

**SECTION C: INSPECTION OF ENGINEERING SYSTEMS, EQUIPMENT, AND MATERIALS**

**CHAPTER 1: MARINE EQUIPMENT AND MATERIALS**

**A. INTRODUCTION**

This and the following two chapters concern those provisions of Title 46, Code of Federal Regulations (CFR) that apply to the inspection of equipment and materials for use aboard inspected vessels, and to certain items of equipment carried on uninspected vessels. The Commandant is required by statutes and regulations to approve certain equipment and materials before they are installed or used aboard inspected merchant vessels, certain uninspected vessels, and boats. The controlling regulations are contained in 46 CFR, Subchapter Q. The Commandant's approvals of equipment and materials are published in the Federal Register, and in Equipment Lists, Commandant Instruction (COMDTINST) M16714.3A. Terminations of approval are also published in the Federal Register. COMDTINST M16714.3A includes a separate section listing formerly approved instruments, machines, and equipment that may continue to be used as long as they are in "good and serviceable" condition, unless otherwise noted (see chapter 18 of this volume concerning the equipment card index system). The marine inspector is responsible for determining that equipment and materials are manufactured and installed in accordance with the Commandant's standards as required by regulations. This responsibility is imposed because the public has a reasonable expectation that equipment and materials approved by the Coast Guard will perform as intended in an emergency. Some statutes provide penalties for failure of lifesaving equipment to meet the Commandant's requirements (see 46 U.S.C. 3318(a) and (b)).

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**B. REPORTS OF UNSATISFACTORY EQUIPMENT**

When a factory or shop inspection indicates that equipment or materials required to be Coast Guard approved do not meet the applicable requirements, a report of the situation shall be submitted to Commandant (G-MOC), via the chain of command. If these conditions are serious, the officer in charge, marine inspection (OCMI) and district commander shall take immediate steps to suspend approval, pending final action by the Commandant (see 46 CFR 2.75-40). Reports should also be initiated when vessel inspections indicate problems associated with approved equipment and materials. Although a system exists to report equipment failures, relatively "minor" problems or those for which use of a report form is not appropriate can go unrecorded. In addition, the source of a problem may be a regulation or its interpretation. However, if several inspectors report similar experiences, further investigation by higher authority will be undertaken. The inspector is encouraged to discuss even minor types of problems with supervisors and other inspectors. Reports of unsatisfactory equipment or materials should clearly identify the problem, provide samples or pictures if possible, indicate impact, and offer recommendations for correction. This type of feedback is essential for regulations and inspection policies to remain effective.

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C. "ACCEPTED" EQUIPMENT AND MATERIALS

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**1. Introduction** The sections below describe the requirements for approved equipment and materials. Certain equipment and materials not required by regulation to be approved may be "accepted" by the Commandant for use aboard inspected vessels, uninspected vessels, and boats after certain control actions have been taken (e.g., submittal of an affidavit by the manufacturer that applicable standards will be/have been met). Unlike approved equipment and materials, "accepted" items are not normally published in the Federal Register. However, they are listed in Equipment Lists and in the Proceedings of the Marine Safety Council.

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**2. Marine Engineering Equipment** Certain marine engineering equipment, e.g., valves, fittings, and flanges, can be accepted on an affidavit basis if certain regulatory requirements are met (see chapter 18 of this volume).

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**3. Welding Filler Metals** For hull construction, foreign and domestically manufactured filler metals must be tested by the American Bureau of Shipping (ABS) and listed in its publication Approved Welding Electrodes, Wire-Flux, and Wire-Gas Combinations. In those cases where limited application may preclude such listing, acceptance by the Commandant will be based upon a satisfactory procedure qualification by the fabricator. For lifesaving equipment, specific acceptance of the welding procedure shall be obtained from Commandant (G-MVI). Under 46 CFR 57.03-1(e), type E6012, E6013, E6014, E6024, E7014, and E7024 electrodes may be used only when the welding procedure used for a specific electrode is qualified by the marine inspector, in accordance with the requirements of 46 CFR 57. These electrodes may not be used in the following instances:

- a. On lifesaving equipment;
- b. In ship's hull fabrication or repairs that involve butt welds in the shell, strength deck, tank top, strength bulkhead, or longitudinal strength member; and

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- c. On galvanized materials, unless the welding procedures used for the specific electrode are qualified by the inspector in accordance with the procedures outlined in Section 30, Part III of the ABS Rules For Building And Classing Steel Vessels.

Generally, these electrodes may be used in horizontal and flat fillet weld attachment of hull stiffening members, provided the welding procedures are qualified in accordance with Section 30, Part III of the ABS Rules. The inspector may require such workmanship tests as deemed necessary to determine that satisfactory welds are being produced.

**NOTE:** The use of E7024 electrodes is contingent upon periodic weld testing to ensure that adequate weld quality is maintained. Acceptable welds with E7024 rods cannot be determined by a one-time test.

**4. Electrical Equipment**

Manufacturers of electrical equipment may obtain prior acceptance of the products through the Underwriters Laboratories, Inc. (UL) Marine Listing Service. A UL "Marine Listing" or "Marine Listing For Use On Vessels Over 65 Feet" indicates that, in addition to meeting UL standards, a product meets applicable requirements of 46 CFR, Subchapter J (Electrical Engineering). This arrangement has resulted from "Marine Supplements" to certain UL electrical standards, which contain specifications meeting the applicable requirements of Subchapter J. The equipment must be marked "Dripproof," "Watertight," or "Suitable For Use In Corrosive Locations" if it is to be used in a location where the regulations require such enclosures. In such cases, the UL label will indicate the particular listing for the equipment. Electrical equipment not having a UL "Marine Listing" may be accepted by the Marine Safety Center (MSC) on a case-by-case basis.

**5. Ships' Stores and Supplies**

46 CFR, Subchapter N, specifically 46 CFR 147, details items of ships' stores and supplies that must be tested and certificated by the Coast Guard before they may be stowed or used aboard inspected vessels.

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**D. 46 CFR, SUBCHAPTER Q, SPECIFICATIONS**

**1. Introduction** During World War II, it was found that specifications for certain approved equipment and materials provided greater uniformity in their production by various manufacturers. Equipment that met neither the intent of the regulations nor the minimum standards were easily detected and eliminated from service. In 1945, the Commandant established the regulations in 46 CFR 160-164 (Subchapter Q). Its purpose was to consolidate the specifications for equipment and materials that were required to be approved by the Commandant, or to meet certain minimum standards. Also, requirements for the operation and construction of inspected vessels were distinguished from specifications applicable to the manufacturers of approved equipment and materials used aboard vessels.

**2. Application** Each item approved under Subchapter Q is assigned a basic approval number. This includes the number of the CFR subpart under which an item was approved, thus identifying the general requirements for its approval. No two specifications have the same number. Subchapter Q has been separated into six parts:

TYPE		CFR CITE
a.	Approval of Equipment and Materials (general)	46 CFR Part 159
b.	Lifesaving Equipment	46 CFR Part 160
c.	Electrical Equipment	46 CFR Part 161
d.	Engineering Equipment	46 CFR Part 162
e.	Construction	46 CFR Part 163
f.	Materials	46 CFR Part 164

Each specification in Subchapter Q is complete, prescribing corollary specifications, materials permitted to be used, types and sizes of equipment, construction and workmanship requirements, markings, and inspections required, and procedures for obtaining the Commandant's approval, if required. Although these specifications are intended primarily for the benefit of the manufacturer, the inspector also benefits from the consolidation of applicable requirements.

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3. **Certification of Approvals** Manufacturers of items considered satisfactory for the purpose(s) intended are issued an approval certificate by the Commandant. Notice of the approval and the item's approval number are published in the Federal Register and Equipment Lists. The approval number applies only to an item that is manufactured in accordance with approved plans, specifications, or other data submitted during the approval process. An item that is manufactured with changes in design, or with materials that are not previously approved by the Commandant, is not "approved" under the approval number listed for a particular item.
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**E. COMMERCIAL DIVING EQUIPMENT**

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**1. Introduction** The objective of the Coast Guard's commercial diving regulations, contained in 46 CFR 197, is to set minimum safety standards for the diving industry. Compliance is verified by marine inspectors coincident with other inspection activities. Inspection of diving equipment and facilities shall be conducted when diving operations occur on:

- a. Vessels inspected for certification;
- b. Deepwater ports; and
- c. Structures and mobile offshore drilling units (MODU's) operating on the Outer Continental Shelf (OCS) of the U.S.

Marine inspectors shall be familiar with the requirements of 46 CFR 197. Volumes I and II of the U.S. Navy Diving Manual, Naval Ship Systems Command (NAVSHIPS) 0994-001-9010, contain useful information about diving equipment and operations.

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**2. Equivalent Equipment, Materials, and Procedures** Under 46 CFR 197.206, the Coast Guard may accept equivalent equipment, materials, and procedures for use in diving operations. Such acceptances shall be approved by Commandant (G-MOC), which can be reached at (202) 267-1464.

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**3. Pressure Vessels for Human Occupancy (PVHO's)**

- a. PVHO's used in commercial diving operations within Coast Guard jurisdiction must have acceptable certification. This will take one of the following forms:
  - (1) PVHO's already certified and stamped in accordance with 46 CFR, Subchapter F.
  - (2) PVHO's already certified and stamped in accordance with the American Society of Mechanical Engineers (ASME) PVHO-1.
  - (3) PVHO's contracted for or constructed before 1 February 1979 that were submitted to the Coast Guard for approval prior to 1 February 1984. Design drawings and calculations must be submitted no later than 31 May 1984. If not, see subparagraph E.3.a.(4) below.

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- (4) Any other PVHO without USCG or ASME PVHO-1 certification and stamping must have plans and specifications approved by the Coast Guard as meeting ASME PVHO-1, and be tested to the satisfaction of the cognizant OCMI before it may operate.
- b. Any PVHO in use within U.S. jurisdiction not fitting any of these criteria is being used in violation of the regulations.
- c. Inspection and testing by OCMI's of PVHO's not already certified per subparagraph E.3.a above should include, as a minimum, a thorough visual exam, pneumatic or hydrostatic test, operational check, and appropriate nondestructive testing (NDT) of the welded joints. NDT would not normally include radiography unless either MSC review indicates it is necessary to satisfy code requirements or OCMI inspection revealed information indicating such testing was necessary. This information could include material condition, operational history and repair history (e.g., heavy corrosion, surface defects in welds, exposure to high temperatures, etc.).
- d. Following satisfactory review by the MSC and testing to the satisfaction of the cognizant OCMI, a letter shall be issued by the OCMI identifying the PVHO and its operating parameters. This letter shall be available at the dive location.
- e. Technical review criteria developed by Commandant (G-MTH-2) is available at the MSC. Questions regarding same should be referred to the MSC.
- f. Other approved PVHO's and diving system pressure vessels that are permanently installed shall be considered as part of the vessel and likewise be inspected under Subchapter F.
- g. Approved PVHO's and all other diving system pressure vessels that are temporarily installed shall be considered separate from the vessel, and inspected under 46 CFR 197.462 (except for compressed gas cylinders).
- h. U.S. made compressed gas cylinders may be accepted for use in a diving system, provided they comply with 46 CFR 197.338. Those of foreign manufacture may be used, provided that:
  - (1) U.S. made, Department of Transportation (DOT) approved cylinders are not readily available;
  - (2) They have been hydrostatically tested within the past 5 years; and

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- (3) The standards of their manufacture shall be compared with 46 CFR 173.34 and 49 CFR 178 to verify equivalence before they are accepted. The OCMI's analysis of foreign standards shall be forwarded to Commandant (G-MOC) for review.
- i. Permanently installed diving system piping shall be inspected under Subchapter F; temporarily installed piping shall be inspected under 46 CFR 197.

**4. Dynamically-Positioned Vessels and "Liveboating"**

Introduction

- a. Introduction. When the commercial diving regulations were written in 1978, dynamically-positioned (D-P) vessels were not addressed. At that time little, if any, interest was expressed in their use in U.S. waters. More recently, D-P vessels have gained in popularity; they are expected to become more widely used in the future. A problem has arisen in the application of 46 CFR 197, in that the definition of "liveboating" could be strictly interpreted to include D-P vessels, due to their use underway (i.e., not anchored or moored). However, the Commandant recognizes the unique characteristics of D-P vessels and their overall superior performance in North Sea operations.

Application of Diving Requirements

- b. Application of Diving Requirements. For purposes of applying the requirements of 46 CFR 197, a D-P vessel shall be considered to be any vessel that uses an automated station-keeping device to operate its propulsion systems, so as to keep the vessel in a relatively stationary location. The following guidelines shall be applied in interpreting the regulations relative to D-P vessels:
  - (1) The D-P and its propulsion systems shall be fully operational under all conditions likely to occur during the diving operation.
  - (2) The master of the vessel shall be experienced and thoroughly familiar with the vessel's installations, as well as the nature of the underwater work being conducted.
  - (3) All diving activities shall employ a diving bell in a moon-pool arrangement. The bell's umbilical shall be held in constant tension to prevent fouling the vessel's screws. Divers' umbilicals from the bell shall be of sufficient length that they, likewise, cannot foul the vessel's screws.
  - (4) Surface diving activities shall not be conducted from D-P vessels.

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Application of 46  
CFR 197.436  
Requirements

- c. Application of 46 CFR 197.436 Requirements. Only the following provisions of these regulations shall be applied to D-P vessels engaged in diving activities:
- (1) Paragraph 197.436(a)(1) Vessel station-keeping abilities;
  - (2) Paragraph 197.436(a)(4) Rescue boat availability; and
  - (3) Paragraphs 197.436(c)(2)-(7) Diving supervisor's responsibilities.
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**F. MISCELLANEOUS INSPECTIONS OF EQUIPMENT AND MATERIALS**

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**1. Introduction** Occasionally, Coast Guard marine inspectors are called upon to inspect boilers, pressure vessels, and other equipment and materials of Coast Guard units and federal, state, and local agencies. For example, a hull inspector may be requested to assist in the survey of a Coast Guard small boat, or a machinery inspector may be asked to investigate a boiler casualty aboard a government vessel. The Commandant desires inspection personnel to fulfill such requests as time and local resources permit. Records of such activities shall be made on the forms supplied by requesting agencies or on forms produced locally. Reports shall be made in accordance with the policy in chapter 3 of this volume.

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**2. Materials and Equipment Obtained for Coast Guard Use**

a. **General Provisions.** As directed by the Commandant or requested by the district commander, the OCMI shall supervise the inspection of equipment and materials purchased for Coast Guard use, in accordance with the contract, purchase order, plans, or specifications furnished. It is contemplated that marine inspectors will examine materials and equipment such as boilers, machinery, auxiliaries, related fittings, and other materials normally inspected for use in the marine industry. The inspector shall interpret plans and specifications as fully as practicable; when questions or doubts arise, the matter shall be referred to the OCMI, the district commander, or the Commandant, as appropriate.

**Duties of the Marine Inspector**

- b. **Duties of the Marine Inspector.**
- (1) To become familiar with the contract and specifications for the material(s), and all related correspondence;
  - (2) To become acquainted with the flow of production and shipment so that progress of the work may be reported periodically;
  - (3) To assist the manufacturer in ensuring that Coast Guard requirements are met; and
  - (4) To report any failure of the manufacturer to fulfill the requirements of the contract, purchase order, plans, specifications, or instructions for the work.

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**3. Definitions**

Full Coast Guard Inspection      a. Full Coast Guard Inspection. This occurs when all materials purchased by a contractor are inspected and tested, in accordance with all requirements of the contract, work order, or other documentation. This type of inspection is rarely required, as it involves very close attention to the work and, probably, assignment of a full-time inspector.

Performance Inspection      b. Performance Inspection. This type of inspection may require operation under "no load" conditions for a period required by the specifications, or demonstration of the load requirements.

**NOTE:** The work documentation must be explicit concerning such requirements.

Surface Inspection      c. Surface Inspection. When this inspection is required, the material shall be visually examined for appearances and imperfections, and critical dimensions shall be checked. No chemical analysis or physical tests need be conducted.

Shipping Inspection      d. Shipping Inspection. This merely requires that materials be properly packed, marked, and shipped in the proper quantities in accordance with the work documentation.