AUXILIARY MACHINE SYSTEMS

1. SCOPE

1.1 Intent. This standard specification describes the requirements for the Contractor to inspect, repair, and test auxiliary machinery systems and their components onboard Coast Guard vessels.

1.2 Appendices.

PROCESS STANDARD	APPENDIX
General Inspection Requirements	A
General Testing Requirements	B
Hydraulic Systems	C
Deck Machinery Systems	D

1.3 Terms and definitions. The terms used in multiple sections of this standard specification are defined below.

1.3.1 "Assembly": A group of two or more interrelated components integral to a system that serve a distinct function. Typically, renewal of components within assemblies can be economically justified where renewal of entire assemblies as one unit cannot be economically justified.

1.3.2 "Cleanliness Grade A": An uncoated surface is "cleanliness Grade A" when all visible or touchable areas of an accessible surface are free of grease, oil, flux, scale, dirt, loose particles or loose corrosion products, and all other contamination foreign to the base material of the surface. Light superficial rust on a carbon steel surface, caused by short time exposure to the atmosphere, is permitted. Potable water residues are permitted.

1.3.3 "Component": A group of one or more interrelated parts that are integral to a system that serves a distinct function. A part is a special case of a component. Components can generally be renewed as a unit.

1.3.4 "Deck machinery system": A deck machinery system contains the union of all associated mechanical load bearing components, all mechanical power transmission component associated with a prime mover, and each component integral to the operation both of those sets of components and assemblies, up to and including their machinery foundations. If the prime mover is an electric motor then all components prime mover side of the connection point to ship's service power are part of the system.

1.3.5 "Dynamic load test": A weight test used to verify that all mechanical power transmission components in a system are properly assembled, properly installed, properly adjusted, and are capable of producing enough force (i.e., pressure, torque, etc.) to hoist or haul the dynamic load. The weight specified for this test is typically just beneath the weight that the system is capable of hoisting or hauling when all mechanical power transmission components are properly assembled, properly installed, and properly adjusted. Systems installed on vessels and barges are designed to hoist or haul loads greater than their published rating in order to compensate for the increased line tensions experienced while operating in a sea state (dynamic loading).

1.3.6 "Fine surfaces": The term "fine surfaces" denotes the union of each of the following definitions:

- Each uncoated surface of a component whose finish is critical to the operation of the component.
- Each uncoated surface of a component that mates with or runs against a machined surface, a plated surface, or software.
- Plated surfaces.

1.3.7 "Haul": To pull a mechanical load in the horizontal plane.

1.3.8 "Hoist": To raise a mechanical load in the vertical plane.

1.3.9 "Mechanical load": The term "mechanical load" denotes each of the following definitions:
- A weight or mass not integral to a hoisting machine but suspended from a hoisting machine.
- A weight or mass not integral to a hauling machine but being hauled by a hauling machine.

1.3.10 "Mechanical load bearing components": Each component in a machine that is subjected to stress while supporting or moving a mechanical load.

1.3.11 "Machinery foundation": Structural members welded to or integral to the ship's structure designed to provide an interface for fastening one or more parts of the machine to the ship.

1.3.12 "Mechanical power transmission component": Each part in a machine, including those parts integral to the prime mover that is subjected to stress generated by a prime mover.

1.3.13 "Nondestructive examination (NDE)": The act of determining the suitability of some material or component for its intended purpose using techniques that do not affect its serviceability.

1.3.14 "Part": A component that can be disassembled no further.

1.3.15 "Pin assembly": The union of all components attached to (e.g., by key, spline, stake, press fit, etc.) and mate with or run against a pin including all sleeves, bushings, and rolling contact bearings that support the pin. For example, when tasked to "Disassemble and Inspect" a "Sheave Pin Assembly", all components that mate with the pin (e.g., a sheave, at least one rolling contact bearing assembly or bushing) shall be disassembled.

1.3.16 "Prime mover": The initial source of mechanical energy integral to a deck machinery system in the form of either an internal combustion engine or an electric motor driven directly by current from the ship's service generator.

1.3.17 "Rated load test": A weight test used to verify that all mechanical power transmission components in a system are properly assembled, properly installed, properly adjusted, and are capable of operating through a complete duty cycle without developing unusual or substandard performance characteristics (e.g., noise, binding, overheating, slow operation, etc.). The weight specified for this test is typically the published Working Load Limit (WLL) of the system.

1.3.18 "Self-locking fastener": A fastener assembly with a design feature (e.g., a soft insert, pre-deformed threads, etc.) for the purpose of adding friction to the threaded connection.

1.3.19 "Shaft assembly": The union of all components attached to (e.g., by key, spline, stake, press fit, etc.) and mate with or run against a shaft including all sleeves, bushings, and rolling contact bearings that support the shaft. For example, when tasked to "Disassemble and Inspect" a "Winch Drum Shaft Assembly", all components attached to the shaft (e.g., winch drum, at least two rolling contact bearing

assemblies, a gear on gearbox end of the shaft, and all associated keys, seal, backing rings, etc.) shall be disassembled. The associated gear box would be disassembled only to the extent required to access the specified shaft assembly.

1.3.20 "Software": The term "software" includes seals, gaskets, o-rings, backing rings for o-rings, lip seals, v-ring packing, flax packing, and mechanical packing seals as part of a component union.

1.3.21 "Static load test": A weight test used to verify that a winch brake, a brake valve, or a counterbalance valve is properly assembled, properly installed, properly adjusted, and is capable of stopping and holding the dynamic load. The weight specified for this test is typically just beneath the weight that will cause a properly assembled, properly adjusted, and properly installed winch brake, brake valve, or counterbalance valve to slip/relieve. The test also verifies, to a lesser extent, the integrity of all other mechanical load bearing components in the system.

1.3.22 "System specifications": All requirements, configuration data, and process descriptions applicable to the work specified that are contained within system drawings, system technical publications, or other documents referenced by a work item or referenced by the standard. Where specifications provided by the system manufacturer disagree with specifications provided by a manufacturer of a component within that system, the specifications provided by the system manufacturer shall take precedent, unless otherwise specified.

1.3.23 "Task description": When the work item contains a table similar to the table shown in paragraph 4.1 (Work item interpretation), a task description is a unit of work described by six separate associated cells across one row of a table in a work item that references this standard. Otherwise, it is a sentence or paragraph in a work item that contains a "Task Type".

1.3.24 "Task type": One or more words, typically verbs, that denotes a general description of work that can be performed on a component or assembly. Examples of standard task types are listed in paragraphs 4.1 (Work item interpretation) and 4.2 (Standard task types).

1.3.25 "Vital fastener assembly": A fastener assembly that is either a mechanical load bearing component or a mechanical power transmission component.

1.3.26 "Wearing components": The term "wearing components" denotes the union of the following sets of components:

- Software.
- Rolling contact bearings excluding turntable or turret bearings.
- Bushings used in a machine to constrain rotating shafts or mechanical load bearing pins.
- Springs.
- Friction discs in disc brakes and liners in band brakes.
- "Wear pads" and "wear strips" defined as relatively soft parts that slide against one or more relatively hard parts within a machine, the soft part being designed to wear at a much faster rate than the hard part.

2. REFERENCES

COAST GUARD DRAWINGS

Coast Guard Fleet Drawing FL-1702-11, Rev -, Inspection of Sheaves

COAST GUARD PUBLICATIONS

Surface Forces Logistics Center Standard Specification 0000 (SFLC Std Spec 0000), 2014, General Requirements

Surface Forces Logistics Center Standard Specification 0740 (SFLC Std Spec 0740), 2014, Welding and Allied Processes

Surface Forces Logistics Center Standard Specification 6310 (SFLC Std Spec 6310), 2014, Preserve Ship Structures

OTHER REFERENCES

American Petroleum Institute (API) Specification 9A, 2004, Specification for Wire Rope

American National Standard Institute/American Water Works Association ANSI/AWWA C217, 2009, Petrolatum and Petroleum Wax Tape Coatings for the Exterior of Connections and Fittings for Steel Water Pipeline

ASTM International (ASTM) A1023, 2009, Standard Specification for Stranded Carbon Steel Wire Ropes for General Purposes

ASTM International (ASTM) D4174, Reapproved 2010, Standard Practice for Cleaning, Flushing, and Purification of Petroleum Fluid Hydraulic Systems

ASTM International (ASTM) E2261, 2012, Standard Practice for Examination of Welds Using the Alternating Current Field Measurement Technique

Commercial Item Description (CID), A-A-50433, Aug 1989, Grease, Sea Water Wash Resistant

Federal Specification (Fed Spec) RR-W-410, Jun 2010, Wire Rope and Strand

International Standard Organization (ISO) 3448, 1992, Industrial Liquid Lubricants - ISO Viscosity Classification

International Standard Organization (ISO) 4406, 1999, Hydraulic Fluid Power – Fluids – Method for Coding the Level of Contamination by Solid Particles

Manufacturers Standardization Society of the Valve and Fittings Industry, Inc. (MSS), SP-58, 2009, Pipe Hangers and Supports – Materials, Design, Manufacture, Selection, Application, and Installation

MIL-PRF-18458, May 2007, Grease, Wire Rope-Exposed Gear

MIL-A-22262, Mar 1996, Abrasive Blasting Media Ship Hull Blast Cleaning

Society of Automotive Engineers (SAE) J1942-1, 2008, Qualified Hoses for Marine Applications.

The Society for Protective Coatings (SSPC) Surface Preparation Specification No.1 (SSPC-SP 1), 2004, Solvent Cleaning

The Society for Protective Coatings (SSPC) Surface Preparation Specification No.11 (SSPC-SP 11), 2012, Power Tool Cleaning to Bare Metal

3. REQUIREMENTS

3.1 General requirements. The Contractor shall adhere to the following general requirements:

3.1.1 Sequencing the performance of work. Determine the optimal sequence for performing the tasks specified in the work item. Unless stated explicitly, no sequence of work is implied within a work item except:

- "Operating and Inspecting" an auxiliary machinery system shall always be performed prior to performing maintenance or repairs on that system.

- Grooming and lubricating of an auxiliary machinery system shall always be performed immediately prior to operational and weight testing of that system.
- Operational and weight testing of a deck machinery system shall always be performed after all other work on that system has been completed.

3.1.2 Extent of system disassembly and interference removal. When disassembly or interference removal is required to perform specified work, disassemble the system or remove interferences or both only to the extent necessary to perform the work specified.

3.1.3 Protection of fine surfaces. Protect all fine surfaces exposed while a component, assembly, or system is disassembled for repair. Install protective coverings that will prevent damage and corrosion. Remove and dispose of all protective coverings prior to reassembly.

3.1.4 Hydraulic system contamination protection. Maintain existing hydraulic system cleanliness. Take all necessary precautions to prevent the introduction of contaminants. Whenever disconnecting or removing components from a hydraulic system, immediately and completely seal all openings to the component and the rest of the system. Use either caps for externally threaded connection points, bolt-on blanks, or taped-on discs and covers of durable plastic or sheet-metal no less than 1/16-inch thick. Plastic bags may be used only when arrangement or configuration prevents the use of the other sealing methods specified above. Filling openings with rags or other articles is prohibited.

3.1.5 Mandatory renewals. If during disassembly of any component software or self-locking fasteners are disturbed, renew them. If during the performance of work hydraulic fluid or lube oil is lost, renew it. Submit a CFR.

3.1.6 Turn-in or disposal of renewed components. Turn in components being renewed to the Coast Guard Property Administrator when specified in the work item. Otherwise dispose of components being renewed in accordance with all applicable Federal, state, and local regulations.

3.1.7 Cleaning of hydraulic system components at reassembly. Prior to installing a new or disturbed hydraulic component into a system, clean all exposed internal surfaces of that component that will come in contact with working system fluid to cleanliness Grade A (see 1.3.2 "Cleanliness Grade A").

3.1.8 Disposal of oils, oily rags, and other hazardous materials. Dispose of all oils, hydraulic fluids, contaminated cleaning materials, or any other hazardous wastes and materials that have been drained, lost, spilled, or otherwise removed during work on any system, in accordance with all applicable Federal, state, and local regulations.

3.1.9 Shaft coupling alignment. Align all new and disturbed shaft coupling assemblies. Unless otherwise specified in the task description or in the system specifications, verify that each hub is round to within 0.002 inches total indicator run-out, and then align both hubs to within 0.005 inches total indicator run-out radial and peripheral per inch of shaft radius.

3.1.10 Pad eye and tie down weld repairs. Pull test all pad eyes and tie downs that have been weld-repaired. Perform testing specified in paragraph 3.2.7 (Pull test), after performing nondestructive examination (NDE) of the weld-repair in accordance with SFLC Std Spec 0740, Appendix C.

3.1.11 Mandatory testing requirements. Be aware that an operational and weight test is required for a deck machinery system whenever an associated mechanical load bearing or mechanical power transmission component is disturbed (i.e., disassembled, repaired, renewed, removed and replaced as an interference, etc).

3.1.12 Work item table interpretations. The Contractor shall interpret the table in work items that reference this standard, as described in paragraph 4.1 (Work item interpretation) and 4.2 (Standard task types) herein. Be aware that one or more "Government-furnished property" items listed in Section 1.2 (Government-furnished property) of the work item apply to each task description that specifies "GFP" in the cell beneath the "Additional Requirements > Other" header.

3.2 Task types. The Contractor shall be aware that the following task types denote specifications for work. As defined within the requiring work item, submit a CIR or CFR for all completed tests, inspections and flushing.

3.2.1 Operate and inspect: When "Operate and Inspect" is specified in a task description, perform the following:

- Perform a no-load operational test on the system. While the Coast Guard Inspector cycles all actuators, controls, shafting, and linkages associated with the system, note all unusual noise, vibration, overheating, binding, misalignment, maladjusted controls, and malfunctioning controls or read-outs found in the system. Ensure any of these conditions are reported in a CFR.
- An operational test using test weights is not required. However, to supplement the no-load test specified and required above, the Contractor may request to have test weights handled. The test weights shall be handled only after the COR determines that the system is safe to handle weights and has approved the request. All test weights and all necessary rigging equipment shall be furnished by the Contractor. The rated load of the system shall not be exceeded. Furnishing and handling test weights for the purpose of troubleshooting shall result no additional cost to the Government.
- At the conclusion of all operations, perform a visual inspection of the system. Open or remove all inspection covers in the system, as applicable, to facilitate visual inspections. Do not disassemble or disturb mechanical load bearing components or mechanical power transmission components prior to or during the inspection. Inspect all accessible surfaces of each component in the system as specified in Appendix A (General Inspection Requirements).
- Inspect sheave assemblies, as applicable, using Coast Guard Drawing FL-1702-11 as a guide.

3.2.2 Service and inspect: When "Service and Inspect" or "Service, Inspect" is specified in a task description, perform the following in conjunction with all other work specified:

- Remove inspection plates, cover plates, and other non-mechanical load bearing components, as applicable, to gain access to hidden surfaces of the component or assembly. Do not disturb mechanical load bearing components or mechanical power transmission components prior to or during the inspection.
- Clean all accessible uncoated surfaces of the component or assembly to cleanliness Grade A, unless otherwise directed by applicable appendix or in the task description.
- Inspect all accessible surfaces in accordance with Appendix A (General Inspection Requirements).
- If a Change Request has been authorized and released by the KO, perform all work resulting from modifications or amendments to the task description as specified.
- Lubricate uncoated surfaces of the component or assembly as specified in the system specifications, the task description, or referenced appendix. When a lubricant is not specified in the task description, system specifications, or appendix of this standard use a lubricant conforming to CID A-A-50433.
- Prior to reinstalling removed covers, plates, and non-mechanical load bearing components perform all other work specified or invoked by the task description.

- Reinstall all removed parts and return the component to normal operating condition.

3.2.3 Disassemble and inspect: When "Disassemble and Inspect" or "Disassemble, Inspect" is specified in a task description, perform the following in conjunction with all other work specified:

- Completely disassemble the specified component or assembly.
- Determine which sub-components are wearing components. Inspect all exposed uncoated surfaces of all non-wearing sub-components in accordance with Appendix A (General Inspection Requirements).
- Clean all accessible uncoated surfaces of the component or assembly to cleanliness Grade A unless otherwise directed by applicable appendix, or in the task description.
- Renew each sub-component that corresponds to a component furnished as GFP for the task description.
- If a Change Request (CR) has been authorized and released, renew each component determined to be a wearing component and perform all work resulting from modifications or amendments to the task description as specified in the CR.
- Lubricate uncoated surfaces of the component or assembly as specified in the system specifications, the task description, or referenced appendix. When a lubricant is not specified in the task description, system specifications, or appendix of this standard, use a lubricant conforming to CID A-A-50433.
- Perform all other work specified or invoked by the task description that can only be performed prior to reassembling the component or assembly.
- Reassemble the component or assembly and return it to normal operating condition within the system.

3.2.4 Preservation: Perform the following when "Partially Preserve" and "Preserve" tasks are specified in work items for all previously coated surfaces of the specified equipment or components:

NOTE

Deck machinery equipment is considered "critical-coated surfaces", as defined in SFLC Std Spec 0000.

3.2.4.1 Fresh water wash. Low-pressure (less than 5,000 psi) fresh water wash all affected equipment/component surfaces, to remove soluble chlorides and other surface contaminants.

NOTE

Freshwater wash is applicable only to in-service equipment.

3.2.4.1.1 Ensure that the water utilized for the low-pressure wash is of sufficient purity and quality that it does not prevent the surface being preserved from achieving the required degree of surface cleanliness or nonvisible contamination criteria.

3.2.4.1.2 Capture, contain, and dispose of wash water for proper disposal in accordance with all Federal, state and local regulations.

3.2.4.2 Disassembly and protective measures.

3.2.4.2.1 For equipment or components not specified to be disassembled in the work item, ensure that equipment or components are disassembled to the extent necessary (e.g.: uncoupling of gear box, hydraulic motor, DCV block, sheaves, etc.) to facilitate surface preparation and coating of inaccessible surfaces. Some examples of surfaces requiring disassembly for access include, but are not limited to the

following:

- Crevices around sheaves.
- Protective boxes around hose manifolds.
- Deck grates and platforms.
- Faying surfaces.

3.2.4.2.2 Ensure that all surfaces not designed to be coated (e.g.: sensitive hydraulics and oil seals, non-ferrous surfaces, etc.) are protected from contaminants.

3.2.4.3 Surface preparation. Accomplish surface preparation/coating removal, using one or a combination of the following cleaning methods:

- Waterjet to a SSPC-SP WJ-2 (M)/NACE WJ-2 (M) standard.
- Abrasive-blast to SSPC-SP10/NACE No. 2, using grit conforming to MIL-A-22262 (1.5 to 2.5 mil anchor profile).
- Power tool clean to a SSPC-SP 11 (1.0 mil anchor profile).

NOTE

Working surfaces of winches and capstan drums require abrasive-blasting to SSPC-SP10/NACE No. 2.

3.2.4.3.1 When "Preserve" is specified in a task description, prepare 100% of all surfaces designed to be coated.

3.2.4.3.2 When "Partially-Preserve" is specified in a task description, do the following:

- Remove coatings only in areas in which mechanical damage extends into the substrate, or where there is evidence of corrosion (see 3.2.4.3 (Surface preparation)).
- Roughen/abrade all surfaces of the entire assembly where existing top-coating is intact with 100-grit paper, to provide a suitable surface profile.
- Feather edges of topcoating into adjacent bare areas, to create a smooth transition.

3.2.4.3.3 When "Establish profile" is specified in a task description, ensure that designated/specified equipment or component is abrasive-blasted, to SSPC-SP10/NACE No. 2, to achieve an anchor tooth profile of 1.5 to 2.5 mils on all previously coated surfaces.

NOTE

Typically "establish profile" will be specified in the task description when a component or area is known to have a corrosion problem that can be attributed to previous improper surface preparation.

3.2.4.4 Post-surface preparation cleaning. Perform solvent cleaning of all prepared surfaces, in accordance with SSPC-SP 1, prior to coating application.

3.2.4.5 Surface coating.

3.2.4.5.1 "Partially-preserve" task. For the "Partially-preserve" task, do the following:

- Spot coat/prime all bare areas with an "Epoxy Primer/Mid-Coat - Polysiloxane Sys" coating as defined in SFLC Std Spec 6310, Appendix C, to a thickness matching that of existing adjacent undercoating (approximately 10-12 mils DFT). Ensure that the primer coating extends over the feathered edges of the sound/intact coating to minimize edge lifting and provide a better appearance.

- Top-coat all primed and abraded surfaces, with a "Polysiloxane Sys" coating as defined in SFLC Std Spec 6310, Appendix C, to ensure a uniform thickness throughout. Select Spar (10371), unless specified otherwise in the work item.

3.2.4.5.2 "Preserve" task. For the "Preserve" task, do the following:

- Prime and coat all prepared surfaces in accordance with SFLC Std Spec 6310, using the coatings specified for "Machinery, Deck" in Appendix A (Cutter and Boat Exterior Paint Systems).
- Select Spar (10371) as the top/finish coat color, unless specified otherwise in the work item.

3.2.4.5.3 Coat the working surfaces of machinery and the surfaces of winch and capstan drums that contact line with an Inorganic Zinc (3.0-4.0 mils) in accordance with SFLC Std Spec 6310, Appendix A, Note 12.

NOTE

Authorized coatings are listed in SFLC Std Spec 6310 Appendix C (Authorized Coatings For Use On Cutters and Boats).

3.2.4.6 When "Inspect and Preserve" is specified in the task description, inspect the area specified. If a Change Request has been authorized, prepare and coat the surface as specified in the Change Request.

3.2.4.7 When preserving or partially-preserving an equipment foundation, ensure that all previously coated surfaces of the foundation, including deck and bulkhead areas enclosed within a perimeter two inches out from the foundation's footprint are also included.

CAUTIONS

Unless a containment system is used to contain surface preparation dust, debris, and coating application overspray during pier side/dockside preservation, the following must be adhered to:
1. All surface preparation tools/equipment must be vacuum-shrouded.
2. Coatings must be applied by brushing or rolling, which may require additional coats to obtain required dry film thickness.

3.2.5 NDE: When "NDE" is specified in a task description, perform nondestructive examination of the specified component(s) and/or weld(s) in accordance with SFLC Std Spec 0740, Appendix C.

3.2.6 Groom and lubricate: When "Groom and Lubricate" is specified in the task description, prepare the system for testing by performing the following, as applicable, in conjunction with all other work specified in the task description while the Coast Guard inspector operates the system in a no-load condition:

- Visually inspect all components in the system. Verify that all reservoirs and gear cases are filled to the level required in the system specifications.

WARNING

Verify that all installed system isolation valves (e.g., return line valves, case drain line valves, etc.) are properly aligned prior to energizing and operating equipment, as applicable.

- Verify proper alignment of all installed system isolation valves, as applicable. Cycle all actuators. Verify that all associated control valves, electrical and mechanical controls, and actuators are operating properly.
- Remove air from the hydraulic system. Break mechanical joints at high points while cycling actuators, if required, to bleed air from the hydraulic system.
- Make adjustments, as required, to all components (e.g., sensors, controls, readouts, pressure

control valves, flow control valves, limit switches, proximity switches, etc.) to achieve proper operation, as specified in the task description or in the system specifications.
- Verify there are no lube oil or hydraulic fluid leaks.
- Identify all lubrication points in the system. Lubricate these points as specified in the task description or in the system specifications.

3.2.7 Pull test: When "Pull Test" is specified in the task description, do the following:
- Determine the required force for the pull test on the specified deck fitting as specified below:
- For periodic testing of a deck fitting the force of pull on the fitting shall be 1.5 times the deck fitting's rated load.
- For testing subsequent to a weld-repair of a deck fitting (i.e., renewal or repair of a fitting) the force of pull on the deck fitting shall be 2 times the deck fitting's rated load.
- Determine the proper direction to pull against the specified deck fitting. The proper direction shall be the direction in which the deck fitting and surrounding deck or bulkhead displays its greatest resistance to damage and deformation.

NOTE

General purpose fittings are typically strongest when pulled perpendicular to the deck or bulkhead where they are attached. Special purpose fittings may be stronger in a direction specific to their intended use that may differ from perpendicular to the deck or bulkhead.

- Pull the specified deck fitting to the force and in the direction determined above and hold for one minute.
- Release the load and verify no permanent deformation or damage to the fitting or the surrounding deck or bulkhead, as applicable.

3.2.8 Operational and weight testing: When "Op Test" or "Weight Test" or "Op and Weight Test" is specified in the task description, do the following:
- Furnish all necessary temporary rigging gear (e.g., temporary wire ropes and pendants, external lifting devices such as a crane, strong-backs, test weights, tag lines, dynamometers, come-alongs, steamboat ratchets, shackles, dunnage, bumpers, etc.) required to perform the testing procedures invoked by the task description. Place dunnage under test weights to protect the vessel's deck and pier, as applicable. Place bumpers or other protective measures between the hull and pier when test procedures involve warping the vessel.
- Furnish all necessary rigging services (e.g., riggers, external crane operators, etc.) required to perform the referenced testing procedures invoked by the task description.
- Conduct a briefing for cognizant shipboard personnel at least 24 hours prior to the specified test procedure.
- Allow the CG Inspector to inspect and approve all temporary rigging gear, prior to being utilized.

NOTE

An external lifting device may not be required if using a water bag to conduct Static Load tests if it can be gradually filled to prevent shock loading of the equipment.

3.2.8.1 When weight testing is specified, determine the vessel's load status and verify that the vessel's stability is adequate and safe for performing the test procedure. Conduct weight testing only when the vessel is waterborne and only after at least one of the following three conditions have been met:
- The vessel is in a full liquid load condition.
- A full liquid load condition has been simulated through the use of equivalent weights that

have been arranged shipboard to achieve the same metacentric height (GM) as a full liquid load condition.

- The vessel's DCA or EO or EPO has determined that the vessel's stability meets or exceeds the minimum stability required to safely perform the test procedure.

3.2.8.1.1 Avoid conditions that will cause sudden application of test loads.

3.2.8.1.2 Keep test weights as close to the deck as possible while performing the test procedure to minimize damage to the vessel if control of the test weight is lost.

3.2.8.1.3 Do not allow immersion of a deck edge or a list of over 15 degrees while performing the test procedure.

3.2.9 All other task types. Refer to the "Additional Requirements" columns of the task description for all other requirements.

4. NOTES

4.1 Work item interpretation. Work items that reference this standard may contain a table similar below sample.

SAMPLE TABLE

				ADDITION REQUIREMENTS	
#	**TASK TYPE**	**QTY**	**COMPONENT OR ASSEMBLY**	**APPENDIX AND PARA. FROM SFLC STD SPEC 5000**	**OTHER**
1	Operate and Inspect	2	Mechanical Chain Stopper Assembly	3.2.1 (Operate and Inspect)	Submit a CIR
2	Disassemble, Inspect, and Preserve	2	Mechanical Chain Stopper Assembly	3.2.3 (Disassembly and inspect) 3.2.4 (Preservation)	Submit a CIR. Reassemble chain stoppers with repair listed GFP
3	NDE	2	Mechanical Chain Stopper Assembly	3.2.5 (NDE)	NDE task is limited to Chain stopper welds.
4	Preserve	2	Mechanical Chain Stopper Assembly and foundation	3.2.4 (Preservation)	Select the following top coating colors: - Black (17038) for the chain stopper surfaces. - Gray (16099) for the foundation surfaces.
5	Groom and Lubricate	2	Mechanical Chain Stopper Assembly	3.2.6 (Groom and lubricate)	
6	Weight Test	2	Mechanical Chain Stopper Assemblies	B2.1(Mechanical Chain Stoppers)	Static Load Test Weight: 24,750# Dynamic Load Test Weight: N/A Rated Load Test Weight: N/A
7	Fabricate and Install	2	Label plate	B2.9 (Label plates)	

4.1.1 Table description. The six column table will contain a shaded "header" row at the top of the table. One or more task description rows will follow the header. Each task description will consist of six separate associated cells that will describe the work to be performed on one or more components or assemblies. The relationship between the contents of the six cells in the task description is described below.

4.1.2 The cell beneath the "#" heading serializes the task description.

4.1.3 The cell beneath the "Task Type" heading specifies the task type associated with the task description. A task type denotes a general description of work that can be performed on a component or assembly.

4.1.4 The cell beneath the "Qty" heading specifies the number of separate components or assemblies associated with the task description.

4.1.5 The cell beneath the "Component or Assembly" heading will functionally describe one or more components or assemblies associated with the task description.

4.1.6 The cell beneath the "Additional Requirements > Appendix & Para." heading will be "N/A" or will contain one or more instances of a letter and a number separated by a hyphen. The letter specifies the applicable appendix in this standard and the number specifies the applicable paragraph number within the specified appendix.

4.1.7 The cell beneath the "Additional Requirements > Other" column will be "N/A" or will contain text that specifies one or more of the following:

- Modifications or amendments to the general description of work denoted by the task type.
- Modifications or amendments to the functional description of the component or assembly.
- Invoke requirements stated elsewhere in the work item that apply to the task description.
- Invoke other specifications and requirements stated or shown in other referenced applicable document.
- Specify platform, cutter, system, assembly, or component specific work descriptions, requirements, and data not found in any other document.

4.2 Standard task types. Standard task types include but are not limited to:

- Operate and inspect.
- Adjust.
- Renew.
- Renew and Preserve.
- Disassemble and Inspect.
- Disassemble, Inspect, and Preserve.
- Service and Inspect.
- Service, Inspect, and Preserve.
- Fabricate and Install.
- Fabricate, Install, and Preserve.
- Preserve.
- Preserve and Inspect.
- Preserve and NDE.
- NDE.
- Groom.
- Groom and Lubricate.
- Test.
- Pull Test.
- High Turbulent Flush.
- Standard Flush or Flush.
- Weatherize.

APPENDIX A

GENERAL INSPECTION REQUIREMENTS

A1. SCOPE

A1.1 Intent. This appendix describes the particular requirements for the Contractor to perform all inspections on Coast Guard deck auxiliary machinery systems, as applicable.

A2. REQUIREMENTS

A2.1 Joint inspections. The Contractor shall inspect, either visually or physically by touch, all accessible mechanical joints for hydraulic fluid or air leaks, as applicable.

A2.2 Pressure containing component inspections. The Contractor shall inspect, either visually or physically by touch, all accessible internal and external surfaces of the component that are used to contain pressurized gas or fluid for: impacts, deformation, warping, bending, yielding, excessive corrosion, loss of base material, cracks, and all other wear or damage that will affect the strength of the pressure-containing boundary or the proper, trouble-free, safe operation of the component. Examples of these components are pump cases, motor cases, valve bodies, cylinder bodies, cylinder tie rods, accumulator and flask bodies, hose assemblies, and heat exchanger tubing and shells.

A2.3 Mechanical load bearing and mechanical power transmission component inspections. The Contractor shall inspect, either visually or physically by touch, all accessible surfaces of all components that transmit power for: impacts, deformation, warping, bending, yielding, mushrooming, excessive corrosion, excessive wear, unusual wear patterns, loss of base material, cracks, and all other wear or damage that will affect the strength of the component or the proper, trouble-free, safe operation of the component. Examples of these components are shafts, mechanical pins, keys, keyways, splines, set-screws, stakes, gear teeth, cams, cam-followers, couplings, cylinder rods, clevises, and trunnions.

A2.4 Fine surface inspections. The Contractor shall inspect, either visually or physically by touch, all uncoated, fine surfaces of components for raised metal, nicks, burrs, scratches, scoring, heat checks, galling, pitting, gouges, corrosion, damage, yielding or stretching, excessive wear, and all other unusual discontinuities with surrounding surfaces that will affect sealing, flow rates and pressures, or the proper, trouble-free, safe operation of the component. Examples of these surfaces are cylinder bores, pistons, piston rods, all surfaces that mate with o-rings or seals, valve spools and spool bores, valve seats, and screw threads.

APPENDIX B

GENERAL TESTING REQUIREMENTS

B1. SCOPE

B1.1 Intent. This appendix describes the particular requirements for the Contractor to perform testing of Coast Guard deck machinery systems. Tests shall be conducted in the order listed.

B1.2 System test requirements. The following paragraphs specify requirements for the associated system or task:

TITLE	PARAGRAPH
Mechanical chain stoppers	B2.1
Hydraulic chain stoppers	B2.2
Winches	B2.3
Booms and cranes	B2.4
Anchor Windlass	B2.5
Capstans	B2.6
Davits	B2.7
Small Boats	B2.8
Label plates	B2.9

B2. REQUIREMENTS

B2.1 Mechanical chain stoppers.

B2.1.1 No-load operational test. While the Coast Guard Inspector releases and resets the chain stopper a minimum of three cycles in a no-load condition, the Contractor shall:

- Verify that the reset spring does not bottom out (fully compress) when the stopper is fully extended.
- Verify that the spring fully resets the stopper.

B2.1.2 Operational test. The Contractor shall:

- Suspend the operational load test weight specified in the work item from the stopper and hold for a minimum of 10 minutes using an external lifting device and an appropriately sized chain.
- Release the operational load test weight using the chain stopper's release mechanism.
- Verify that the stopper has no permanent deformation or damage.

NOTE

Static load weight testing mechanical chain stoppers is only required after weld-repairs have been performed on the chain stopper or its supporting structure.

B2.1.3 Static load test. The Contractor shall:

- Suspend the static load test weight specified in the work item from the stopper and hold for a minimum of 10 minutes using an external lifting device and an appropriately sized chain.
- Remove the test weight.
- Verify that the stopper has no permanent deformation or damage.
- Return the chain stopper to its normal operating condition.

B2.2 Hydraulic chain stoppers. The Contractor shall test hydraulic chain stoppers in conjunction with testing of the associated buoy chain winch.

B2.2.1 No-load operational test. While the Coast Guard Inspector extends and retracts all actuators a minimum of three cycles, the Contractor shall verify proper operation and no unusual vibration, noise or binding.

B2.2.2 Operational load test.

B2.2.2.1 The Contractor shall suspend the operational load test weight specified in the work item from a chain that attaches to the buoy chain winch and passes through the chain stopper assembly.

B2.2.2.2 While the Coast Guard Inspector demonstrates normal operational use of the stopper using the operational load test weight specified in the work item and the buoy chain winch to raise and lower the test load a minimum of three cycles, the Contractor shall verify that the rising sheave freely turns when the loaded chain is pulled through the sheave groove.

NOTE

The Coast Guard Inspector will set the chain in the stopper, slack the chain between the buoy chain winch and the stopper, re-tension the chain between the winch and the stopper, and lift the chain from the stopper with the rising sheave.

B2.2.2.3 After the Coast Guard Inspector retrieves the operational load test weight using the buoy chain winch, the Contractor shall:

- Verify that the chain loaded with the test weight is properly released from the stopper with no unusual noise, vibration, or binding.
- Remove the test weight and verify that the stopper has no permanent deformation or damage.
- Return the chain stopper to its normal operating condition.

NOTE

Static load weight testing hydraulic chain stoppers is only required after weld-repairs have been performed on the chain stopper or its supporting structure.

B2.2.2.4 Static load test. After the Coast Guard Inspector has fully retracted the sheave, the Contractor shall:

- Suspend the static load test weight specified in the work item from the stopper and hold for a minimum of 10 minutes using an external lifting device and an appropriately sized chain.
- Remove the test weight.
- Verify that the stopper has no permanent deformation or damage.
- Return the chain stopper to its normal operating condition.

B2.3 Winches.

B2.3.1 Functional / no-load test. While the Coast Guard Inspector operates the winch in both directions a minimum of 2 minutes, the Contractor shall verify that:

- All controls and sensors are operating properly.
- No unusual vibration or noise is emitted from the winch and there is no binding or misalignment.
- Proper setting and release of the winch brake.

B2.3.2 No-load test for level wind arm assemblies. The Contractor shall perform the following on winches that have a level wind arm assembly installed. While the Coast Guard Inspector fully extends and retracts level wind arm hydraulic cylinder in a no-load condition do the following:

- Verify proper operation of all controls.
- Verify no unusual vibration, noise, or binding.

NOTES

1. During no-load operations ensure sufficient tension is kept on wire ropes to prevent improper wrapping on hoist drum.

2. Strongbacks, external cranes, or other Contractor-furnished rigging devices may be needed to perform weight testing on winches not equipped with boom/sheave assemblies (i.e., cross deck winches, mooring winches, etc.)

B2.3.3 Static load test. The Contractor shall:

- Using an external lifting device, suspend the static load test weight specified in the work item from the winch structure and hold for a minimum of 10 minutes.
- Remove the test weight.
- Verify no permanent deformation or damage to any components.

B2.3.4 Static load test for level wind arm assemblies. The Contractor shall perform the following on winches that have a level wind arm assembly installed. While performing static load test, do the following:

- Verify that the level wind arm hydraulic cylinder does not drift.
- Verify no permanent deformation or damage to any components.

B2.3.5 Winch Brake / Modified static load test. The Contractor shall:

- Using an external lifting device, suspend the static load test weight specified in the work item for each hoist from the applicable wire rope assembly and hold for a minimum of 10 minutes.
- Verify the winch brake holds without slipping.
- Remove the test weight.
- Verify no permanent deformation or damage to any components.

B2.3.6 Dynamic Overload test. While the Coast Guard inspector raises and lowers each dynamic load specified in the work item a minimum of three complete cycles and through as wide a range as practicable; stopping the winch at least twice in each direction every cycle, the Contractor shall verify the following as applicable:

- The winch lifts the dynamic load.
- The winch brake stops and holds the dynamic load without slipping.
- No permanent deformation, damage to, or overheating of any components.
- Proper operation of all controls and sensors.
- No unusual vibration or noise is emitted from any component (e.g., winch, actuator, shaft

assembly, pin assembly, etc.) and there is no binding or misalignment.
- Verify no leakage from hydraulic components.

NOTE

Relief valve and pressure compensator settings shall not require adjustment in order to conduct this test.

B2.3.7 Rated load test. While the Coast Guard Inspector operates the winch, raising and lowering the rated load specified in the work item a minimum range of 5 feet a minimum of 10 complete cycles, starting and stopping the winch at least twice in each direction, the Contractor shall verify the following:
- The winch lifts the rated load at rated speed.
- The brake stops and holds the rated load without slipping.
- No permanent deformation or damage to any components.
- Proper operation of all controls and sensors.
- No unusual vibration, noise, or binding.

B2.4 Booms and cranes.

B2.4.1 Functional / No-load test. While the Coast Guard Inspector operates each actuator associated with the boom or crane in both directions a minimum of 2 minutes by topping the boom, rotating the boom, and operating each associated winch, the Contractor shall verify that:
- All controls, sensors and alarms are operating properly.
- No unusual vibration or noise is emitted from any component (e.g., winch, actuator, shaft assembly, pin assembly, etc.) and there is no binding or misalignment.
- Proper setting and release of each brake.

NOTE

During no-load operations ensure sufficient tension is kept on wire ropes to prevent improper wrapping on hoist drum.

B2.4.2 Static load test. The Contractor shall:
- Using an external lifting device, suspend the static load test weight specified in the work item from the boom or crane structure and hold for a minimum of 10 minutes.
- Remove the test weight.
- Verify no permanent deformation or damage to any components.

B2.4.3 Winch Brake / Modified static load test. The Contractor shall:
- Using an external lifting device, suspend the static load test weight specified in the work item for each hoist from the applicable wire rope assembly and hold for a minimum of 10 minutes.
- Verify that each hoist brake holds without slipping.
- Remove the test weight.
- Verify no permanent deformation or damage to any components.

B2.4.4 Dynamic Overload test. While the Coast Guard inspector raises and lowers each dynamic load specified in the work item from the applicable hoist a minimum of three complete cycles and through as wide a range as practicable; rotates each dynamic load through as wide a range as practicable a minimum of three complete cycles; and tops each dynamic load through as wide a range as practicable; or as specified in the task description, a minimum of three complete cycles starting and stopping each actuator at least twice in each direction every cycle, the Contractor shall verify the following as applicable:
- Each actuator lifts or rotates the dynamic load.

- Each brake stops and holds the dynamic load without slipping.
- No permanent deformation, damage to, or overheating of any components.
- Proper operation of all controls and sensors.
- No unusual vibration or noise is emitted from any component (e.g., winch, actuator, shaft assembly, pin assembly, etc.) and there is no binding or misalignment.
- Verify no leakage from hydraulic components.

NOTE

Relief valve and pressure compensator settings shall not require adjustment in order to conduct this test.

B2.4.5 Rated load test. While the Coast Guard inspector raises and lowers each rated test load specified in the work item from the applicable hoist a minimum of 10 complete cycles and through as wide a range as practicable; rotates each rated load through as wide a range as practicable a minimum of 10 complete cycles; and tops each rated load through as wide a range as practicable; or as specified in the task description, a minimum of 10 complete cycles, starting and stopping each actuator at least twice in each direction every cycle, the Contractor shall verify the following as applicable:

- Each actuator lifts or rotates the rated load at rated speed.
- Each brake stops and holds the rated load without slipping.
- No permanent deformation, damage to, or overheating of any components.
- Proper operation of all controls and sensors.
- No unusual vibration or noise is emitted from any component (e.g., winch, actuator, shaft assembly, pin assembly, etc.) and there is no binding or misalignment
- Verify no leakage from hydraulic components.

B2.5 Anchor windlass.

B2.5.1 Capstan operational test. The Contractor shall test each capstan associated with the anchor windlass system as specified below.

B2.5.2 Wildcat operational test. With the vessel waterborne, and while the Coast Guard Inspector raises and lowers each anchor individually from the hawse pipe to the channel floor a total of three complete cycles, stopping each anchor in the middle of travel at least once each cycle; operates each pawl and pelican hook; and cycles each mechanical band brake twice as applicable, the Contractor shall:

- Verify that no unusual vibration or noise is emitted from any component (e.g., winch, actuator, each shaft assembly, each pin assembly, etc.) and there is no binding or misalignment.
- Verify that wildcat lifts the rated load at rated speed.
- Verify that the load is held and controlled by each hydraulic disc brake and each operates satisfactorily.
- Verify the load is held and controlled by each mechanical band brake and each operates satisfactorily.
- Verify no leakage from hydraulic components.

B2.6 Capstans. With the vessel waterborne and while the Coast Guard Inspector warps the vessel forward a minimum of 30 feet, then aft a minimum of 30 feet three complete cycles, the Contractor shall:

- Verify that the capstan will warp the vessel.
- Verify proper operation of all controls and sensors.
- Verify the brake sets and releases properly.
- Verify no permanent deformation, damage to, or overheating of any components.

B2.7 Davits.

B2.7.1 Single point davits.

B2.7.1.1 No-load operational test. While the Coast Guard Inspector operates each actuator associated with the davit in both directions a minimum of two minutes by topping the boom (if applicable), rotating the boom, and operating the hoist, the Contractor shall verify:

- All controls and sensors are operating properly.
- No unusual vibration or noise is emitted from any component (e.g., winch, actuator, shaft assembly, pin assembly, etc.) and there is no binding or misalignment.
- Proper setting and release of each brake.

NOTE

During no-load operations ensure sufficient tension is kept on wire ropes to prevent improper wrapping on hoist drum.

B2.7.1.2 Static load test. The Contractor shall:

- Using an external lifting device, suspend the static load test weight specified in the work item from the davit wire rope assembly and hold for a minimum of 10 minutes.
- Verify that the davit hoist brake holds without slipping.
- Remove the test weight from the davit wire rope assembly.
- Verify no permanent deformation or damage to any components.
- Verify no leakage from hydraulic components.

B2.7.1.3 Winch Brake / Modified static load test. The Contractor shall:

- Using an external lifting device, suspend the static load test weight specified in the work item from the davit wire rope assembly and hold for a minimum of 10 minutes.
- Verify that the davit hoist brake holds without slipping.
- Remove the test weight from the davit wire rope assembly.
- Verify no permanent deformation or damage to any components.
- Verify no leakage from hydraulic components.

B2.7.1.4 Dynamic Overload test. While the Coast Guard inspector raises, lowers, and rotates the dynamic load specified in the work item a minimum of three complete cycles and through as wide a range as practicable, and if applicable, tops the dynamic load through as wide a range as practicable a minimum of 3 complete cycles starting and stopping each actuator at least twice in each direction every cycle, the Contractor shall verify the following as applicable:

- Each actuator lifts or rotates the dynamic load.
- Each brake stops and holds the dynamic load without slipping.
- No permanent deformation, damage to, or overheating of any components.
- Proper operation of all controls and sensors.
- No unusual vibration or noise is emitted from any component (e.g., winch, actuator, shaft assembly, pin assembly, etc.) and there is no binding or misalignment.
- Verify no leakage from hydraulic components.

B2.7.1.5 Rated load test. While the Coast Guard inspector raises, lowers, rotates, and if applicable tops the rated load specified in the work item a minimum of 10 complete cycles and through as wide a range as practicable, starting and stopping each actuator at least twice in each direction every cycle, the Contractor shall verify the following as applicable:

- Each actuator lifts or rotates the rated load at rated speed.

- Each brake stops and holds the rated load without slipping.
- No permanent deformation, damage to, or overheating of any components.
- Proper operation of all controls and sensors.
- No unusual vibration or noise is emitted from any component (e.g., winch, actuator, shaft assembly, pin assembly, etc.) and there is no binding or misalignment.
- Verify no leakage from hydraulic components.

B2.7.2 Dual point davits. Contractor shall not use a USCG small boat for operational, dynamic or static load tests of davits.

B2.7.2.1 No-load operational test. While the Coast Guard Inspector operates each actuator associated with the davit in both directions a minimum of 2 minutes by extending and retracting the davit arms and operating the hoist(s), the Contractor shall verify:

- All controls and sensors are operating properly.
- No unusual vibration or noise is emitted from any component (e.g., winch, actuator, shaft assembly, pin assembly, etc.) and there is no binding or misalignment.
- Proper setting and release of each brake.

NOTE

During no-load operations ensure sufficient tension is kept on wire ropes to prevent improper wrapping on hoist drum.

B2.7.2.2 Static load test. The Contractor shall:

- Using an external lifting device, suspend the static load test weights specified in the work item from each wire rope assembly and hold for a minimum of 10 minutes.
- Verify that the hoist brake holds without slipping.
- Remove the test weight.
- Verify no permanent deformation or damage to any components.
- Verify no leakage from hydraulic components.

B2.7.2.3 Winch Brake / Modified static load test. The Contractor shall:

- Using an external lifting device, suspend the static load test weights specified in the work item from each wire rope assembly and hold for a minimum of 10 minutes.
- Verify that the hoist brake holds without slipping.
- Remove the test weight.
- Verify no permanent deformation or damage to any components.
- Verify no leakage from hydraulic components.

B2.7.2.4 Dynamic load test. While the Coast Guard inspector raises, lowers, extends and retracts the dynamic load test weights specified in the work item a minimum of 3 complete cycles and through as wide a range as practicable starting and stopping each actuator at least twice in each direction every cycle, the Contractor shall verify the following, as applicable:

- Each actuator lifts or rotates the dynamic load test weights.
- Each brake stops and holds the dynamic load test weights without slipping.
- No permanent deformation, damage to, or overheating of any components.
- Proper operation of all controls and sensors.
- No unusual vibration or noise is emitted from any component (e.g., winch, actuator, shaft assembly, pin assembly, etc.) and there is no binding or misalignment.
- Verify no leakage from hydraulic components.

B2.7.2.5 Rated load test. While the Coast Guard inspector raises, lowers, extends, and retracts the rated load test weights specified in the work item a minimum of 10 complete cycles and through as wide a range as practicable, starting and stopping each actuator at least twice in each direction every cycle, the Contractor shall verify the following, as applicable:

- Each actuator lifts or rotates the rated load test weights at rated speed.
- Each brake stops and holds the rated load without slipping.
- No permanent deformation, damage to, or overheating of any components.
- Proper operation of all controls and sensors.
- No unusual vibration or noise is emitted from any component (e.g., winch, actuator, shaft assembly, pin assembly, etc.) and there is no binding or misalignment.
- Verify no leakage from hydraulic components.

B2.8 Small boats. The Contractor shall test small boat lifting eyes and slings by performing the following as specified in the task description:

- Collect unit specific data associated with full outfit of the small boat: weight of personnel, weight of fuel, and weight of cargo.
- Weigh the small boat to determine its actual weight.
- Perform calculations to determine the required test weight.
- Submit a CFR listing the test weight value in pounds and all other data and calculations described above. Note any test weight value exceeds 150% of the rated load of the associated davit.

WARNING!

If the CG Inspector or COR determines that the hull weight of the boat exceeds 115% of the "new boat weight" specified in the system specifications or the task description, or if the maximum launch weight exceeds the working load limit of the davit then all further testing of the boat lifting eyes and slings will be suspended until CG Inspector or COR contacts the cognizant Product Line subject matter expert for instructions.

- After the COR has approved the test weight value and all other submitted calculations, the Contractor shall furnish multiple individual test weights whose combined weight shall equal the approved test weight value plus 0% minus 5%. The number of individual test weights shall be equal to or greater than the number of lifting points on the small boat. The test weights shall be fabricated from water bags, or similar soft material or shall be placed on pads to prevent damage to the small boat.
- Determine the optimum arrangement for the test weights on the waterborne small boat and place the test weights accordingly.
- Arrange the test weights so that the tension caused by the added weight is distributed evenly on each strap of the lifting sling and as close to each lifting eye as practicable in conjunction with maximizing overall stability of the boat.
- Suspend the small boat from the lifting slings used during normal operations.
- Using an external lifting device, hoist and suspend the small boat just above the surface of the water and hold for a minimum of 10 minutes.
- Lower the small boat back into the water and verify no permanent deformation or damage to the small boat or the lifting sling. Remove the weights from the small boat and return it to normal operating condition.

B2.9 Label plates. The Contractor shall remove the existing test label plate from the system and fabricate a new 3 inch by 5 inch label plate from 1/16" thick minimum anodized-hydrated aluminum sheet, using printed black lettering for the titles shown in figures B-1, B-2, and B-3 below, as

applicable. Stamp, engrave, etch, or print the test information onto the label plate: system name, contractor name, date of test, and the weight values specified in the work item. Affix in plain view the label plate onto the equipment that was tested using a suitable adhesive.

FIGURE B-1

Operational Test

System _____

Contractor _____

Date _____

FIGURE B-2

Operational and Weight Test

System _____

Contractor _____

Date _____

Rated Load Test Weight _____

_____

Dynamic Load Test Weight _____

Static Load Test Weight

FIGURE B-3

Operational and Weight Test

System _____

Contractor _____

Date _____

Aux Rated Load Test Weight _____
Aux Dynamic Load Test Weight _____

Aux Static Load Test Weight _____
Main Rated Load Test Weight _____
Main Dynamic Load Test Weight _____

Main Static Load Test Weight _____

APPENDIX C

Hydraulic Systems

C1. SCOPE

C1.1 Intent. This appendix describes the requirements for repairing and testing hydraulic systems and components onboard Coast Guard vessels.

C1.2 Requirements. The following paragraphs specify requirements for the associated hydraulic component or task:

TITLE	PARAGRAPH
Fluids	C2.1
Hose assemblies	C2.2
Piping and tubing	C2.3
Valves and manifolds	C2.4
Gages	C2.5
Gas charged accumulators	C2.6
Heat exchangers and fluid coolers	C2.7
Hydraulic system flushing	C2.8

C2. REQUIREMENTS

C2.1 Fluids. The Contractor shall conform to the following requirements when working with hydraulic fluids.

C2.1.1 Renewal. When "Renew" is specified in the task description:

- Drain and dispose of the existing system hydraulic fluids.
- Furnish hydraulic fluids that meet the quantity, type, grade, viscosity, and all other material criteria as specified in the system specifications or in the task description.
- Filter the new hydraulic fluids through one or more three-micron absolute, non-bypass type filters designed specifically for filtering oils and other lubricants.
- Sample and test the new, filtered fluids as specified in paragraph C2.1.3.1 (Fluid sample tests) and submit a CFR prior to installing into the system.

C2.1.2 Filtering. When "Filter" is specified in the task description:

- Furnish a filtering cart/rig equipped with a three-micron absolute filter, a water separator, and a pressure differential gage across the filter element assembly.
- Connect the supply and discharge lines of the filtering cart/rig to the hydraulic system as specified in the system specifications or the task description.

NOTE

The best connection points will minimize filtering time and will maximize the rate at which previously unfiltered fluid passes through the rig/cart. Select points at opposite ends of the reservoir if possible.

- Continuously circulate system hydraulic fluids through the filtering cart/rig for the period specified in the table below based on reservoir size and filter cart/rig pump capacity. Be aware that the Coast Guard Inspector shall be allowed to cycle the system actuators four separate times as described in the notice below during the filtering process.

NOTE

To dislodge and suspend particulate contamination and to heat the fluid to a maximum, constant, steady state temperature, the Coast Guard inspector will cycle all actuators associated with the hydraulic system for a minimum of 20 minutes at the start of the filtering process. The Coast Guard Inspector will repeat this process a minimum of three additional times, equally spaced through the filtering period.

- Renew the filter element a minimum of four times equally spaced through the filtering period or every eight hours, whichever is less, and whenever the pressure differential across the filter element exceeds the filter element manufacturer's specifications.
- Sample and test the system fluids as specified in Table C-1 below, once at the midpoint of the filtering period and once again at the end of the filtering period. Submit a CFR after receiving the test results from both samples. If a Change Request has been authorized by the KO based on the test results, continue filtering as specified.

TABLE C-1

Reservoir Size (gal)	Minimum Filtering Periods Filter Cart/Rig Pump Flow Capacity (GPM)				
	5	10	15	20	25
100	16 hrs	8 hrs	5 hrs	4 hrs	3 hrs
200	32 hrs	16 hrs	11 hrs	8 hrs	6 hrs
300	48 hrs	24 hrs	16 hrs	12 hrs	10 hrs
400	64 hrs	32 hrs	21 hrs	16 hrs	13 hrs
500	80 hrs	40 hrs	27 hrs	20 hrs	16 hrs
600	96 hrs	48 hrs	32 hrs	24 hrs	19 hrs
700	112 hrs	56 hrs	37 hrs	28 hrs	22 hrs
800	128 hrs	64 hrs	43 hrs	32 hrs	26 hrs

C2.1.3 Sample and test. When "Sample and Test" is specified in the task description:

- Allow the Coast Guard Inspector to cycle the system actuators as described in the notice below.

NOTE

Prior to sampling hydraulic fluid in a system, the Coast Guard inspector will cycle all actuators associated with the subject hydraulic system for a minimum of 20 minutes, and until the system fluid reaches a maximum, constant, steady-state temperature, to dislodge and suspend particulate contamination.

- Take at least one fluid sample from the hydraulic system as described in the notice below

immediately following system warm-up and actuator cycling. Take other samples from other points in the system as specified in the task description. Submit each sample to an independent laboratory for analysis, in accordance with all fluid sample test requirements specified below.

NOTE

As a general rule, a volume of oil equivalent to one to two times the volume of oil contained in the sampling line and valve should be displaced before taking the sample. The preferred sampling point is immediately upstream of a return line filter. In the absence of sampling or vent valves, use a pump discharge gage line. Approximately one quart should be drained from gage lines prior to taking a sample. Avoid sampling from a reservoir.

- Submit a CFR including laboratory contamination report.

C2.1.3.1 Fluid sample tests.

C2.1.3.1.1 Sample containers. Sample containers shall be made of glass or plastic. The interior surfaces of sample containers shall be cleanliness Grade A. Use one 8-ounce (250-mL) container per sample.

C2.1.3.1.2 Contamination tests and reports. Samples shall be tested for water and particulate contamination by a chemical analysis laboratory using optical Automatic Particle Counters (APC). Test reports shall describe a level of contamination by solid particles in accordance with ISO 4406 and the level of water contamination in percent by volume or parts per million for each sample taken.

C2.1.3.2 Portable testing apparatuses. Portable particulate and water content counters are acceptable for intermediate testing provided that calibration certification reports are submitted to the COR. Final contamination test results shall be performed and documented by a chemical analysis laboratory as specified above.

C2.1.4 Acceptable contamination level. Unless otherwise specified in the work item or in the system specifications the maximum acceptable levels of contamination are:

- A particulate count of 20/18/15 in accordance with ISO 4406 (Max 10000 particles per milliliter $\geq$ 4 μm max 2500 particles per milliliter $\geq$ 6μm, max 320 particles per milliliter $\geq$ 14μm)..
- A water content of 500 parts per million (ppm) (0.05% by volume).

NOTE

The max contamination levels specified above establish a minimum standard when no max contamination level for the system is specified in a work item or the referenced system specifications. More stringent requirements may exist in the work item or in the system specifications and shall take precedent.

C2.2 Hose assemblies. The Contractor shall conform to the following for hydraulic hose assemblies:

C2.2.1 Renewal. When "Renew" is specified in the task description:

- Disconnect, remove, and dispose of each specified hose assembly.
- Validate each hose's physical properties (e.g., size, length, material, etc.) against the vessel hose log data.
- Fabricate new hose assemblies in accordance with the system specifications and as detailed below.
- Pressure-test each new hose assembly.

- Fabricate and install a hose tag onto each new hose assembly.
- Flush each new hose assembly to remove all contaminates to achieve cleanliness Grade A prior to installation.
- While the Coast Guard Inspector energizes the system and cycles actuators, verify that all disturbed joints are leak free.
- Submit a "hose log data form" as specified below for each new hose assembly.

C2.2.1.1 Hose material and dimensional requirements. Hose assemblies shall conform to SAE J1942-1. All material and mechanical properties of a new hose shall be equivalent to the properties of the hose being renewed, which include but are not limited to pressure rating, burst pressure, minimum bend radius, jacket durability, and fluid compatibility. The inner diameter dimension of a new hose shall be equal to the inner diameter of the hose being renewed.

C2.2.1.2 End fittings.

C2.2.1.2.1 Material and dimension requirements. New end fittings shall be as follows:

- Mild steel crimp type fittings or reusable non-crimp style SST fittings, where the hose assembly will be in the weather or where condensation develops.
- Fabricated from Monel, if the hose assembly fittings being renewed are Monel or other nickel alloys.
- Pressure rated equal to or greater than the new mating hose.
- Compatible with the connection points in the hydraulic system.

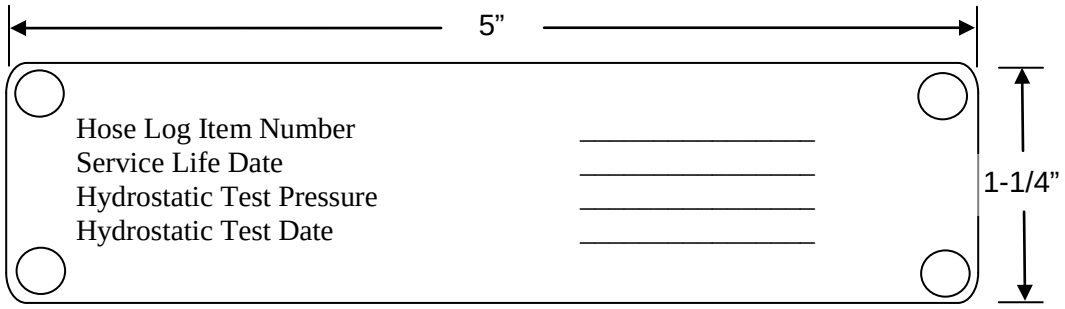
C2.2.1.2.2 Weatherization. When "Weatherize" is specified in the task description, for mild steel crimp type fittings ensure that each fitting is wrapped in a or petroleum wax saturated tape coatings such as "Densil (Densyl) Tape" or equivalent, conforming to ANSI/AWWA C217, after installation (see C3.3 Petroleum wax tape vendors). Follow manufacturer's instructions, to ensure proper installation of the tape.

C2.2.1.3 Pressure testing requirements. Pressure test each new hose assembly to twice its rated working pressure, or twice the design pressure of the hydraulic system, whichever is less. Hold this pressure for 5 minutes. Leakage or permanent deformation is not allowed. Pressure test media shall be either water or a hydraulic fluid compatible with the system fluid. If water is used, the hose assembly shall be drained after the test and blown dry with clean air.

C2.2.1.4 Tagging requirements. Tag each new hose assembly as follows:

- Determine the service life date for each hose assembly.
- For hose assemblies exposed to weather or condensation add five years to the date the new hose assembly was pressure tested if the hose is not specifically designed for these conditions.
- For all other hose assemblies add eight years to the date the hose assembly was pressure tested.
- Permanently stamp, engrave, or etch the following on a metal hose tag as shown in Figure C-1.
- "Hose Log Item Number". This is the new serial number on the "Hose Log Data Form" provided by the unit.
- "Hydrostatic Test Pressure". This is the test pressure in pounds per square inch (psi).
- "Date". This is the date of the test in the format (DD/MM/YY).
- "Service Life Date". This is the date for hose renewal in the format "xQyy" (where "xQ" is the quarter and "yy" is the year, e.g., 12 December 2008 shall be recorded 4Q08).

FIGURE C-1



- Attach each tag to the hose assembly near an end fitting using self-clinching nylon straps or metal wire that will not damage the hose.

C2.2.1.5 Hose log data form requirements. After the COR provides the “Hose Log Data Form” with “UNIT FURNISHED DATA” for each new hose assembly, the Contractor shall provide the new hose information designated by a “*” on the form and submit to COR. A sample form is provided as Form C-1 (Sample Hose Log Data Form).

C2.3 Piping and tubing. The Contractor shall conform to the following requirements when working with hydraulic piping or tubing:

C2.3.1 Renewal or modification. When “Renew” or “Modify” is specified in the task description:

- Renew or modify the specified pipe or tube and all associated fittings as shown on all applicable installation drawings. Where arrangement specifications are silent, arrange the pipe or tube as specified below.
- Pressure test piping or tubing and clean as specified below.

C2.3.2 Arrangement. When arrangement drawings and details are not specified, or when configurations cannot be maintained when renewing or modifying existing arrangements, all material and mechanical properties of new or modified component arrangements shall:

- Meet the properties of the components being renewed or modified, which include but are not limited to base material, pressure rating, and burst pressure. Inner diameter dimensions that affect flow must be maintained.
- Minimize the number of new piping joints through the maximum application of pipe bends, with a minimum radius of 5 outside diameters of the new pipe or tube. Use of flanged, threaded union, or similar takedown joints shall be minimized.
- Locate takedown joints away from bends or offsets where they are least affected by thermal expansion or other external loadings.
- Mechanically attached fittings (e.g., LOCRING or equivalent) are authorized for 2-1/2 inch inside diameter and smaller pipe and tube.
- Install rigid pipe hangers in accordance with MSS SP-58 in accordance with Table C-2 below.

TABLE C-2

Nominal Pipe or Tube Size (inches)	Maximum spacing (feet)
1-1/4 and below	7
1-1/2	9
2	10
2-1/2	11
3	12
3-1/2	13
4	14

C2.3.3 Cleanliness. All internal surfaces of new, modified, or disturbed pipe or tube shall be cleanliness Grade A.

C2.3.4 Pressure testing. Pressure test new modified or piping or tubing in accordance with SFLC Std Spec 0740, Appendix C. System pumps and relief valves shall not be used to perform testing.

C2.4 Valves and manifolds. The Contractor shall conform to the following requirements when working with hydraulic valves and manifolds:

C2.4.1 Renewal. When "Renew" of is specified in the task description for a valve or manifold:

- Remove and dispose of the entire assembly, including all attached electrical actuators and sensors as applicable.
- When not provided Government-furnished property, furnish and install a new assembly or component. If a pressure control valve is part of the assembly, bench set the relief pressure as specified below or set during system grooming.
- Renew all associated mounting fasteners in accordance with the system specifications.

C2.4.2 Disassembly. When "Disassemble and Inspect" of a valve or manifold is specified in the task description, perform the following as applicable in accordance with the system specifications.

- Inspect and test all solenoid assemblies and sensors associated with the valve or manifold and provide results in the CFR.
- Disassemble all solenoid assemblies, sensor assemblies, encoders assemblies, and all other electrical components associated with the valve or manifold, as applicable, and clean all surfaces including electrical contact points to cleanliness Grade A.
- Bench set and label pressure control valves as specified below.

C2.4.2.1 Testing solenoid assemblies. Apply the rated voltage across the valve's electrical actuators to operationally cycle the valve. Verify there is no insulation degradation.

C2.4.2.2 Testing electrical sensors. Actuate and read resistance across sensors, verifying they are in accordance with the system specifications. Verify there is no insulation degradation.

NOTE

Pressure control valves include but are not limited to system relief valves, counterbalance valves, brake valves, pump compensators, and any other pressure regulating or reducing valve.

C2.4.3 Bench setting and tagging pressure control valves. Using a system compatible fluid vent the appropriate ports and adjust the valve in accordance with the system specifications or as specified in the task description, using a calibrated gage. Permanently stamp, engrave, or etch the information below on a new metal tag and attach it to the valve:

- Vessel name and hull number.
- Valve identification number.
- Valve lifting pressure or set pressure.
- Date valve was tested and set.
- Name of repair facility.

C2.4.4 Setting and tagging pressure control valves in place. Set and tag the pressure control valve as described in paragraph C2.4.3 (Bench setting and tagging pressure control valves) except using system pump and fluid to apply pressure to the valve.

C2.5 Gages. The Contractor shall conform to the following requirements when working with hydraulic gages:

C2.5.1 Renewal. When "Renew" is specified in the task description:

- Remove and dispose of each specified gage.
- Furnish new gage(s) in accordance with the system specifications.
- Calibrate each new gage as specified in paragraph C2.5.2 (Calibration).
- Install each new gage in accordance with the system specifications.

C2.5.2 Calibration. When "Calibrate" is specified in the task description:

- Remove each specified gage from the system.
- Calibrate each gage as specified in C2.5.2.2 (Gage Types) with a master gage conforming to paragraph C2.5.2.1 (Contractor's standard gage requirements).
- Attach a calibration cert to each gage as specified in paragraph C2.5.2.3 (Calibration certification).
- Submit a CFR listing each gage calibrated, with nomenclature, location, manufacturer, model, serial number, date of calibration, calibration laboratory, identification of person who performed calibration, and a traceability statement. After approval of a change request by the KO, renew or repair failed gages.
- Install each gage in accordance with the system specifications.

C2.5.2.1 Contractor's master gage requirements. Utilize a master gage whose calibration certification is traceable to an accuracy four times greater than the instrument to be calibrated. Master gages used shall have certificates attesting the date, accuracy, and environmental or other conditions under which the furnished results were obtained.

C2.5.2.2 Gages types.

C2.5.2.2.1 Dial type pressure gages. Accuracy of pressure gages with dial diameters 3.5 inches and larger shall be within 1 percent accuracy, pressure gages with dial diameters between 3.5 inches and 2 inches shall be within 3 percent accuracy, and dial diameters 2 inches and less shall be within 5% accuracy.

C2.5.2.2.2 Dial type thermometers. Accuracy of all direct indicating, bi-metallic, or remote gas filled bulb thermometers shall be within 2% accuracy.

C2.5.2.2.3 All other types of gages. Accuracy of all other types of gages shall be as specified in the task description or the system specifications.

C2.5.2.3 Calibration certification. Clearly label the following data on a calibration certification sticker and affix it to each gage:

- Date calibrated.
- Due date (add 12 months to date calibrated).
- Calibration laboratory.
- Initials or code of person performing calibration.

C2.6 Gas-charged accumulators. When "Disassemble and Inspect", "Disassemble, Inspect", "Service and Inspect", "Service, Inspect", or "Renew" is specified in a hydraulic gas-charged accumulator's task description, after performing all other specified work, charge the accumulator with an inert gas in accordance with the system specifications.

C2.7 Heat exchangers/fluid coolers. The Contractor shall conform to the following requirements when working with hydraulic heat exchangers or fluid coolers:

C2.7.1 Disassembly. When "Disassemble and Inspect" or "Disassemble, Inspect" is specified in the task description, in addition to all other specified work:

- Do not use cleaning equipment or media that will damage the heat exchanger or cooler.
- Pressure test heat exchanger or cooler as specified below. .

C2.7.2 Pressure testing. Perform the following:

- Determine the design operating pressure of the tube side and shell side of the heat exchanger.
- Apply test pressure to the exterior tube walls equaling 125 percent of the working design operating pressure of the tubes and hold for a minimum of 15 minutes. Visually inspect tubes for leaks.
- Apply test pressure to the interior tube walls equaling 125 percent of the working design operating pressure of the tubes and hold for a minimum of 15 minutes. Visually inspect tubes for leaks.
- While maintaining the test pressure on the interior of the tubes, apply a test pressure of 125 percent of the shell's working design operating pressure for a minimum of 15 minutes. Visually inspect shell for leaks.

C2.7.3 Reassembly. Reassemble coolers hat have been coolers; renew the following components, as applicable, in accordance with the equipment manufacturer's recommendations:

- Fasteners (shall be stainless steel).
- Threaded fittings.
- O-rings, gaskets, and seals.
- Hoses between cooler and piping systems, and associated hose clamps.
- Thermostats.

C2.8 Hydraulic system flushing. The Contractor shall conform to the following requirements when working on entire hydraulic systems:

C2.8.1 Flushing. When "high turbulent flush" or "flush" or "standard flush" is specified in a task description for a hydraulic system, note that the "system" includes piping, pumps, valves, motors, cylinders, etc, and includes pressure, return and drainage piping.

C2.8.1.1 Flushing plan. Prepare and submit a written Flushing Plan, as follows:

- Identify and list all piping runs, tubing runs, hose assemblies, etc. in the system that cannot be disassembled and cleaned. Grouping those components together, to the extent practical, identify a series of flushing circuits and describe how each will be connected to a flushing rig; some piping may be part of multiple flushing circuits. Identify the end points of each circuit, and where jumper hoses will be installed around cleanable components within the circuit.
- List fluid flow rate in gallons per minute (GPM) for each flushing circuit to meet minimum flow rate specified below. Estimate the pressure drops which will occur in each circuit. Identify the proposed flushing rig pump capability, and verify that it can support the intended actions. Turbulent flow shall be established and maintained in all piping sections, unless approved by the KO.
- Identify and list each component in the system (pumps, valves, motors, cylinders, hoses, tubing, etc.) which will be disassembled and cleaned. Identify how each component will be cleaned (e.g. cleaned in place, removed for bench cleaning, sent to a subcontractor for cleaning, cleaned with a (hose) pig, flushed as an independent item, etc.) When listing components, group components serving dedicated sections of the hydraulic circuit together. The list shall be in a format which can be used as a check-off sheet.
- Identify how the Contractor intends to ensure cleanliness of components and circuits once cleaned.

C2.8.1.2 Flushing particulars. After the Flushing Plan approval by the COR, flush each circuit using Contractor furnished flushing rig, hoses and adaptors. Clean each component as specified.

C2.8.1.2.1 Circuit flushing.

- Provide a flushing rig/components and fittings necessary to connect to the piping to be flushed. Provide calibrated flow measuring devices, gages and test equipment.
- Provide at least one flow measuring device for each flushing circuit where the circuit has multiple branches with concurrent flow. The flow in the primary or most critical branch shall be monitored. If multiple circuits are flushed concurrently, each circuit shall have flow measuring device. Flow meter calibrations shall be provided to the COR prior to flushing.
- Pressure gages, differential pressure, or duplex pressure gage shall be provided at all output and return ends of installed piping of each flushing circuit, including the ends of all branches to validate the actual pressure drop during flushing. Pressure gages, differential pressure, or duplex pressure gage shall be across flushing rig filters or strainers to determine differential pressure.
- ASTM D4174 shall be used for flushing guidance, except as follows:
    - For central hydraulic systems, or extensive piping networks, temperature and flushing flow rate shall be maintained until the desired minimum fluid contamination level has been reached and remained stable (or decreasing) for at least 10 minutes. Contamination level shall be checked at least once every 10 minutes using calibrated particle counting test equipment. The circuit shall be flushed for a minimum of 1 hour.
    - For simple hydraulic circuits serving one function, and a relatively low total fluid piping volume, temperature and flow rate shall be maintained until the desired fluid minimum contamination level has been reached and remained stable (or decreasing) for at least 10 minutes. Contamination level shall be checked at least once every 5 minutes using calibrated particle counting test equipment. The circuit shall be flushed for a minimum of 20 minutes.
    - All flushing fluid which has gone through the piping to be flushed shall pass through

return filters prior to going into the flushing reservoir. Contamination samples shall be taken at a joint just prior to this return filter.

- Contamination levels shall be identified by ISO 4406 cleanliness code, based on averaged particle counts at 3 different particle sizes (4, 6 and 14 micron). Unless otherwise directed, the target minimum contaminant code level for an operating system shall be to Code 19/17/14. Systems and equipment shall be flushed to a lower contamination level of 18/16/13 or better in order to permit the operating hydraulic system to generate some contaminants. Note that contamination codes shall not be determined or reported in other formats and then "converted" by estimation into ISO 4406 code.
- The condition of flushing unit filters and strainers shall be continuously observed. Whenever a noticeable increase in the pressure drop across filters or strainers is observed, the filter media shall be changed immediately.

C2.8.1.2.2 Flushing fluid minimum flow rate requirements – for a "high turbulent flush". When "high turbulent flush" is required in a work item, ensure the minimum flow rates provided in Table C-3-1 are maintained for each piping leg within a flushing.

TABLE C-3-1. MINIMUM FLOW RATE FOR "HIGH TURBULENT FLUSH"

Pipe Size inside diameter (Inch)	Gal/Min
To 0.5	18
0.5 to 0.75	34
0.75 to 1.0	56
1.0 to 1.25	100
1.25 to 1.5	138
1.5 to 2.0	230
2.0 to 2.5	330
2.5 to 3.0	420

NOTES

1. Table C-3-1 is based on the interior diameter of the piping, and not on the nominal pipe size. Flow rates represent minimum flow needed to achieve a turbulent flow condition and maximize benefits of flushing effort. Flow rates are based on a flow velocity of 25 ft/second – used for removing scale from the walls of carbon steel pipes.

2. If there is a conflict between the pressure and flow rate requirements of this specification, the minimum flow rates shall be governing, unless the design pressure of the piping is exceeded.

3. The use of by-pass (flow control) valves is not allowed downstream of the flow meters.

4. Where a section of piping is fabricated with a larger diameter pipe and is welded to smaller diameter pipe, use the smaller pipe minimum flow rate for flushing.

C2.8.1.2.3 Flushing fluid minimum flow rate requirements – for a "standard flush". When "flush" or "standard flush" is required in a work item, ensure the minimum flow rates provided in Table C-3-2 are maintained for each piping leg within a flushing.

TABLE C-3-2. MINIMUM FLOW RATE FOR "FLUSH" OR "STANDARD FLUSH"

(ISO 32 HYDRAULIC FLUID)

Nom Sch 40 Pipe Size (inches)	Pipe or Tube ID (inches)	Min Flow Rate (GPM)	
		150°F cSt ~ 22.6	180°F cSt ~ 14.2
Up to 1/8	0.269 or less	8	5
>1/8 thru 1/4	0.270 - 0.364	10	7
>1/4 thru 3/8	0.365 - 0.493	14	9
>3/8 thru 1/2	0.494 - 0.622	18	11
>1/2 thru 3/4	0.623 - 0.824	24	15
>3/4 thru 1	0.825 - 1.049	30	19
>1 thru 1-1/4	1.050 - 1.380	39	25
>1-1/4 thru 1-1/2	1.381 - 1.610	46	29
>1-1/2 thru 2	1.611 - 2.067	59	38
>2 thru 2-1/2	2.068 - 2.469	71	45
>2-1/2 thru 3	2.470 - 3.068	88	56

NOTES

1. Table C-3-2 lists minimum flushing fluid flow rates for "various inner diameters of pipe or tube" at required temperature range to achieve turbulent flow; it does not mandate a specific flow rate for each pipe size; rather it provides a reference for the flow rate deemed adequate to achieve the desired end result of a standard flush.

2. Table C-3-2 is based on the interior diameter of the piping, and not on the nominal pipe size. Flow rates represent flow needed to achieve a minimum turbulent flow condition. Flow rates are based on a flow velocity of 12 ft/second – with the express purpose of removing loose contaminates from the walls of pipes.

3. If there is a conflict between the pressure and flow rate requirements of this specification, the minimum flow rates shall be governing, unless the design pressure of the piping is exceeded.

4. The use of by-pass (flow control) valves is not allowed downstream of the flow meters.

5. Where a section of piping is fabricated with a larger diameter pipe and is welded to smaller diameter pipe, use the smaller pipe minimum flow rate for flushing.

C2.8.1.3 Cleaning:

C2.8.1.3.1 Components which are not part of the flushing loop circuits shall be cleaned. They shall be disassembled, inspected, cleaned, repaired, and reassembled with fresh seals. Particular attention shall be paid to last chance filters, internal strainers, internal orifices, pilot piping, and valve spools which may have trapped contamination from the distribution systems; these areas shall be cleaned by hand. Particular attention shall be paid to first components upstream and downstream of the ends of the flushing circuits. After cleaning, the component shall be sealed from re-contamination by cap, plug, plate or appropriate sealing method; rags and duct-taped light-weight plastic are not acceptable.

- If significant damage is found as part of the inspection and cleaning process, a CFR shall document the damage and request direction for further cleaning, repair or replacement.
- The status of components cleaned in place shall be tracked.

- The status of components being removed and shop cleaned shall be tracked.
- The status of components being removed and sent to an outside facility shall be tracked.
- The "cleaning" seals of components being returned for installation shall be reviewed, and appropriate action taken if seal has been voided.
- Determination of ISO 4406 contamination codes and recording of same is not required.

C2.8.1.4 Hoses may be flushed, similar to the flushing circuits but with a small flushing pump, or may be cleaned by alternate appropriate methods. Such methods include cleaning with a compressed air pig system.

- The status of hoses being flushed shall be tracked.
- Hoses shall be inspected for condition.
- Where hoses are cleaned by flushing, at least 40 times the fluid volume of the hose shall be pumped through the hose at high velocity (25 fps).
- Where hoses are cleaned with a compressed air pig system, and a significant amount of contaminate is removed, a second pig may be required.
- Where hoses are not properly installed (too short, too tight radius, with chaffing, etc.) consideration shall be made to replacement in lieu of cleaning, and installation issues corrected. Poor installation practices shall not be repeated. Submit a CFR. Replacement shall be at the direction of the Contacting Officer's Representative.
- Where hoses have achieved at least ½ of their service life, consideration shall be made to replacement in lieu of cleaning. Service life of each hose shall be checked using the Unit's Hose Log database or hose tracking system. Submit a CFR. Replacement shall be at the direction of the Contracting Officer's Representative.
- Where replacement hoses are provided, all of the hose construction data shall be provided in hard copy. See paragraph C2.2
- Hoses shall be capped or plugged to prevent re-contamination, and shall be tagged with the assigned Hose Log database tag id number.
- Determination of ISO 4406 contamination codes and recording of same is not required.

C2.8.1.5 Tubing sections may be flushed, similar to the flushing circuits but with a small flushing pump, or may be replaced.

- The status of tubing sections shall be tracked.
- Particular attention shall be paid to the cleanliness of tubing in case drainage systems, which see little flow and may have accumulated significant silt.
- During flushing, at least 40 times the fluid volume of the tube shall be pumped through the tubing at high speed (25 fps).
- After forming or bending, tubing shall be flushed or may be cleaned by alternate appropriate methods. Cleaned tubing shall be capped or plugged to prevent re-contamination.
- During reinstallation, tubing shall be installed with new seals or ferrules. Installation processes shall ensure that tubing sections are fully seated.
- Determination of ISO 4406 contamination codes and recording of same is not required.

C3. NOTES

C3.1 Fluid contamination code conversion. The following table is provided for historical information only; NAS 1638 is no longer active and shall not be referenced.

ISO 4406 CODE	NEAREST NAS 1638 CLASS
-/23/20	-
-/22/19	-
-/21/18	12
-/20/17	11
-/19/16	10
-/18/15	9
-/17/14	8
-/16/13	7
-/15/12	6
-/14/11	5
-/13/10	4
-/12/9	3
-/11/8	2
-/10/7	1
-/9/6	0
-/8/5	00
-/7/4	-

C3.2 Petroleum wax tape vendors: Known vendors for the petroleum wax tape coating may be reached via the below links:

VENDOR	CONTACT INFORMATION
Denso North America	Tel: 281-821-3355; Fax: 281-821-0304 Web link: http://www.densona.com/pdfs/DensoPetrolatumTapes/Denso-Densyl-Tape.pdf
Specialty Polymer Coatings	Tel: (604) 514-9711; Fax: (604) 514-9722 Web link: http://www.spc-net.com/pdfs/Product%20Data%20Sheet%20Petrolatum%20Tape%20System.pdf
Hisco	Tel: 877.447.2650 Web link: http://www.hisco.com/products
NRI:	Tel: 561-683-6992; Fax: 561-683-8366 Web link: http://www.neptuneresearch.com/products/petrolatum-tape.html

C3.3 Hose log data form. Sample "Hose Log Data Form" is provided below.

FORM C-1 – SAMPLE HOSE LOG DATA FORM

Data Description	UNIT FURNISHED DATA	VENDOR FURNISHED DATA
Hose Serial Number		
System Designation		
Associated Assembly		
Item (Hose/Flex Couple/Exp Joint)		
Designation (Std/Non-Std/CBM)		
Compartment Number		
Ship Maintenance Div (Prop/Aux/Elec)		
MPC Number		
MPC Inspection Period (Months)		
Part Number (if applicable)		
NSN (if applicable)		
Construction (Syn Rubber/Teflon/Metal/Plastic)		
Replacement Periodicity (Months)		
ESWBS Code		
Drawing Ref # (if applicable)		
Tech Pub Ref # (if applicable)		
Remarks		
Special Notes		
Source of Supply (Vendor name)		*
Hose Brand		*
Hose Model #		*
Design Pressure (PSI, minimum)		*
Hose Diameter (inches)		*
Hose Assembly Length (inches)		*
Inlet Fitting Description		*
Inlet Fitting Part #		*
Outlet Fitting Description		*
Outlet Fitting Part #		*
Fabrication Date		*
Hydrostatic Test Date		*
Installation Date		
Inspection Date		
Cost Account (30/45)		

APPENDIX D

DECK MACHINERY SYSTEMS

D1. SCOPE

D1.1 Intent. This appendix describes requirements for the Contractor to perform all work on Coast Guard deck machinery systems.

D2. REQUIREMENTS

D2.1 Fastener assemblies. The Contractor shall conform to the following requirements when working with fastener assemblies:

D2.1.1 Vital fastener assembly renewal. When "Renew" is specified in the task description, verify that the existing fastener installed complies with the system specifications. Install new vital fastener assemblies identical in type of head, nominal size, threads per inch, thread class, length of thread, overall length, material grade, material class, and all other dimensional and mechanical properties to those assemblies being renewed.

D2.1.2 Anti-seize. Threaded surfaces of all new or disturbed fasteners installed in systems exposed to the weather shall be coated with a commercial anti-seize compound prior to reinstallation. The compound shall not contain lead or copper.

D2.1.3 Vital fastener assembly checks. Torque all new and disturbed vital fastener assemblies in accordance with the system specifications or as specified in the work item.

D2.1.4 Certified fasteners. When "Provide certified fasteners" is specified in the task description, submit certification to the COR stating:

- Two of the fasteners from each heat of steel have been tested to meet or exceed minimum strength and maximum hardness for the grade of fastener being renewed.
- A minimum average Charpy impact energy value of 30 ft-lbs (40.6 Joules) at zero degrees Fahrenheit obtained from three tests with no single test value less than 22 ft-lbs (29.8 Joules) was obtained from each fastener tested.

D2.2 Wire rope assemblies. The Contractor shall conform to the following requirements when working with wire rope assemblies:

D2.2.1 Renewal. When "Renew" is specified in the task description:

- Furnish and install a new wire rope assembly in accordance with the material construction specified below.
- Submit to COR documentation certifying the new wire rope assembly has been pull tested as specified below.
- Pressure lubricate new wire rope assembly prior to installation as specified below.
- Install running rigging under tension and verify proper wrapping on winch or hoist drum.
- Verify that wire rope assemblies installed on crane hoist and davit hoist drums are of

adequate length as specified below.

D2.2.1.1 Construction type and dimensions. New wire rope shall be equal in length, nominal diameter, construction, and acceptable breaking strength to the wire rope assembly being renewed. Unless otherwise specified in the task description or system specifications, furnish wire rope that conforms to Fed Spec RR-W-410, ASTM A1023, or API Specification 9A.

- For running rigging, furnish class 6x37, uncoated, independent wire rope core (IWRC), right regular lay (RRL) wire rope or Dyform-18, rotation resistant wire rope.
- For standing rigging furnish class 6x19, uncoated, independent wire rope core (IWRC), right regular lay (RRL) wire rope.

D2.2.1.2 End fitting types. Install only one-hundred percent strength efficiency end fittings onto the wire rope in accordance with system specifications. Install only end fittings that are compatible with all existing lifting appliances. Install either poured spelter, poured resin, permanently swaged, or fiege type end fitting onto the wire rope as specified in the work item or system specifications. When end fitting type is not specified, use poured spelter type end fittings.

D2.2.1.3 Pull tests and certification. Contractor shall provide documentation certifying the wire rope assembly has been pull tested to the tension specified in the work item prior to use. When pull test tension is not specified, Table D-1 shall be used for required pull test tension.

TABLE D-1
DYFORM-18, 6X19 AND 6X37 IWRC RRL

Wire Rope Nominal Diameter (inches)	Pull Test Tension in Pounds (40% of the acceptable breaking strength)		
	Improved Plow Steel (IPS) (uncoated)	Extra Improved Plow Steel (EIPS or XIPS) (uncoated)	Extra Extra Improved Plow Steel (EEIPS or XXIPS) (uncoated)
1/2	8,960 (+448 -0)	10,400 (+520 -0)	11,680 (+584 -0)
9/16	11,280 (+564 -0)	13,120 (+656 -0)	14,800 (+740 -0)
5/8	14,000 (+700 -0)	16,080 (+804 -0)	18,160 (+908 -0)
3/4	20,000 (+1000 -0)	22,960 (+1148 -0)	25,920 (+1296 -0)
7/8	26,960 (+1348 -0)	31,040 (+1558 -0)	35,040 (+1752 -0)
1	35,040 (+1752 -0)	40,320 (+2016 -0)	45,520 (+2,276 -0)
1-1/8	41,040 (+2,052 -0)	50,720 (+2536 -0)	57,200 (+2,860 -0)

D2.2.1.4 Lubrication. Pressure-lubricate new wire rope assemblies with lead-free grease specifically designed for use on wire ropes installed in salt water marine environments. The grease shall be compatible with pressure lubrication equipment.

NOTE

Environmentally friendly lubricants are preferred.

D2.2.1.5 Crane and davit wire rope assembly post installation inspections. Verify the wire rope assembly is properly attached to the hoist or winch drum in accordance with the system specifications. Verify the winch drum is not overfilled with rope. While the Coast Guard inspector operates the machinery and lowers the hook to the position where during normal operations the maximum amount of wire rope is unwrapped from the drum, verify the minimum number of wraps specified in the system specifications are on the drum.

NOTE

The above inspection verifies that a wire rope assembly installed is of sufficient length. Typically, winch and hoist system specifications require a minimum of 2-1/2 to 5 wraps, or dead-turns, of wire rope on the drum when the wire rope is fully paid-out.

D2.3 Brakes and clutches. The Contractor shall conform to the following requirements when working with brakes and clutches:

D2.3.1 Friction disc renewal. Contractor shall renew friction discs when "Service" or "Disassemble" is specified in the task description for a brake or clutch, in accordance with the system specifications or as specified in task description.

D2.3.2 Hydraulically operated brakes and clutches. Contractor shall verify air is removed from pistons, cylinders, and hoses or tubes leading to new, disassembled, serviced, or disturbed hydraulically operated brakes and clutches prior to placing them back in service.

D2.4 Open gearing and gear reducers. The Contractor shall conform to the following requirements when working with open gearing and gear reducers:

D2.4.1 Open gearing lubrication. When lubricant is not specified in the task description or system specifications, Contractor shall use a lubricant conforming to MIL-PRF-18458.

D2.4.2 Gear reducer case oil renewal. Contractor shall renew gear case oil when "Service" or "Disassemble" is specified in the task description for a gear reducer, in accordance with the system specifications or as specified in the task description.

D2.4.3 Gear lube oil acceptable contamination level. Unless otherwise specified in the work item or system specifications maximum levels of contamination shall be:

NOTE

The max contamination levels specified below establish a minimum standard when no maximum contamination level for the system is specified in a work item or the system specifications. More stringent requirements may exist in the work item or in the system specifications and shall take precedent.

- A particulate count of -/19/16 in accordance with ISO 4406 (max 5000 particles per milliliter ≥ 6μm, max 640 particles per milliliter ≥ 14μm).
- A water content of 0.1% by volume.