs is to provide Masters, Administrative Commanders and Contract Operators of MSC Force ships an accurate description of the ship as presently configured to permit safe and efficient operation. SRDs are also used by shore personnel responsible for ship support, maintenance, and modernizations.

The SRDs typically include the general arrangement drawing with profiles, capacity plan, docking plan, machinery arrangement, HVAC diagrammatic and equipment list, electrical distribution one-line diagram, IC block diagram, tank capacity tables, fire control plan, damage control display plan, and all piping diagrams, as well as other analyses, plans and diagrams.

The MSC requirements for SRDs are stated in COMSCINST 9000.1, "Preparation, Maintenance and Distribution of Selected Record Plans and Booklets for MSC Ships (USNS)", and MSC Standard Drawing 803-7079667, "Preparation of Selected Record Drawings (SRDs) for USNS Ships".

Tasking Working Drawings in Paragraph 7.6. Use Paragraph 7.6 to task the shipyard to produce only those working drawings necessary for MSC project office personnel to ensure that the shipyard will install a fully functional installation. Do not attempt to list all of the working drawings which the shipyard might choose to develop.

If more than one drawing is tasked, use the statement, "Prepare working drawings to accomplish all work required by this item. Drawings as a minimum shall include: ", followed by a list of the necessary drawings. For example:

7.0 STATEMENT OF WORK REQUIRED

7.6 Preparation of Drawings

Prepare working drawings to accomplish all work required by this item. Drawings as a minimum shall include:

7.6.1 First Drawing

7.6.2 Second Drawing

If only a single working drawing is necessary, the drawing statement is as follows:

7.0 STATEMENT OF WORK REQUIRED

7.6 Preparation of Drawings

Prepare working drawings to accomplish all work required by this item. Drawings as a minimum shall include the Piping System Arrangement and Details working drawing.

It is important to always use the phrase "working drawings" because it invokes the appropriate CDRL. Without this phrase there is no applicable CDRL.

Do not include Selected Record Drawings (SRDs) in this paragraph unless specifically directed to do so by the Project Engineer. MSC may need to obtain a shipbuilder-produced drawing which is an SRD sooner than they will get the SRDs. If so, the drawing must be stated as a work item deliverable in Paragraph 7.6.

If there are no specific working drawing requirements, follow the title with "None additional".

Paragraph 7.7 "Inspection/Testing". If there are specific test requirements and/or acceptance criteria above and beyond the applicable regulatory body requirements, state them here, e.g. NDT, proof tests, megger tests, cleaning, flushing, etc. Usually MSC will require at least an operational test of the system. Do not say "perform" the tests. Just list the appropriate tests as they are titled in the GTR. Do not say "Operational test of all new and modified systems". Just list "Operational test". It is implied that the tests are for the new and modified systems.

Do not list tests required for regulatory body approval.

If both Inspections and Tests are required, use the following format:

7.0 STATEMENT OF WORK REQUIRED

7.7 Inspection/Test

7.7.1 Inspections

a.

b.

7.7.2 Tests

a.
b.

If there are no inspection or testing requirements, follow the title with "None additional".

Paragraph 7.8 "Painting". The standard words for painting are: "Paint all new and modified surfaces to match surrounding surfaces." This should appear word for word in virtually all work items.

If there are special requirements for painting, they should be called out here, e.g. requirements for specialty coating systems such as flame spray, Devcon, etc.

For exterior paint, MSC has a painting contractor who will provide the paint as GFM. Therefore, an estimate of the required coverage in square feet must be provided to the MSC TPOC who will get the paint contractor to provide information on the type and quantity of paint he will supply. This paint type and quantity must be listed as GFM in Article 4.0. Paint for other special applications, such as potable water and MSD tanks, may also be specified as GFM. When providing paint as GFM, a specific tasking statement is required and is shown in the example below as Paragraph 7.8.2:

7.0 STATEMENT OF WORK REQUIRED

7.8 Painting

7.8.1 Paint all new and disturbed surfaces to match surrounding surfaces.

7.8.2 Blast to near white and paint all new exterior surfaces with the following approved paint system, as provided in paragraph 4.2:

- Dimetcote D9FT (Primer) - 1 coat at 3 mils DFT
- Amercoat 385 (Midcoat) - 1 coat at 5 mils DFT
- Amershield (Topcoat) - 1 coat at 3 mils DFT

If there are no painting requirements, follow the title with "None additional".

Paragraph 7.9 "Marking". Virtually all work items should include the following standard words for markings: "Install name plates, notices, and markings for all new and modified systems (or areas)." This statement will also obtain cable tags.

List any additional special label, hazard, and warning plates or markings here.

If there are no marking requirements, follow the title with "None additional".

Paragraph 7.10 "Manufacturer's Representative". If a manufacturer's representative (or authorized technical representative) is to be provided and paid for by the Government, this must be clearly stated here, along with the type of assistance to be provided and the representative's responsibilities. Government Furnished Services must also be specified in Article 4.0.

When a contractor furnished manufacturer's representative (or authorized technical representative) is considered necessary for the shipyard to effect a fully functional installation, use words similar to: "Provide the services of a manufacturer's representative (or authorized technical representative) during installation, testing and sea trials."

Always use the term "authorized" when requiring a technical representative but never for a manufacturer's representative. A manufacturer's representative is authorized by definition since he or she is an employee of the manufacturer and use of the term "authorized" is redundant. A technical representative, on the other hand, is independent from the manufacturer and is not an employee of the manufacturer. Therefore, if the services of a technical representative are required, it is very important that the "tech rep" be authorized by the manufacturer to represent him in order to ensure the proper qualifications. If the term "authorized technical representative" is not used, the necessary qualifications for any contractor furnished (CF) tech rep must be provided.

Sources for CF tech reps must also be provided. Required services must be quantified, along with the required duration, e.g. pierside testing, sea trials, etc., so that they can be bid. Support for the installation and testing of a particular system sufficiently quantifies the required support. If the required services cannot be quantified, estimate the required hours and use words like "Provide 600 hours of service from an authorized technical representative." State that CF tech rep reports shall be submitted to the MSCREP.

If there are no manufacturer's or technical representative requirements, follow the title with "None".

- **8.0 GENERAL REQUIREMENTS**

Put any additional design or special requirements in this article. These requirements would be above and beyond those invoked for the entire package through the "000" items containing the general requirements. If there are no special requirements for this article, then the title shall be followed by "None additional".

APPENDIX A

MSC DEFINITIONS

1. Administrative Contracting Officer - identifies the MSC Contracting officer at the Contractor's facility.

2. Article - means a separately numbered part of a work item of the Work Package. Articles in different items may bear the same number; hence, to identify an article completely, the item of which it is a part must be specified.

3. As-original - means a condition meeting the original system and manufacturer's design.

4. CFE and CFM - identify Contractor Furnished Equipment and Material and are used interchangeably.

5. COMSC - identifies the Commander, Military Sealift Command.

6. COMSCLANT or COMSCPAC - identifies the Area Commander, Military Sealift Command, Atlantic or Pacific.

7. Contracting Officer - identifies the Commanding Officer Military Sealift Command, Central Technical Activity.

8. Contractor - identifies the shipyard holding the prime contract for the work specified in the Work Package.

9. Delivery. The term "delivery" is the correct contractual term for the point in time when the Contractor accepts the ship into his custody. The point where the ship is "delivered" is stated in the Delivery, Care, Redelivery item as it is dependent on steaming, towing, etc.

10. Detach or Disconnect - means to disconnect attachments to the unit to enable the unit to be moved. Attachment points shall be tagged, identified, blanked, and protected to facilitate reinstallation. Work items do not necessarily identify interferences, and the Contractor is responsible for the identification and resolution of interferences affecting a detachment and subsequent movement.

11. Extend - See "install" definition below.

12. General Technical Requirements (GTRs) - defines the standards of performance for work being performed by Contractors.

13. GFE and GFM - Identify Government Furnished Equipment and Material and are used interchangeably.

14. Install, Extend, and Modify - mean that the Contractor shall provide the piece of equipment, material, or system to be installed and shall provide the materials, structural supports, and labor to attach, connect, and test the equipment or system to effect a finished fully operational installation complete in all aspects.

a. When new material or equipment is not specified by type, the material or equipment shall be identical to the existing. When "install" is used with reference to GFE, all conditions of the above definition except the requirement to provide the piece of equipment are applicable.

b. Work items do not necessarily identify interferences and the Contractor is responsible for the identification and resolution of interferences affecting the installation by temporarily removing, reinstalling, or relocating interferences. The Contractor shall temporarily remove, permanently relocate, alter, and reroute all interferences, including, but not limited to, ductwork, piping, wireways, fixtures, insulation, joiner linings, equipment, furniture, etc., to facilitate finished fully operational installations and modifications covered by the Work Package. In the event that piping, ductwork, equipment, linings, etc. must be temporarily removed to facilitate installation of new or modified work, the Contractor shall subsequently reinstall same in an "as original" condition. This includes but is not limited to painting of steel, restoring floor coverings and joiner work, painting, replacing items and equipment removed for access, plugging wiring and pipe penetrations, and restoring all other disturbed areas to match the surrounding areas. Disturbed coatings shall be repaired.

15. Interference - means any objects(s), equipment(s), or component(s) that must be temporarily removed and reinstalled, relocated, modified, or designed around to facilitate the installation of new or modified equipment or systems.

16. Labor and Materials - means labor, materials, plant facilities, supervision services, equipment, and any other resources required to accomplish the specified work.

17. Manifests - are the official shipping document forms originated and signed by the generators, transporters, and operators of the hazardous waste disposal facility as required by Federal, state, or local regulations.

18. MSC Drawing - means Contract Guidance Drawing.

19. MSC Representative (MSCREP) - identifies the technical representative of the MSC Contracting Officer at the contractor's facility.

20. MSCREP approval - indicates only that the general method of construction and detailing as presented by the Contractor appear to be satisfactory and will not relieve the Contractor of the responsibility of any error.

21. Modify - See "Install" definition.

22. None additional or None - means that there are no additional requirements beyond those contained in the GTRs and Work Items 001 to 099. Where specific requirements are set forth in Articles 6.0, 7.0 or 8.0 of a work item, such requirements are in addition to those requirements listed in the GTRs and Work Items 001 to 099.

23. Or equal - means that components or equipment shall be equivalent in terms of performance (flow rate, pressure, heat transfer characteristics, etc.), services required (power, cooling water, HVAC, etc.), compatibility with interrelated systems and arrangements, and supportability over the service life of the components or equipment. In the case of component or equipment substitution for those components or equipment noted on the Contract Guidance Drawings or in the Work Package, the Contractor shall submit a written request delineating the design and performance data on both the specified and substituted piece of equipment for MSCREP approval and if approved, the Contractor shall take full contractual and technical responsibility for ensuring installation of components or equipment or both and compatibility with the interrelated systems.

24. Redelivery. The term "redelivery" means the point in time that the Master/MSCREP accepts the ship back from the Contractor by signing the DD 250.

25. Refurbish - means to temporarily remove, disassemble, clean, inspect, and submit an as-found condition report; further, upon approval of the MSCREP, the contractor shall lubricate, reassemble the unit, equipment or system, set and adjust in accordance with manufacturer's specifications, test the unit, equipment, or system to demonstrate proper function to the manufacturer's specifications, and submit an as-released condition report. The reinstalled refurbished unit, equipment, or system shall be fully operational and complete in all aspects. New screws, bolts, nuts, washers, gaskets, packing, pins, keys, "o"-rings, and shims shall be used when reassembling and reinstalling the unit, equipment or system. Additional information concerning the location of equipment refurbishment, special processes to be used in the refurbishment, and additional parts to be replaced during refurbishment shall be as specified in the individual work items.

26. Reinstall - means that the Contractor shall provide labor and material to install a piece of equipment, material, or system after the equipment, material, or system was temporarily removed, relocated, modified, or refurbished. The requirements of an installation as set forth in paragraphs 14., 14.a, and 14.b above with regard to completeness, operation, testing, the identification and resolution of interferences, etc. also apply to a reinstallation.

27. Relocate - means to provide labor and materials to detach the unit, equipment, or system and to reinstall the same unit, equipment, or system at a new or modified location. The requirements of an installation as set forth in paragraphs 14, 14.a, and 14.b above with regard to completeness, operation, testing, the identification and resolution of interferences, etc. also apply to a relocation.

28. Remove or Ripout - means to provide labor and materials to disconnect, detach, and transfer the unit, equipment, materials, or system in its entirety off the ship as specified in the GTR. Supports, stuffing tubes, collars, and other appurtenances shall be removed by burning, chipping, or cutting when a Work Item requires machinery, piping, wiring, ducting, structure, outfitting, joiner, or equipment removal. Areas effected by removals/ripouts shall be restored as set forth in paragraph 14.b.

a. When the Work Package requires the removal of machinery, piping, wiring, ducting, structure, outfitting, joiner, or equipment removal, supports, stuffing tubes, collars, or other appurtenances by burning, chipping, or cutting, stubs, rough spots, and other surface irregularities shall be ground smooth and flush with adjacent surfaces. Once tasked work in the affected area is complete, the areas affected by the removal shall be restored to the condition before the removal action. This includes but is not limited to painting of steel, restoring floor coverings and joiner work, painting, replacing items and equipment removed for access, plugging wiring and pipe penetrations, and restoring all other disturbed areas to match the surrounding areas. Disturbed coatings shall be repaired to match the surrounding area.

b. After removing the machinery, piping, wiring, ducting, structure, outfitting, joiner, or equipment removal, supports, stuffing tubes, collars, or other appurtenances, watertight and firezone boundaries shall be reestablished. Holes in oil tight, watertight, and gas tight boundaries and structural bulkheads shall be blanked with flush inserts providing structural integrity and tightness equal to that which they replace.

Holes in non-structural steel and steel joiner bulkheads may be blanked with lapped plates.

c. When the electrical wiring requiring removal joins a circuit not being removed (i.e. at a junction box), the electrical wiring or cable shall be entirely removed to the junction point. All other attachments including but not limited to fasteners, supports, and brackets shall be entirely removed. When electric cable is designated for removal, it shall be physically and electrically traced to the power source and the circuit deenergized before removing the cable. When cable is removed from multiple cable runs, the remaining cables shall be bound and strapped.

29. Replace or Renew - means to remove the unit, equipment, or systems including interferences, and to install a new unit, equipment, or system which is either identical to or equal to that which was removed; the installation shall include but not be limited to any hook-ups, supports, and adapters which are required to effect a finished fully operational installation complete in all aspects.

30. Restore - means to perform those processes (i.e. weld build-up, chrome plate, machine, grind, lap, non-destructive test, etc.) which are required to return a component to the manufacturer's specifications regarding dimensions, tolerances, angles, surface finish, and clearances.

31. Section - means a major part of the Work Package and shall include a group of related work items.

32. Specification - means either a single work item or a complete set of work items.

33. Tag out - means a procedure to both notify personnel that tagged-out equipment, components, or systems are either isolated or not in a normal operating condition and to prevent injury to personnel, improper operation, or damage to the tagged-out equipment, components, or systems.

34. Temporary Installation or Temporarily Install - means to provide labor and materials to install the unit, material, equipment or system to completely provide the function described in the individual Work Item, and to remove the same unit, material, equipment or system prior to redelivery of vessel or as required to satisfactorily meet the requirements of the individual Work Item. All of the requirements of an installation and a removal set forth in paragraphs 14, 14.a, 14.b and 28 above with regard to completeness, operation, testing, the identification and resolution of interferences, disconnection, detachment and transfer of the unit, material, equipment or system in its entirety off the ship as specified in the GTR apply to a temporary installation and subsequent removal.

35. Temporary Removal or Temporarily Remove - mean to provide labor and materials to disconnect and move the unit, equipment, or system from its initial location, and to reinstall the same unit, equipment, or system either in the same location or elsewhere on the ship as described in the Work Package. All the requirements of an installation as set forth in paragraphs 14, 14.a, and 14.b above with regard to completeness, operation, testing, the identification and resolution of interferences, etc. also apply to a temporary removal and reinstallation.

36. Work item or item - means a separately numbered part of the Work Package describing a discrete portion of the work to be accomplished.

37. Work Package - means the entire written portion of the contract including the Master Ship Repair Agreement, the contract provisions, work items, and the GTRs.

TECHNICAL DOCUMENTATION DELIVERABLE - QUALITY CONTROL ROUTE SHEET

CUSTOMER _____ **CONTRACT NO.** _____ **SHIP** _____

TPOC _____ **TASK NO.** _____

DOCUMENT NO. _____ **TITLE** _____ **REV.** _____

SCHEDULED DUE DATE _____ **URGENT**

CALCULATION **REPORT** **STUDY** **TRANSALT REQUEST** **WORK ITEM**

WORK PACKAGE **TECHNICAL MANUAL** **OTHER** _____

DISK NO. _____

FUNCTIONAL RESPONSIBILITY	PREL. DRAFT INITIALS DATE	REVIEW COPY INITIALS DATE	FINAL COPY INITIALS DATE	COMMENTS
1. ORIGINATOR				
2. WORD PROCESSING				
3. TECHNICAL EDITOR				
4. COG. ENGINEER				
5. SR. ENGINEER				
6. SUP. ENG.-NAVARCH				
7 SUP. ENG.-MAR. ENG				
8 SUP. ENG.-ELEC/ELEX				
9. MANAGER				
10. DIRECTOR				

11. SKETCHES TABLES NOTES
PROJECT ENGINEER _____
ACCEPTABLE FOR DELIVERY

12. COPIES DELIVERY LETTER
ADMINISTRATIVE ASST. _____
COMPLETE FOR DELIVERY

13. PROGRAM MANAGER
ASST. PROG. MANAGER _____
APPROVED FOR DELIVERY

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	DELIVERABLE QUALITY RECORD
	WORK ITEM FORMAT & GUIDELINES CHECKLIST
	PROJECT:_____ SUPRV. ENGINEER:_____
PAGE 1 OF	CUSTOMER:_____ ORIGINATOR:_____

TITLE OF DELIVERABLE:_____ JOB NO.:_____
DOCUMENT NO.:_____ ISSUE DATE:_____

ACTIVITY	ATTRIBUTE/ACCEPTANCE CRITERIA	Y/N	COG. ENG.	TECH EDITOR	REMARKS
FORMAT COMPLIANCE	Structure of document agrees with Work Item Preparation Guidelines or customer directed format.				
EDIT	Document edited for grammar, sentence structure and typos. No grammar errors.				
SPELLCHECK	Spellcheck performed; no misspellings.				
TECHNICAL CHECK	Reviewed for technical content and accuracy against job plan/task order/regulatory body requirements. DEFINITIONS - Intent of MSC/GTR definitions for install, remove, modify, replace, relocate, etc., followed BIDDABLE - Is the scope of work clear, unambiguous and succinct? Does Work Item state what has to be done? Are quantities clear (e.g. one system, two systems)? Can description of work be interpreted in only one way? Does Work Item text include too many words for work clearly shown on referenced drawings and figures? CONSISTENT - Is Work Item text consistent within itself and with reference to drawings and figures? For tasks with multiple Work Items, are the approach, wording and level of detail for each Work Item similar? Producible - Can the work required by the Work Item be produced with typical shipyard practices and marine grade materials and equipment? Defendable - Can the Work Item and its references be defended against a shipyard claim? Equipment -/System Salient Features - Are the salient features of equipment and systems identified (even when make/ model is identified) to support equivalency requests? Design - Requirements - List ABS/USCG system requirements reviewed and GTRs checked during work item preparation.				

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DELIVERABLE QUALITY RECORD

WORK ITEM FORMAT & GUIDELINES CHECKLIST

PAGE 2 OF

PROJECT:_____ SUPRV. ENGINEER:_____

CUSTOMER:_____ ORIGINATOR:_____

TITLE OF DELIVERABLE:_____ JOB NO.:_____

DOCUMENT NO.:_____ ISSUE DATE:_____

ACTIVITY	ATTRIBUTE/ACCEPTANCE CRITERIA	Y/N	COG. ENG.	TECH EDITOR	REMARKS
ELEMENT CHECK	Contains all required Work Item elements. HEADER - All header items included on all pages 1.0 ABSTRACT 2.0 REFERENCES 3.0 ITEM LOCATION/DESCRIPTION 3.1 LOCATION/QUANTITY 3.1.1 LOCATION 3.1.2 QUANTITY 3.2 ITEM DESCRIPTION/MANUFACTURER'S DATA 4.0 GOVERNMENT FURNISHED EQUIPMENT/MATERIAL/SERVICES 5.0 NOTES 6.0 QUALITY ASSURANCE REQUIREMENTS 7.0 STATEMENT OF WORK REQUIRED 7.1 ARRANGEMENTS/OUTFITTING 7.2 STRUCTURAL 7.3 MECHANICAL/FLUID 7.4 ELECTRICAL 7.5 ELECTRONICS 7.6 PREPARATION OF DRAWINGS 7.7 INSPECTION TEST 7.8 PAINTING 7.9 MARKING 7.10 MANUFACTURER'S REPRESENTATIVE 8.0 GENERAL REQUIREMENT PAGE NUMBERS - OF THE FORM XXX-1 INCLUDED ON ALL PAGES INCLUDING FIGURES AND TABLES				
SCHEDULE	Delivered on schedule: Preliminary_____ Final_____				
GRAPHICS CHECK	Quality of graphics verified, meets customer's requirements. Graphics/Figures imported to Work Item file.				
REFERENCE CHECK	Internal cross references and reference to other documents correct. Is each reference absolutely necessary for shipyard to bid the job? All references available to deliver with Work Item.				
PRELIMINARY STAMP	All sheets of preliminary Work Item and drawings stamped with MSC stamp.				
REG BODY REVIEW	Submit to Reg Bodies for review.				

CHECKED BY: _____ DATE: _____
PROJECT ENGINEER

QUALITY DEPUTY: _____ DATE: _____
PROGRAM MANAGER

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MSC Alternate Format for Work Items - Repair Contracts Only:

(Ship's Name)
(Hull Designation)

(SECTION TITLE) (1) Specification No.
(Date)

ITEM NO. (2) Category (3) (4) / (5) / (6)
(7)

1.0 ABSTRACT

1.1 (8)

2.0 REFERENCES/ENCLOSURES

2.1 (9)

3.0 ITEM LOCATION/DESCRIPTION

3.1 Location/Quantity (10)
3.2 Item Description/Manufacturer's Data (11)

4.0 GOVERNMENT FURNISHED EQUIPMENT/MATERIAL/SERVICES

4.1 Government Furnished Equipment (GFE) (12)
4.2 Government Furnished Material (GFM) (12)
4.3 Government Furnished Services (GFS) (12)
4.4 Government Furnished Information (GFI) (12)

5.0 NOTES (13)

6.0 QUALITY ASSURANCE REQUIREMENTS

6.1 Material Requirements (14)
6.2 Qualification/Process Requirements (15)
6.3 Inspection/Test Requirements (16)

7.0 STATEMENT OF WORK REQUIRED (17)

7.1 Arrangements/Outfitting (18)
7.2 Structural (18)
7.3 Mechanical/Fluids (18)
7.4 Electrical (18)
7.5 Electronics (18)
7.6 Preparation of Drawings (19)
7.7 Inspection/Test (20)
7.8 Painting (21)
7.9 Marking (22)
7.10 Manufacturer's Representative (23)
7.11 Etc. as necessary

8.0 GENERAL REQUIREMENTS (24)
1.0 ABSTRACT

(Item No. - Sheet No.)
Numbers in ( ) refer to notes on the following pages

MSC Alternate Format for Work Items - Repair Contracts Only:

(Ship's Name)
(Hull Designation)

(SECTION TITLE) (1) Specification No. (Date)

ITEM NO. (2) Category (3) (4) / (5) / (6)

(7)

1.1 (8)

2.0 REFERENCES

2.1 (9)

3.0 ITEM LOCATION/DESCRIPTION

3.1 Location/Quantity (10)
3.2 Item Description/Manufacturer's Data (11)

4.0 GOVERNMENT FURNISHED EQUIPMENT/MATERIAL/SERVICES

4.1 Government Furnished Equipment (GFE) (12)
4.2 Government Furnished Material (GFM) (12)
4.3 Government Furnished Services (GFS) (12)
4.4 Government Furnished Information (GFI) (12)

5.0 NOTES (13)

6.0 QUALITY ASSURANCE REQUIREMENTS

Refer to Article 7.0

7.0 STATEMENT OF WORK REQUIRED (17)

(NOTE: When the alternate format is used for repair Work Items, this article is to be written in a time- phased sequence. The last two items in this article are to be entitled Manufacturer's Representative and Preparation of Drawings; if neither is required, enter "None".)

8.0 GENERAL REQUIREMENTS (24)

NOTES

(1) Section Title from MSC Standard Work Package Index Sections (e.g., HULL STRUCTURE)

(2) x01 to x99 of any section; Obtain the x number from the Standard Work Package Index (e.g., HULL STRUCTURE is 100. Pumps are found in Section 500, MACHINERY, AUXILIARY SYSTEMS of the Index, etc.)

(3) Indicate category "A" or "B"

(4) Preparing Activity (e.g., AME, Raytheon, MSCLANT)

(5) Preparer's name

(6) Project/Port Engineer's initials

(7) Title of discrete task (e.g., Modify Living Spaces 03 Level, Relocate Entertainment System (TransAlt T-AO-428), or Repair Main Feed Pump). Indicate, when applicable, TransAlt No., V/R, CASREP, sponsor request, etc., in the title

(8) Provide a brief overview of what is to be done, identifying the purpose or objective of the work item. Do not use "intent" in the text.

(9) List the primary drawings, specifications, manuals and other documents necessary for doing the work (e.g., a. Drawing, T-AO (STD)-570-4840203, "Fueling at Sea Stations - Arr & Dets"). Listed references must be addressed in the body of the item; do not list any reference which is not cited elsewhere in the work item; do not repeat herein references which are cited in the references listed (e.g., the references which are listed on referenced drawing T-AO (STD)-570-4840203, "Fueling at Sea Stations - Arr & Dets", would not be added to the list of references herein). If none, enter "None".

(10) a. Identify the location in Vessel where the work will be performed (deck, compartment number, frame, port or starboard, etc.).

b. Identify the number of units, compartments, extent of system, etc. involved. Having an established location for the numbers involved will assist many people who need to know the extent of the work package without having to search for it.

This section is intended to further identify which equipment is to be repaired/overhauled (e.g., Cargo pumps No. 1, No. 3, No. 4, No. 6).

(11) Provide any pertinent data to describe the equipment being worked (e.g., MFR, model, size, capacity, CID, etc.). If none, enter "None". This section may be used as bill of material.

(12) List equipment, material, and services to be supplied by the Government. If none, enter "None".

(13) Include pertinent explanatory information that does not lend itself to inclusion in the General Requirements Section. Notes shall not place a work requirement on the Contractor.

(14) Specify requirements for certification of material called out in Article 7.0 (e.g., "Contractor shall provide written certification that material used in salt water piping system is 70-30 CuNi.").

MSC Alternate Format for Work Items - Repair Contracts Only:

(15) Specify exceptional requirements for personnel qualifications (e.g., welder's qualifications) which are beyond those detailed in the General Technical Requirement.

(16) Specify requirements for conducting/reporting inspections and tests; identify and refer to test/inspection procedures/requirements/acceptance criteria established by regulatory bodies (e.g., "Tests shall be conducted in accordance with written procedure previously approved by MSC representative.").

(17) All work to be accomplished under this Work Package item must be addressed within Article 7.0 STATEMENT OF WORK. Other sections of the item contain general requirements, performance standards, and notes, but no work statements. Articles 6.0, 7.0 and 8.0 contain Contractor requirements; all other sections contain information and guidance to assist the Contractor, but the Contractor is not bound by them.

(18) Specify work to be accomplished. A normal logical time sequence within the trade or component is to be used.

(19) List drawings to be deleted, marked up, updated or new drawings to be prepared.

(20) Specify inspections and tests to be performed, when they are to be performed, who shall be notified to witness, etc.

(21) Specify any painting to be performed.

(22) Specify any marking and labeling to be performed.

(23) Indicate if manufacturer's representative is required, what will be expected from him, who is to pay for his services, etc.

(24) Since the MSC General Technical Requirements (GTR) are to be invoked in the first work item of every Work Package, this section is to be used only when a technical requirement is not covered in the GTR. Do not repeat requirements identified elsewhere in the work item or conditions addressed in the Master Agreement for Repair and Alteration of Vessels (i.e., firewatch, cleanliness, paint touch-up).

MSC Standard Format for Work Items

GENERAL NOTES (the following instructions apply for all Work Package items):

- All eight (8) categories shall be listed for each Work Package item. Where information or data is not applicable to a particular category, the word "None" shall be entered under that category.
- Information or data for categories 1.0, 3.1, and 7.0, is mandatory for all Work Package items.
- The heading, down to and including Item Title, shall be included on each page of the Work Package item.
- Pages shall be numbered at the bottom center of the page using item number-sheet number format (e.g., 402-1, 402-2, 402-3, 403-1).

Alternate Format For Work Package

The procedures described above organize the work requirements according to shops or technical areas and will generally be used when developing MSC Work Package items. When developing work items for a repair contract, however, the Preparing Activity may select to organize the work requirements according to a time-phased sequence. The time-phased approach shall not be used for major alterations or installations. Selection of this option (for repair contracts only) will result in the following modifications to the procedures outlined above:

- Article 6.0 QUALITY ASSURANCE REQUIREMENTS

  These may be incorporated under Article 7.0 of the work item. In this case, "Refer to Article 7.0" should be entered.

- Article 7.0 STATEMENT OF WORK REQUIRED

  The subsections shall follow the natural order of work to be performed (e.g., 7.1 Disconnect Piping; 7.2 Removal to Shop; 7.3 Inspection; 7.4 Repair; 7.5 Installations; 7.6 Painting; 7.7 Testing). the last two items of Article 7.0 shall be Manufacturer's Representative and Preparation of Drawings; if the repair contract will not require the assistance of a manufacturer's representative or the preparation of drawings, "None" shall be entered under these last two items. Note that the subsections of Article 7.0 are renumbered when using the time-phased approach for repair.

MSC Alternate Format for Work Items - Repair Contracts Only:

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MSC STANDARD WORK PACKAGE INDEX

Section	Title
000	GENERAL REQUIREMENTS

a. ADMINISTRATIVE

1. Intent, Scope and General Definitions
2. General and Administrative
3. General Services for MSCREP
4. General Services for Ship
5. Weight Estimates
6. FIre Protection and Ship's Safety

b. PLANNING AND CONTROL REQUIREMENTS

1. Networks, Schedules and Progress Reports
2. Materials Purchase and Control Requirements
3. Inspection System Requirements

c. DOCUMENTATION REQUIREMENTS

1. Drawings, Drawing Approval and Distribution and Drawings Aboard Ship
2. Selected Record Plans
3. List of Contract Guidance Drawings and Reference Materials
4. Photographs
5. System and General Technical Manual Requirements

d. SUBCONTRACTOR AND SUPPLIER REQUIREMENTS

1. Manufacturer's Representatives
2. Vendor Drawings
3. Spare Parts

e. GENERAL WORK REQUIREMENTS

1. Receipt, Care and Handling of Government Furnished Material
2. Delivery, Care and Redelivery of the Ship
3. Emptying, Cleaning and Gas Freeing of Tanks and Spaces
4. Hazardous Waste Removal
5. Contamination Prevention During Shipyard Period

f. TESTING REQUIREMENTS

1. Stability Tests
2. Dock Trials
3. Sea Trials
4. Sponsor Equipment Tests
5. Helicopter Platform Test

MSC STANDARD WORK PACKAGE INDEX

Section	Title
100	HULL STRUCTURE
	a. Shell Plating, But Not Including Underwater/Drydock Items
	b. Longitudinal and Transverse Framings
	c. Structural Bulkheads
	d. Deck and Platform Platings
	e. Inner Bottom
	f. Trunks and Enclosures
	g. Superstructure
	h. Tanks: Ballast, Fuel Oil, Lube Oil, Feed Water, Potable Water and Cargo
	i. Cofferdams and Voids
	j. Doors, Hatches, Manholes and Scuttles
	k. Kingposts and Support Frames
	l. Masts, Towers, Tetrapods and Service Platforms
	m. Compartment and Tank Testing
	n. Foundations For Machinery
	o. Cargo Holds
	p. Hatch Covers
	q. Topside Painting
200	MACHINERY, PROPULSION
	a. Main Boilers, Including Mountings
	b. Main Engines, includes components installed to deliver propulsive power to the ship, such as Steam Turbines, Diesel Engines, Gas Engines/Turbines, Main Propulsion Generators and Motors and Main Reduction Gears
	c. Main Condensers, Air Ejectors and Coolers/Heat Exchangers
	d. Shafting And Bearings, but not including Drydock Items
	e. Propulsion Control Systems, including Automation
	f. Combustion Controls, Steam Plant
	g. Main Steam Systems, Steam Plant
	h. Feed Water And Condensate System, Steam Plant
	i. Main Circulating & Cooling Water System, Both Steam and Diesel Plant
	j. F.O. Service Systems, Both Steam and Diesel Plant
	k. Lubricating Oil System, Both Steam and Diesel Plant
300	ELECTRICAL
	a. Electrical Power Generation, includes Ship Service, Emergency and Unrep Generators Electrical End
	b. Power Distribution Switchboards
	c. Power Distribution System (Cable)
	d. Lighting System (Distribution and Fixtures)

MSC STANDARD WORK PACKAGE INDEX

Section	Title

e. Ship's Electric Equipment, including all Electrical Items
f. Electric Motors and Controllers
g. Power Generation Support Systems

1. Lube Oil
2. Diesel Support Systems
3. Turbine Support Systems
4. Operating Fluids
5. Spare Parts

400 COMMUNICATION AND NAVIGATIONAL AIDS

a. Navigation Equipment (Non-Electric)
b. Radar Systems

1. Surface Search Radar
2. Air Search Radar (2D)
3. Air Search Radar (3D)
4. Aircraft Control Approach Radar
5. Identification Systems (IFF)
6. Multiple Mode/Function Radar
7. Space Vehicle Electronic Tracking

c. Radio Communication System

1. Radio Frequency Transmission Lines
2. Antenna Requirements
3. Grounding and Bonding
4. Electromagnetic Interference Reduction (EMI)
5. System Test Requirements

d. Electronic Navigation System

1. Electrical Navigation Aids (includes Navigation Lights)
2. Electronic Navigation Systems, Radio
3. Electronic Navigation Systems, Acoustical
4. Electrical Navigation Systems
5. Inertial Navigation Systems
6. Navigation Control Monitoring

e. Interior Communications

1. Sound-Powered Phone
2. Switchboards for I.C. Systems
3. Telephone Systems
4. Announcing Systems

MSC STANDARD WORK PACKAGE INDEX

Section	Title

5. Entertainment and Training Systems
6. Voice Tubes and Message Passing Systems
7. Alarm, Safety and Warning Systems
8. Indicating, Order and Metering Systems
9. Integrated Control Systems
10. Recording and Television Systems

f. Exterior Communications

1. Underwater Systems
2. Visual and Audible Systems
3. Telemetry Systems
4. TTY and Facsimile Systems
5. Security Equipment Systems

g. Sonar Systems

500 Machinery, Auxiliary Systems

a. Auxiliary Machine in Engine Room includes Auxiliary Steam Turbines, Auxiliary Engines, Pumps and Auxiliary Equipment
b. Refrigeration, Plant and Equipment for Domestic Use
c. Firemain, Flushing, Sprinklers, Washdown, and Salt Water Service Systems
d. Fire Fighting Equipment
e. Fire Extinguishing Systems
f. Drainage System
g. Fresh Water System
h. Reefer Deck Vans
i. Compressors, Refrig Lines, Condensers, Receivers
j. Defrosting Systems
k. Scuppers and Deck Drains
l. Fuel Oil Filling, Venting Stowage and Transfer Systems
m. Tank Heating System
n. Compressed Air System
o. Auxiliary Steam, Exhaust Steam, And Steam Drains
p. Distilling Plant
q. Steering System
r. Cargo Pumps, External To Engine Room
s. Elevators, Dumbwaiters
t. Ship Stores And Equipment Handling Systems
u. Cargo Handling Systems
v. Vehicle Handling And Stowage Systems
w. Mechanical Handling Systems
x. Anchor Handling And Stowage System
y. Mooring And Towing Systems
z. Environmental Pollution Control Systems

MSC STANDARD WORK PACKAGE INDEX

Section	Title
	aa. LO Transfer, Fill And Purifying
600	Outfit, Furnishings and Habitability
	a. Hull Fittings
	b. Boats, Boat Stowage and Handling (Zodiak, Monark, Whaleboat, but not Lifeboat)
	c. Boats, Boat Handling and Stowage Systems
	1. Lifeboat, Davits, Testing of
	2. Liferafts
	d. Rigging and Canvas
	e. Ladders And Gratings
	f. Interior Painting
	g. Deck Covering (Tile, Carpeting, Terrazo, Rubber)
	h. Deck Insulation
	i. Storerooms, Stowages, and Lockers
	j. Equipment for Utility Spaces
	k. Equipment for Workshops, Laboratories and Test Areas
	l. Equipment For Galley, Pantry, Scullery, and Commissary Outfit (Excluding Hoods)
	m. Furnishing for Living Spaces
	n. Furnishing for Offices, Control Centers, and Machinery Spaces
	o. Furbishing for Medical, Dental and Pharmaceutical Spaces
700	Sponsor Equipment
	a. Special Purpose Systems
	b. Scientific and Ocean Engineering Systems
	c. Swimmer and Diver Support and Protection Systems
800	Heating, Ventilation And Air Conditioning
	a. Heating System - Convectors, Steam Traps, Orifice Plates, Duct Heaters, Steam Supply and Return Lines
	b. Ventilation Systems - All Supply and Exhaust Systems including Fans, Dampers, Hoods, Goosenecks, Ducts, Laundry Dryer Lint Trap
	c. Air Conditioning - All Air Conditioning Equipment including Cooling Coils (Ducts), Chilled Water Pumps, Compressors, Condensers, Refrigerant Lines, Self Contained Units

MSC STANDARD WORK PACKAGE INDEX

Section	Title
900	Drydocking And Undocking
	a Section 000 Should Be Attached If This Section Is To Stand Alone
	b. Underwater Hull Painting
	c. Fathometer Work
	d. Sea Valves
	e. Sea Chests
	f. Propellers
	g. Rudders
	h. Hull Cathodic Protection
	i. All Other Items Requiring Drydocking
1000	Unrep Gear
	A. Unrep Gear - Hydraulic Pumps and Motors, Winches (Steam Elect. and Elect/Hydr), Sliding Pad Eyes, Control Stations and Light Boxes

USNS MSCSUPPLY
(T-AEFS 1)

MACHINERY, AUXILIARY SYSTEMS **RFP NO. N62387-96-R-0001**
1 October 1996
ITEM NO. 501 **Category "A"** **JJMA/O'BEAUTON/SSF**

OVERFLOW, VENT AND FUEL OIL TANK REGULATOR VALVE MODS (ABS)

1.0 ABSTRACT

This item describes modification of the overflows and vents from fuel oil , JP-5, reserve feed, void and oily waste tanks and modification of steam regulating valves for fuel oil tank heating elements.

2.0 REFERENCES/ENCLOSURES

2.1 References

2.1.1 MSC Drawing No. T-AEFS 1 506-6970247, Overflow and Vent Mods Diagram

2.1.2 MSC Drawing No. T-AEFS 1 436-6970231, EOS Alarm System Installation BWD

2.2 Enclosures

2.2.1 Enclosure 501-1, Overflow, Vent and Steam Regulating Valve Modification Checklist

3.0 ITEM LOCATION/DESCRIPTION

3.1 Location/Quantity

3.1.1 Locations: Various

3.1.2 Quantity: None

3.2 Item Description/Manufacturer's Data

3.2.1 Bill of Materials

PC No.	QTY	Description
1	12	Steam temperature regulating valve, 2 in. and below
2	120 ft.	Piping, 2 in. and below, NPS ASTM A53 Sched 40 Galvanized

USNS MSCSUPPLY
(T-AEFS 1)

MACHINERY, AUXILIARY SYSTEMS **RFP NO. N62387-96-R-0001**
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OVERFLOW, VENT AND FUEL OIL TANK REGULATOR VALVE MODS (ABS)

3	24	Valve, globe 2 in. and below
4	300 ft.	Piping, 1-1/2 inch NPS Carbon steel ASTM A53 Sched 40 Galvanized
5	100 ft.	Tubing 1-1/2 inch CU-NI 90-10 ASME SB466
6	3	Flow Switch, paddle type, 316 SS construction
7	As Req'ed	Insulation and Lagging
8	1	Level Switch, 316 SS material for wetted parts

3.2.2 Quantities are considered estimates. The Contractor shall provide the exact quantities and additional material such as miscellaneous pipe fittings, elbows, caps, valves, pipe hangers, weld material, cable hangers, cable tags, buswork, etc., which are not included in the List of Materials, in order to install a fully functional system which meets the requirements of this specification.

4.0 GOVERNMENT FURNISHED EQUIPMENT/MATERIAL/SERVICES: None

5.0 NOTES

5.1 The contractor and all subcontractors, regardless of tier must consult the General Technical Requirements (GTR) to determine applicability to this work item. In performance of this work item, the contractor and all subcontractors regardless of tier must comply with the requirements of all applicable GTR's including but not limited to GTR's 1 through 7, 22, 23, 24, 27, 28 and 29.

5.2 The contractor and all subcontractors regardless of tier are advised to review other work items under this contract, including but not limited to Work Items 011, 013, 014, and 021, to determine their effect on the work required under this work item. Many of the definitions relating to performance of this work item are found in Work Item 001.

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(T-AEFS 1)

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OVERFLOW, VENT AND FUEL OIL TANK REGULATOR VALVE MODS (ABS)

5.3 New compartment names and numbers are used for the installation and modification work.

6.0 QUALITY ASSURANCE REQUIREMENTS: None additional

7.0 STATEMENT Of WORK REQUIRED

7.1 Arrangement/Outfitting: None additional

7.2 Structural: None additional

7.3 Mechanical/Fluids

7.3.1 Removals

a. Remove the steam regulating valve for tank heating for fuel oil tanks shown in Table 501-1.

Table 501-1

TANK	NUMBER
Port Fuel Oil Settling Tank	(6-208-2)
Port Fuel Oil Settling Tank	(6-211-2)
Stbd Fuel Oil Settling Tank	(6-208-1)
Stbd Fuel Oil Settling Tank	(6-211-1)
Fuel Oil Tank	(8-227-2)
Fuel Oil Tank	(8-227-1)
Fuel Oil Tank	(8-246-2)

b. Remove piping and components using Reference 2.1.1 as guidance.

c. Remove the 1-1/2 inch vents from Reserve Feed Tanks 6-117-1-W and 6-117-2-W.

USNS MSCSUPPLY
(T-AEFS 1)

MACHINERY, AUXILIARY SYSTEMS **RFP NO. N62387-96-R-0001**
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OVERFLOW, VENT AND FUEL OIL TANK REGULATOR VALVE MODS (ABS)

7.3.2 Installations

a. Install steam regulating valves, Leslie Controls, Inc., Eventemp Temperature Regulators, or equal, PC No. 1, with the following salient characteristics, using Figure 501-1 and Enclosure 2.2.1 as guidance, in the locations of each of the valves removed in paragraph 7.3.1.a.

- Temperature Regulator
- Thermo sensing unit, with sensing line
- Size to suit
- Stainless Steel

b. Install piping and valves, PC Nos. 2 and 3, to form a valved bypass, using Figure 501-1 and Enclosure 2.2.1 as guidance for each of the valves installed in paragraph 7.3.2.a. Piping and materials to be same as the existing steam piping into which the bypass is installed. Bypass shall be sized to accommodate the full flow of the regulator.

c. Install piping and components, PC Nos. 4 and 5, using References 2.1.1 and 2.1.2 and Enclosure 2.2.1 as guidance, including flow switch, Gems Model FS-550, or equal, PC No. 6, with salient characteristics as follows:

- Paddle type
- Single pole double throw
- 316 SS construction

d. Install weather tight closures on new and existing vent terminations located in the weather.

e. Install 1-1/2 inch air escape, PC No. 4, for Void 6-0-0-V. Air escape shall terminate with a gooseneck.

f. Install 6 inch NPS overflow piping, PC No. 5, using Enclosure 2.2.1 as guidance from each Reserve Feed Tank (6-117-1-W and 6-117-2-W) to the Second Deck. Overflows shall discharge overboard by way of a gooseneck and two swing check valves, and shall be located so as not to increase the static

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OVERFLOW, VENT AND FUEL OIL TANK REGULATOR VALVE MODS (ABS)

head on the tanks. Piping material shall be the same as the existing and valves shall be selected using Reference 2.1.1 as guidance.

g. Install 1-1/2 inch NPS vent piping, PC No 4, using Enclosure 2.2.1 as guidance from the top of the goosenecks installed in paragraph 7.3.2.f to the Main Deck. Vents shall terminate in an enclosed space as approved by the MSCREP and shall be provided with a gooseneck and insect screen.

h. Install insulation and lagging, PC No. 7, for new and modified piping.

7.4 Electrical

Installations

Install level switch, GEMS Model LS-1800, or equal, PC No. 8, in Over Flow Tank 6-137-0-F such that it acts as a high level alarm, to alarm at 10% of tank capacity using Reference 2.1.2 as guidance with the following salient characteristics:

- Buna N Float
- Normally Open
- SPST Switch
- 316 SS material for wetted parts

7.5 Electronics: None additional

7.6 Preparation of Drawings/Documentation

Prepare working drawings to accomplish all work required by this item. Drawings as a minimum shall include:

7.6.1 Auxiliary Steam Arrangement and Details

7.6.2 Vent and Overflow Piping Arrangement and Details

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(T-AEFS 1)

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7.6.3 Sounding Tube Tables

7.7 Inspection/Test

7.7.1 Clean and Flush

7.7.2 Pneumatic test. Pneumatic tests shall be performed by pressurizing the overflow piping with air to 1.25 times the maximum static head seen by the piping. The pneumatic test pressure shall be maintained for a minimum total time of 10 minutes.

7.7.3 Hydrostatic test

7.7.4 Operational test

7.7.5 Functional test

7.8 Painting

Paint all new and disturbed surfaces to match surrounding surfaces.

7.9 Marking

Install name plates, notices, and markings for all new and modified systems.

7.10 Manufacturer's Representative: None

8.0 GENERAL REQUIREMENTS: None additional

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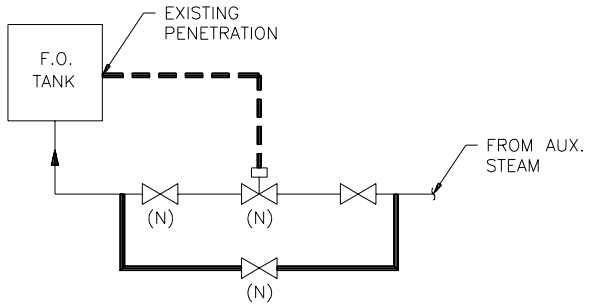
(T-AEFS 1)

MACHINERY, AUXILIARY SYSTEMS **RFP NO. N62387-96-R-0001**
1 October 1996
ITEM NO. 501 **Category "A"** **JJMA/O'BEAUTON/SSF**

OVERFLOW, VENT AND FUEL OIL TANK REGULATOR VALVE MODS (ABS)

FOR GUIDANCE ONLY



SYMBOL LIST	
	VALVE, GLOBE
	VALVE, TEMPERATURE REGULATOR
(N)	NEW
	PIPE, EXISTING
	PIPE, NEW
	TUBING, NEW TEMPERATURE SENSING, FURNISHED WITH VALVE

NOTES

1. THIS PLAN IS INTENDED FOR CONTRACT GUIDANCE AND SHOULD BE VERIFIED AGAINST EXISTING SHIP CONFIGURATION BEFORE IMPLEMENTATION.

2. THIS PLAN IS PART OF A SPECIFICATION AND SHALL NOT BE USED SEPARATELY FROM THIS SPECIFICATION.

Figure 501-1

ENCLOSURE 501-1

USNS MSCSUPPLY (T-AEFS 1)

OVERFLOW VENT AND STEAM REGULATING VALVE MODIFICATION CHECKLIST

CHECK POINT	VERIFY	MSCREP INITIALS/DATE	CONTINUE INSTALLATION
1	Installation location of Steam Temperature Regulating Valves determined and valves ordered.		YES NO
2	Location of modifications to piping and new globe valves for valved bypass determined.		YES NO
3	Working drawing of Steam Temperature Regulating Valves installation and piping modifications and globe valve installations completed.		YES NO
4	Installation location of flow switches determined and switches ordered		YES NO
5	Working drawing of flow switch installation and piping modifications completed.		YES NO
6	Working drawing of overflow and vent piping installation completed.		YES NO
7	All modifications and installations completed and ready for testing.		YES NO

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OVERFLOW, VENT AND FUEL OIL TANK REGULATOR VALVE MODS (ABS)

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USNS BUTTE
(T-AE 27)

SECTION TITLE RFP NO. N62387-95-R-3003
9 February, 2001
ITEM NO. XXX Category "A"XXXX/LAST NAME/MSC TPOC
(XXXX = LOE company initials)

TITLE OF DISCRETE WORK TASK

1.0 ABSTRACT

This item describes *(Brief description of work to be done.)*

2.0 REFERENCES

2.1 MSC Drawing No. T-AE 27 XXX-XXXXXXX, Title of Drawing

2.2 All references must be referred to in Section 7 of the Work Item.

2.3 List references in the order they appear in the text of the work item.

--(*If the work item has both references and Enclosures, then use this format:*)--

2.0 REFERENCES/ENCLOSURES

2.1 References

2.1.1 MSC Drawing No. T-AE 27 XXX-XXXXXXX, Title of Drawing

2.1.2 MSC Drawing No. T-AE 27 XXX-XXXXXXX, Title of Drawing

2.2 Enclosure

2.2.1 Enclosure XXX-1, Title Of Enclosure

3.0 ITEM LOCATION/DESCRIPTION

3.1 Location/Quantity

USNS BUTTE
(T-AE 27)

SECTION TITLE RFP NO. N62387-95-R-3003
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TITLE OF DISCRETE WORK TASK

3.1.1 Location: Identify compartment number *(or* Various*)*
*--(If there are several locations where the work is being performed, use the term, "*Various"*. If only one location, list it directly after the title:* Location: Emergency Diesel Generator Room (2-XXX-X)*).--*

3.1.2 Quantity: Normally "None"
--(If work item is describing GFE or an item to be repaired or overhauled, list number of items, e.g. "two main feed pumps".)--

3.2 Item Description/Manufacturer's Data
--(If item is describing equipment/systems to be repaired or overhauled, manufacturer's data may be provided.)--

3.2.1 Bill of Materials

PC No.	QTY	Description
X	Y	Description of material (Large items, cabling, piping, and tubing. Fastners, consummables, connectors, fittings, etc., are not included.)

--(Bill of material to be provided on all work items when a drawing does not accompany tasked worked.)--

3.2.2 Quantities are considered estimates. The Contractor shall provide the exact quantities and additional material such as miscellaneous pipe fittings, elbows, caps, valves, pipe hangers, weld material, cable hangers, cable tags, buswork, etc., which are not included in the List of Materials, in order to install a fully functional system which meets the requirements of this specification.

USNS BUTTE
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SECTION TITLE RFP NO. N62387-95-R-3003
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TITLE OF DISCRETE WORK TASK

--(This paragraph to be included in all work items which have a Bill of materials. The consumables listed within the paragraph should be tailored to each work item/Bill of Materials.)--

4.0 GOVERNMENT FURNISHED EQUIPMENT/MATERIAL/SERVICES: Usually "None"
--(If the government is providing GFE/GFM/GFS/GFI, then you must list all the sub-paragraphs as follows:

4.1 Government Furnished Equipment (GFE):

One ABC Ind. Feed Pump, Model 1234

4.2 Government Furnished Material (GFM): None

4.3 Government Furnished Services (GFS): None

4.4 Government Furnished Information (GFI): None*)--*

5.0 NOTES
*--(If there are no notes, the term "*None *" is placed here. Use this section for relevant information which does not have a home elsewhere. Do not use the word "shall". "Shall" is a tasking word and belongs in Article 7.0. Do not use "Notes" to specify a work requirement, but only to provide information. If there is more than one note, use sub-headings as follows: 5.1, 5.2, etc.)--*

5.1 The contractor and all subcontractors, regardless of tier must consult the General Technical Requirements (GTR) to determine applicability to this work item. In performance of this work item, the contractor and all subcontractors regardless of tier must comply with the requirements of all applicable GTR's including but not limited to GTR's 1-7, 22, 23, 24, 28 and 29.

USNS BUTTE
(T-AE 27)

SECTION TITLE RFP NO. N62387-95-R-3003
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ITEM NO. XXX Category "A"XXXX/LAST NAME/MSC TPOC
(XXXX = LOE company initials)

TITLE OF DISCRETE WORK TASK

5.2 The contractor and all subcontractors regardless of tier are advised to review other work items under this contract, including but not limited to Work Items 009, 010, 015, and 021, to determine their effect on the work required under this work item. Many of the definitions relating to performance of this work item are found in Work Item 001.

6.0 QUALITY ASSURANCE REQUIREMENTS: Normally "None additional"
--(If there are additional QA requirements beyond the normal requirements of ABS, the GTR, etc., Subsections 6.1 through 6.3 must all be included as follows:

6.1 (for material certification requirements)

6.2 (for personnel qualifications and process certifications)

6.3 (for conducting/reporting inspections and tests))--

7.0 STATEMENT OF WORK REQUIRED
--(Use the term "None additional" for any statement of work area with no action such as : 7.1 Arrangements/Outfitting: None additional*", except for 7.10, Manufacturer's Representative, which is as follows, "*7.10 Manufacturer's Representative: None*".)--*

7.1 Arrangements/Outfitting
--(Use this format if there are at least two of Removals, Modifications/Relocations, or Installations. Use only those sub-headings which have action.)--

7.1.1 Removals

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(T-AE 27)

SECTION TITLE RFP NO. N62387-95-R-3003
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TITLE OF DISCRETE WORK TASK

a. Remove XYZ using Reference 2.1.1 as guidance.

b. Remove UVW using Reference 2.1.2 as guidance.

7.1.2 Relocations
--(Use this format when only one action listed for a sub-heading.)--
Relocate RST using Reference 2.1.2 as guidance.

7.2 Structural
--(Use this format when only one sub-heading of the three sub-headings, Removals, Modifications/Relocations, or Installations, has action, i.e. Removals but no Modifications/Relocations or Installations.)--

Removals *(When using "Remove" do not list incidental removals such as foundations and cabling; they are taken care of by "Remove".)*

7.2.1 Remove ABC using Reference 2.1.1 as guidance.

7.2.2 Remove DEF using Reference 2.1.2 as guidance.

7.3 Mechanical/Fluids

Installations

7.3.1 Install the GHI system using Reference 2.1.3 as guidance.

7.3.2 Install JKL valves, Hydraulic Valve Co. Model A1B2C3, or equal, in the following compartments using References 2.1.2 and 2.1.3 as guidance:

USNS BUTTE
(T-AE 27)

SECTION TITLE RFP NO. N62387-95-R-3003
9 February, 2001
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(XXXX = LOE company initials)

TITLE OF DISCRETE WORK TASK

--(Use bullets or letters (a., b., etc.) to list items under sub-items as follows:)--

- Compartment X-XXX-X-X
- Compartment X-XXX-X-X

7.4 Electrical
--Example showing removals, modifications, and installations with salient characteristics.--

7.4.1 Removals

Remove all power panels and connection boxes in new or modified spaces using Reference 2.1.1 as guidance.

7.4.2 Modifications

a. Modify the circuit breaker trips on the switchboard circuit breakers to reflect the new trips using Reference 2.1.1 as guidance.

b. Modify the switchboard to accept the new 400 amp. frame circuit breakers using Reference 2.1.1 as guidance.

7.4.3 Installations
--(Use bullets or numbers to list items under sub-items as follows:)--

Install the following electrical systems and equipment using Reference 2.1.1 as guidance with the indicated salient characteristics:

(1) Group Control Center:

USNS BUTTE
(T-AE 27)

SECTION TITLE RFP NO. N62387-95-R-3003
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(XXXX = LOE company initials)

TITLE OF DISCRETE WORK TASK

- Height: 90 inches
- NEMA 12 enclosure, framework 12 gauge steel
- Wired for NEMA 2B

(2) Controller:

- Disconnect switch
- Appropriate NEMA size starters, non-reversing, magnetic, 450 VAC
- Local pushbutton operators and indicator lights as required

7.5 Electronics

7.5.1 Removals

7.5.2 Modifications/Relocations

7.5.3 Installations

7.6 Preparation of Drawings

Prepare working drawings to accomplish all work required by this item. Drawings as a minimum shall include:

7.6.1

7.6.2

-(If only a single drawing is required, use this format)-

Prepare working drawings to accomplish the work required by this item. Drawings as a minimum shall include the Piping System Installation Arrangement and Details working drawing.

USNS BUTTE
(T-AE 27)

SECTION TITLE RFP NO. N62387-95-R-3003
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ITEM NO. XXX Category "A"XXXX/LAST NAME/MSC TPOC
(XXXX = LOE company initials)

TITLE OF DISCRETE WORK TASK

7.7 Inspection/Test
--(List the appropriate test as it is titled in the GTR)--

7.7.1 Operational test

7.7.2 Hydrostatic test

--(If both Inspections and Tests are required, then use this format)--

7.7.1 Inspections

a.

b.

7.7.2 Tests

a.

b.

7.8 Painting

Paint all new and modified surfaces to match surrounding surfaces.

--(Add any special painting reuirements. List exterior paint type and quantity as GFM in Article 4.0)--

7.9 Marking

Install name plates, notices, and markings for all new and modified systems *(or areas)*.

USNS BUTTE
(T-AE 27)

SECTION TITLE RFP NO. N62387-95-R-3003
9 February, 2001
ITEM NO. XXX Category "A"XXXX/LAST NAME/MSC TPOC
(XXXX = LOE company initials)

TITLE OF DISCRETE WORK TASK

--(List any additional special label, hazard, and warning plates or markings)--

7.10 Manufacturer's Representative

Generally "None". When a contractor furnished manufacturer's representative or technical representative is needed, use words similar to: Provide the services of a manufacturer's representative (or authorized technical representative) during installation, testing, and sea trials.

If the Government is to provide a manufacturer's or technical representative, so state, along with the type of assistance to be provided and the rep's responsibilities.

8.0 GENERAL REQUIREMENTS: Normally "None additional"

USNS SHIP NAME
(T-HULL NO.)

SECTION TITLE **RFP NO. LXXXX-XX-L-XXXX**
9 February, 2001
ITEM NO. XXX **Category "A"** **JJMA/JJMA ENGR/MSC ENGR**

TITLE OF DISCRETE WORK TASK

Table XXX-1

TABLE TITLE

COLUMN HEADING	COLUMN HEADING	COLUMN HEADING
DATA	DATA	DATA
DATA	DATA	DATA
DATA	DATA	DATA
DATA	DATA	DATA
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USNS SHIP NAME
(T-HULL NO.)

SECTION TITLE **RFP NO. LXXXX-XX-L-XXXX**
9 February, 2001

ITEM NO. XXX **Category "A"** **JJMA/JJMA ENG/MSC ENG**

TITLE OF DISCRETE WORK TASK

FOR GUIDANCE ONLY

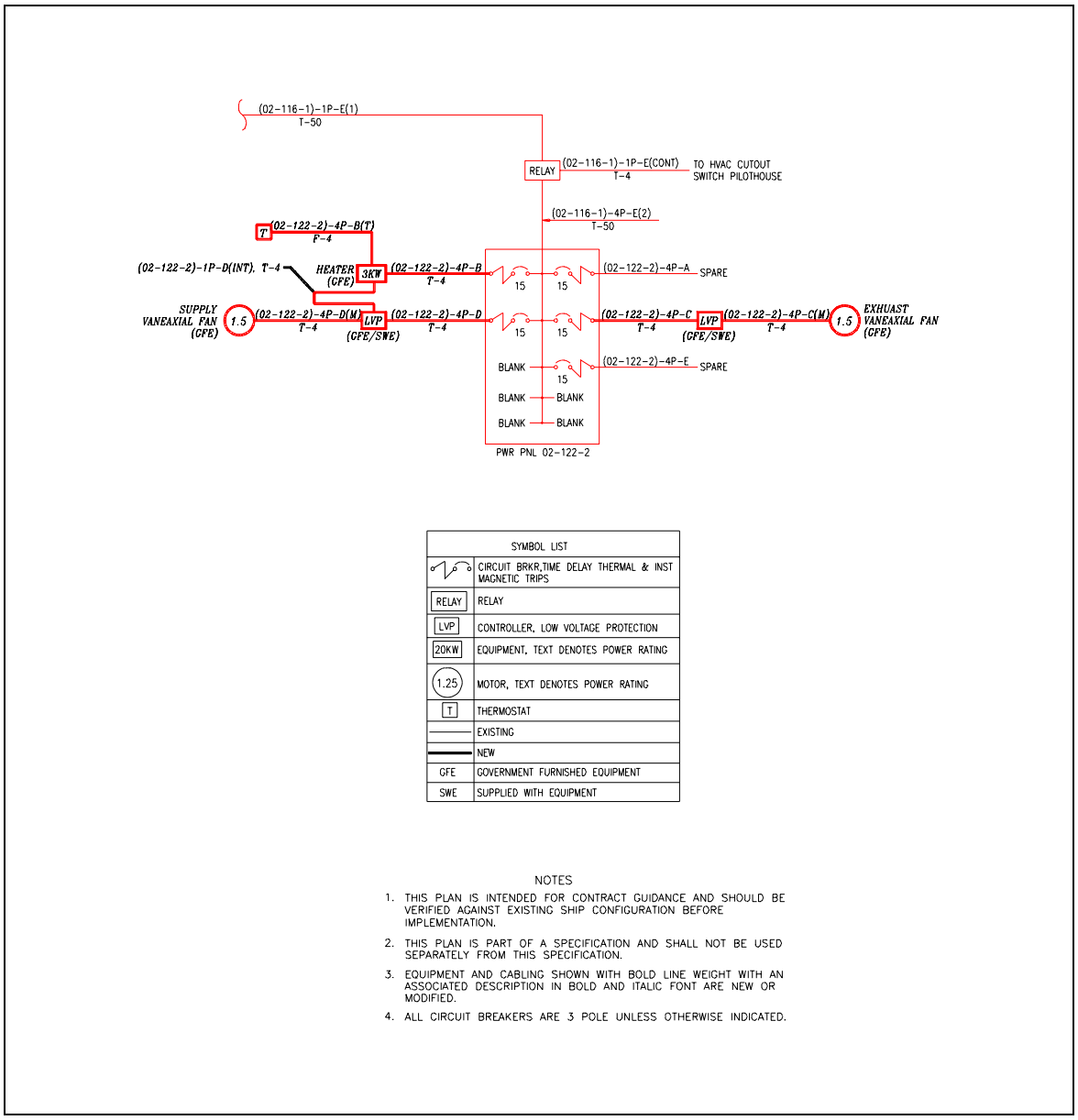

Figure XXX-1

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MSC WORK ITEM PREPARATION GUIDE FEEDBACK FORM

This form is intended to facilitate feedback on recommended changes to MSC's Work Item Preparation Guide. Comments will be evaluated and retained for future incorporation. To forward comments, this page should be photocopied, completed, signed, and returned to the following address:

COMMANDER, MILITARY SEALIFT COMMAND
901 M STREET SE
WASHINGTON DC 20398-5540
ATTN: COMSC N7

PAGE NO.:	PARA. NO. AND TITLE:
COMMENT:	

JUSTIFICATION: _____

_____

_____

SUBMITTED BY: _____ DATE: _____

ORGANIZATION: _____

RECEIVED BY: _____ DATE: _____

RECOMMENDED ACTION:

INCORPORATE INTO NEXT REVISION:

STUDY FURTHER (Indicate steps to further evaluate, additional information needed, etc.):

_____

_____

REVISION NOT RECOMMENDED (Indicate reason): _____

_____

_____

MSC WORK ITEM PREPARATION GUIDE FEEDBACK FORM

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_____

REVISION NOT RECOMMENDED (Indicate reason): _____

_____

_____