



**U.S. SUPPLEMENT
TO
DNV GL RULES FOR CLASSIFICATION OF SHIPS
AND
INTERNATIONAL CONVENTIONS**

REVISION 0

USCG Approved 08/01/2016

US Supplement to the Annex to the MEMORANDUM OF AGREEMENT between the U.S. COAST GUARD and DNV GL Governing Participation in the Alternate Compliance Program and the Delegation of Certain Survey and Certification Services for United States of America Flagged Vessels.

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1 INTRODUCTION

The supplemental requirements given in this document are those of the United States Coast Guard (USCG) applicable for issuance of a Certificate of Inspection (COI) which are contained in the Code of Federal Regulations (CFR) but not adequately covered by DNV GL Rules for Classification of Ships (October 2015) or International Convention Requirements. This DNV GL U.S. Supplement contains supplemental requirements to Critical Ship Safety Systems as defined by Federal Register, Vol. 63, No. 30 dated 13 February 1998. The DNV GL U.S. Supplement also contains U.S. Interpretations to SOLAS, and additional requirements related to tonnage measurements, loadline, MARPOL 73/78, diving support systems, accommodations for officers and crew, navigation safety, the IBC and IGC Codes, offshore supply vessels and bulk dangerous cargoes. This DNV GL U.S. Supplement is applicable to U.S. Flag new builds or existing vessels that are enrolled in the Alternate Compliance Program (ACP) and classed by DNV GL, issued with, or intended to be issued with, ILCC, MARPOL and SOLAS Certificates and to be issued a COI under 46 CFR Chapter I, Subchapter D "Tank Vessels", Subchapter H "Passenger Vessels", or Subchapter I "Cargo and Miscellaneous Vessels", Subchapter L "Offshore Supply Vessels", or Subchapter O "Certain Bulk Dangerous Cargoes". The requirements for U.S. Flag vessels can be expressed as the sum of:

$$\begin{aligned} & \text{DNV GL Rules for Classification of Ships} \\ & + \\ & \text{International Conventions (SOLAS, Load Lines, MARPOL, etc.)} \\ & + \\ & \text{DNV GL U.S. Supplement (this Document)} \end{aligned}$$

Updated information on current DNV GL U.S. Supplements and authorizations are posted on the USCG ACP web site, specifically <http://www.uscg.mil/hq/cg5/acp/>.

The U.S. Supplements are cumulative documents. The process used to arrive the previous versions of the DNV and GL U.S. Supplements was a consideration of the Critical Ship Safety Systems (as given in the Federal Register 63, issued 13 February 1998, p. 7495-7499), plus other references to the Code of Federal Regulations, and reviews by the USCG and DNV GL. The last version of the DNV Supplement, Version 11, was based on version 10 and incorporated rule updates, Subchapter L for offshore supply vessels, and US interpretations to SOLAS Ch. II-2 for passenger vessels.

This current version is the first DNV GL U.S. supplement that is based on the DNV GL combined rule set, which was created subsequent to the merger of Det Norske Veritas and Germanischer Lloyd. This supplement is likewise based on the previous DNV and GL U.S. Supplements incorporating current rules, requirements and interpretations as of December 2015. The new DNV GL rules for ships entered into force on January 1, 2016. For vessels built according to the new DNV GL rules this supplement will be applied.

The previously issued supplements by both DNV and GL will continue to be available for use by vessels built according to DNV or GL legacy rules. The legacy rules for ships will be phased out in December 2017. After this date, all DNV GL new build vessels will be built under DNV GL rules only.

1.1 Extent of Authorization

The Alternate Compliance Program (ACP) is a voluntary, alternate process for a U.S. flag vessel to obtain a Certificate of Inspection (COI) from the U.S. Coast Guard. As stipulated in Navigation and Vessel Inspection Circular (NVIC) 02-95 (current version), a Class society participating in the program must be both recognized and authorized by the USCG in accordance with the requirements given in NVIC 02-95 (current version), Enclosure 1. ACP is a separate, additional authorization granted by the USCG to class societies able to meet these requirements. DNV GL is currently authorized to approve drawings, perform surveys, and issue the following statutory certificates on behalf of the USCG ("delegated authorizations"):

- International Load Line

- International Tonnage
- U.S. Regulatory Tonnage
- SOLAS Passenger Ship Safety Certificate (PSSC)
- SOLAS Cargo Ship Safety Construction
- SOLAS Cargo Ship Safety Equipment
- SOLAS Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk
- SOLAS Certificate of Fitness for the Carriage of Liquefied Gases in Bulk
- MARPOL 73/78 Annex I, International Oil Pollution Prevention (IOPP)
- MARPOL 73/78 Annex II, Noxious Liquid Substances in Bulk (NLS)
- MARPOL 73/78 Annex III, Packaged Harmful Substances (for vessels enrolled in ACP only)
- MARPOL Annex V, Garbage Pollution Prevention (for vessels enrolled in ACP only)
- MARPOL 73/78 Annex VI, International Air Pollution Prevention (IAPP only, EIAPP is to be issued by EPA)
- MARPOL 73/78 Annex VI, International Energy Efficiency (IEE)
- International Anti-fouling System (IAFS) International Safety Management (SMC and DOC)
- Certificate of Fitness for the Transport and Handling of Limited Amounts of Hazardous and Noxious Liquid Substances in Bulk on Offshore Support Vessels (resolution A.673(18), as amended)

In addition, DNV GL is authorized to approve Cargo Securing Manuals and the Document of Compliance for Carriage of Dangerous Goods on behalf of the USCG. The current list of class society authorizations can be found here: <https://www.uscg.mil/hq/cg5/acp/>.

1.2 Enrollment and Participation in ACP

The procedures for vessel enrollment, as well as class society participation, in the Alternate Compliance Program (ACP) are described in the USCG Navigation and Vessel Inspection Circular (NVIC) 2-95 (current version), <http://www.uscg.mil/hq/cg5/nvic/pdf/1995/n2-95ch2.pdf>. For all situations when an owner wants to enroll his vessel in ACP with DNV GL, a meeting should be arranged between owners, USCG, and DNV GL, consideration should also be given to including the shipyard or technical consultant. The process for enrollment into ACP is given in USCG Marine Safety Manual, Vol. II, Section B, Chapter 9.

Newbuildings: At the same time as the yard submits "Request for Classification" to DNV GL, an application (Form CG-3752) should be sent to DNV GL and the responsible local USCG Officer in Charge, Marine Inspection (OCMI) stating that there is a desire for the vessel to be enrolled in the ACP. Both the shipyard and the owner are to send such applications, or an application signed by both parties will be acceptable.

Existing vessels: The owner or operator is to submit an application (CG 3752) to the USCG (OCMI), to have the vessel enrolled in the ACP with DNV GL. The USCG will subsequently authorize DNV GL to commence with the ACP process. A "Hand over Survey" described in NVIC 2-95 (current version) must be conducted.

Re-flagging under ACP: As for existing vessels, the owner or operator is to submit a letter/application (CG 3752) to DNV GL and the OCMI. Any re-flagging project should include meetings between the owner (consultant), the USCG and DNV GL, in order to discuss the process and the required Vessel Deficiency Report ("Gap-Analysis"). The Marine Safety Center Technical Note MTN 02-05 (current version) as well as NVIC 10-81 (Current Version) are the guiding documents for re-flagging. Very briefly, the reflag and acceptance into the ACP includes, but is not limited to

- Preparation of a Gap Analysis by the owner or his consultant
- Verification of the Gap Analysis by DNV GL, and recommendations for equivalencies or repairs
- Submission of Gap Analysis and documentation list (drawings) to the USCG for approval

- Further meetings/discussions between owners and DNV GL to discuss technical solutions
- DNV GL approval of plans necessary for USCG acceptance
- Approval of Gap Analysis and possible repairs or equivalencies by USCG
- Surveys and inspections, by USCG and DNV GL
- Total duration of this process is expected to be around 6 months

The USCG accepted Gap Analysis augments the definition of the standards applied to the specific vessel. Please note the requirement of existing ships transferring to U.S. Flag to meet the probabilistic dry cargo ship damage stability requirements, see Section 9.

Guidance Note:

Re-flagging under the Maritime Security Program (MSP) is different and involves less rigorous steps than ACP. Guidance may be found in NVIC 01-13 (current version), or contact DNV GL Flag Liaison for information (Flag.North.America@dnvgl.com).

Withdrawal from ACP: The owner is to inform the USCG in writing, with copy to DNV GL. Data from the time the vessel was enrolled in ACP will be transferred from DNV GL to the USCG, and entered into the USCG database. Even after withdrawal from ACP the owner has the option of requesting DNV GL to survey and issue individual certificates on behalf of the USCG, however, the level of oversight may be different compared to that under an ACP scheme. Alternatively, the owner may request subsequent statutory surveys and issuance of certificates directly to the USCG.

Marine casualty reporting: In accordance with 46 CFR Part 4, the vessel's owner, agent, master, operator or person in charge shall notify the nearest USCG Sector Office whenever a vessel is involved in a marine casualty. In accordance with DNV GL Rules, the Master is also to report any damages affecting class or statutory matters to DNV GL and DNV GL will ensure the CG was notified. DNV GL will take appropriate action, including surveys, and will also coordinate any such activity with the OCMI. The following is a list of reportable marine casualties as defined in 46 CFR 4.05-1 "Notice of Marine Casualty", cite:

Immediately after the addressing of resultant safety concerns, the owner, agent, master, operator, or person in charge, shall notify the nearest Marine Safety Office, Marine Inspection Office or Coast Guard Group Office whenever a vessel is involved in a marine casualty consisting of:

- 1) An unintended grounding, or an unintended strike of (collision with) a bridge;*
- 2) An intended grounding, or an intended strike of a bridge, that creates a hazard to navigation, the environment, or the safety of a vessel, or that meets any criterion of paragraphs (3) through (7);*
- 3) A loss of main propulsion, primary steering, or any associated component or control system that reduces the maneuverability of the vessel;*
- 4) An occurrence materially and adversely affecting the vessel's seaworthiness or fitness for service or route, including but not limited to fire, flooding, or failure of or damage to fixed fire extinguishing systems, lifesaving equipment, auxiliary power-generating equipment, or bilge pumping systems;*
- 5) A loss of life;*
- 6) An injury that requires professional medical treatment (treatment beyond first aid) and, if the person is engaged or employed on board a vessel in commercial service, that renders the individual unfit to perform his or her routine duties; or*
- 7) An occurrence causing property-damage in excess of \$25,000, this damage including the cost of labor and material to restore the property to its condition before the occurrence, but not including the cost of salvage, cleaning, gas-freeing, dry-docking, or demurrage.*

DNV GL conditions of class, non-conformities, and USCG form CG-835: Normally, all outstanding deficiencies (class and statutory) will be issued as a Condition of Class (CC) or Conditions on behalf of Flag Administrations (CA) by DNV GL, and subsequently surveyed/deleted by DNV GL. The USCG has access to the DNV GL system to view such Conditions, and will at any time know the status of the CC/CA. The USCG may also issue outstanding items or deficiencies on USCG Form CG-835, with required action and time limit. A copy of form CG-835 shall be submitted to DNV GL North America Flag Liaison Office.

DNV GL may survey the rectification of the deficiencies and, if found satisfactory, forward a report to the USCG, recommending that the 835 be deleted. The deletion is to be done by the USCG, not DNV GL. The vessel operator shall immediately report any ISM major non-conformities, manning issues & vessel security issues to the nearest USCG OCMI and DNV GL. DNV GL shall consult with the Marine Safety Center and local OCMI regarding any conversions or major repairs.

DNV GL shall notify the local OCMI whenever a survey involves:


- Issuing an International Certificate;
- An internal structural examination, a cargo tank internal examination, or a dry docking (including Underwater survey in Lieu of Dry docking);
- Clearing a Coast Guard issued CG-835;
- An apparent violation of any applicable law or regulation by the vessel's owners, operators, or crewmembers;
- Vessel damages or marine casualties;
- A serious deficiency (i.e. equivalent to a detainable deficiency or a "No-Sail" 835). A list of examples can be found in Appendix 2 of the Procedures for Port State Control.
- A major non-conformity or a significant materiel deficiency that might affect the validity of the Safety Management Certificate (SMC).; or
- A recommendation to revoke or withdraw an International Certificate.
- Suspension or revocation of a class certificate

Certification, COI, exemptions: Based on the reports and certificates issued by DNV GL and vessel compliance with other mandatory drills and inspections as mentioned in NVIC 2-95 (current version), the USCG will issue the final Certificate of Inspection (COI). It is to be emphasized that the endorsement or issuance of a COI is not delegated to DNV GL. NVIC 2-95 (current version) describes the various processes to be followed by DNV GL for vessels enrolled or to be enrolled in the ACP. Some functions are not delegated to DNV GL, such as extension of dry-docking intervals, decisions on underwater surveys in lieu of dry-docking (UWILDs), exemptions or equivalencies from statutory requirements, etc. See NVIC 02-95 (current version), for a full description of activities retained by the USCG for ACP vessels.

Oversight: DNV GL has a quality system certified according to ISO 9001, which is an important element in the USCG oversight. While DNV GL is fully authorized to act on behalf of the USCG as delegated, the USCG conducts oversight of approval and surveys as found appropriate. Procedures for plan review oversight are found in Marine Safety Center Technical Note 04-03 (current version). In general, when plans are approved on behalf of the USCG for an ACP vessel, the USCG requires notification using an approved "Notification Spreadsheet" sent to the Marine Safety Center. Drawings should be in as close to their final form as possible as the USCG does not accept drawings with pending comments. However, minor "For Information" and "surveyor" comments are acceptable. When drawings are selected for oversight, the ACS point of contact identified in the notification worksheet will be informed via email. Items selected for review will be identified using the same information provided in the notification worksheet. All required drawings, approval letters, and supporting documents will be transmitted to the Marine Safety Center (MSC) to the following e-mail address: msc@uscg.mil. The results of the USCG oversight activity will be communicated in an official letter containing observations, non-conformities, or major non-conformities, if any discrepancies are found, and the expected time frame and action for remediation.

The USCG will conduct boarding of vessels and on-site inspections according to USCG Marine Safety Manual, Vol. II, Sect. B, Ch. 9. For new buildings and major conversions, DNV GL's project-specific Project Information Manual will specify additional copies for plans and approval letters; how to record these, and where to send these records.

Maintenance of records: Plans and documents approved on behalf of the USCG for vessels in ACP shall be given two stamps: the standard DNV GL approval stamp, and a USCG ACP specific stamp. Approval letters shall reference the correct U.S. Supplement (this document). DNV GL maintains electronic records of all approved plans and documents, survey reports, and associated records, together with copies of issued certificates. All electronically approved plans and documents are filed in DNV GL's production system, Nauticus Production System (NPS). All non-electronically approved plans and documents are filed and stored in a physical archive. Any DNV GL office can access and view the records in NPS.



Issuance of certificates: Details of the U.S. Flag procedural arrangements are given in DNV GL's Flag Information and Authorizations, FlagIT. DNV GL will issue certificates as authorized in a format which has been reviewed and approved by the USCG. The ACP Liaison shall be notified when any certificates are issued.

2 SUPPLEMENTAL REQUIREMENTS

2.1 Critical Ship Safety Systems

2.1.1 General

This supplement addresses those critical ship safety systems defined by USCG in Federal Register Vol. 63 No. 30, 1998, as not being adequately covered by international standards. Each critical ship safety system shall attain an equal level of safety as required by the USCG regulations. The requirements included in this Section are intended to bridge the gap between the combination of class rules plus international standards, and Coast Guard regulations. The following supplemental requirements relevant to the issuance of all certificates by DNV GL pertaining to SOLAS are given using the appropriate Code of Federal Regulations (CFR) cites. Additional USCG interpretations of the SOLAS requirements not contained in the DNV GL Rules or given in IMO Resolutions are included in Section 10.

2.1.2 Background

As the Alternate Compliance Program has evolved USCG has made efforts to streamline the process for creation of the Class Society U.S. Supplements. The first supplement that was created for the program involved a line by line comparison of class society rules against the requirements in 46 CFR Subchapters D, F, H, I and J. This was a time consuming process and did not result in a comprehensive document that addressed all areas of concern. As a result, the Critical Ship Safety System concept was developed. Using a panel of experts from government and industry, the USCG compiled a list of important shipboard systems, their safety criticality and their expected failure rates. With this subjective risk ranking of systems, the USCG then looked where standard international regulations, such as SOLAS, had requirements that were equivalent to the Code of Federal Regulations. The remaining items that were deemed critical to the USCG but not adequately covered by international regulations became the Critical Ship Safety Systems that all class societies must address when working on behalf of the U.S. Flag. This means that when a Class Society created their U.S. Supplement, they must either document that the Critical Safety System is adequately covered by their rules, or they must include the specific CFR requirement in their supplement. For example, steering gear is an important ship system with high safety criticality, but the USCG judges that SOLAS requirements are equivalent to the rules in the CFR, therefore steering gear need not be addressed in the supplement because all ACP vessels will have a SOLAS certificate. The complete list can be found in the federal Register/Vol.63, No. 30.

2.1.3 Equipment Approvals

2.1.3.1 General

USCG requires USCG approved equipment and materials on US flagged vessels. Type approvals of safety equipment, materials and installations are covered by regulations contained in 46 CFR 2.75. For US flag vessels, USCG type approvals for fire suppression equipment, structural fire protection materials and lifesaving appliances are performed by the USCG as mandated by SOLAS 1974, through USCG accepted independent laboratory testing and inspection. Provisions within the 1996 USCG Authorization Act also allow the use of equipment approved by or on behalf of other governments under certain circumstances. In the case of lifesaving appliances, there must be a reciprocal agreement in place before equipment approved by that country could be used on a US vessel. ACP does not change the requirements to use USCG approved materials and equipment. Therefore, class society approvals do not fulfill the obligations of the USCG, as an Administration, where type approval is required by international convention regulations or this supplement.

The USCG approves applicable SOLAS lifesaving equipment using the IMO Life-Saving Appliance (LSA) Code. For fire protection items, the USCG approves SOLAS materials using the IMO Fire Test Procedures Code and the IMO Fire Safety Systems Code.

Mutual Recognition Agreement (MRA) exists between the U.S. and the European Community (EC), and the U.S. and the European Free Trade Association (EFTA), which address a limited number of items of fire protection, lifesaving, and navigation equipment. The MRA makes it possible for a manufacturer with a European Approval (MED/wheel mark) to obtain USCG approval for certain equipment covered by the MRA. This is accomplished by permitting the "Notified Bodies" responsible for issuing approvals in Europe

to issue USCG approval. Likewise, the USCG is able to issue the European Approval (MED/wheel mark) for manufacturers having a USCG approval if the item is included within the scope of the MRA. It is important to note that this MRA does not change the requirement of using USCG approved equipment and materials on U.S. Flag vessels. It allows an alternative means for obtaining USCG approval. The European Marine Equipment Directive (MED) "wheel mark" is not accepted in lieu of USCG approval. Further guidance is contained in NVIC 8-04 (current version).

Information on non-MRA equipment can be found on the USCG website, Lifesaving & Fire Division (CG-ENG-4), and includes equipment such as lifeboats, fire hose nozzles, portable fire extinguishers, fixed fire extinguishing systems, foam and gaseous fire extinguishing systems, and portable foam applicators.

2.1.3.2 Fire Protection Equipment

USCG type-approved materials and equipment from both U.S. and foreign sources approved in accordance with the procedures contained in 46 CFR 159 will continue to be acceptable, and those items manufactured in a country with which the United States has a Mutual Recognition Agreement in force, or the USCG has found to have an equivalent approval program, will also be acceptable.

Approval through MRA: The following structural fire protection materials approved by the MRA may be used in lieu of USCG type approved materials for ACP vessels.

Item	USCG Type Approval Class
Deck assembly	164.105
Primary deck covering	164.106
Structural insulation ("A" and "B" class)	164.107
Bulkhead panels ("B" class)	164.108
Non-combustible materials	164.109
Structural ceiling	164.110
Draperies, curtains and other suspended textiles	164.111
Interior finish	164.112
Floor coverings	164.117
Fire doors ("A" and "B" class) ¹	164.136
Penetration seals (fire stops)	164.138
Dampers	164.139
Bedding components	164.142
Upholstered furniture	164.144
Fire door control system	164.146

¹ Limited to doors without windows or with total window area no more than 645 cm² in each door leaf. Approval limited to maximum door size tested. Doors must be used with a fire tested frame design.

2.1.3.3 Lifesaving Equipment

Lifesaving appliances must be approved to the appropriate CFR, SOLAS or IMO standard. USCG approved products and systems are accepted regardless of country of manufacture. The USCG recognizes that with the Life-Saving Appliances Code (LSA Code) there exists an acceptable IMO standard for approval.

Equipment carrying a CG type approval number issued under the US-EC or US-EFTA Mutual Recognition Agreements, discussed above in the "General" section, are acceptable.

A copy of the USCG acceptance letter must be provided with each piece of equipment supplied to a U.S. flag ship under these agreements.

In addition, life-saving equipment accepted under the reciprocal acceptance in agreement with Norway may also be used on U.S. flag vessels.

The following life-saving appliances approved by the MRA may be used in lieu of USCG type approved materials for ACP vessels.

Item	USCG Type Approval Class
Lifebuoy self-activating smoke, 15-minute (pyrotechnics)	160.157
Rocket parachute flare (pyrotechnics)	160136
Hand flares (pyrotechnics)	160.121
Buoyant smoke signal, 3-minute (pyrotechnics)	160.122
Line-throwing appliances (pyrotechnics)	160.040
Rigid life raft	160.118*
Automatically self-righting rigid life raft	160.118*
Canopied reversible rigid life rafts	160.118*
FLOAT free (hydrostatic release units)	160.162
Release mechanism for lifeboats, rescue boats, life rafts launched by a fall or falls.	160.133, 160.170
Marine evacuation system	160.175

* The emergency pack is not covered by the MRA.

Where a particular lifesaving appliance or arrangement is required, the Commandant, USCG, may accept any other appliance or arrangement that is at least as effective as that specified. If necessary, the Commandant, USCG, may require engineering evaluations and tests to demonstrate the equivalence of the substitute appliance or arrangement.

Lifesaving appliances carried on board the ship in addition to equipment of the type required under this part must be approved equipment or be acceptable to the cognizant USCG Officer in Charge of Marine Inspection (OCMI).

2.1.3.4 Navigation Equipment

The following navigation equipment approved by the MRA may be used in lieu of USCG type approved materials for ACP vessels.

Item	USCG Type Approval Class
Magnetic compass	165.101
Transmitting magnetic heading device, TMHD (formerly electromagnetic compass)	165.102
Gyrocompass	165.103
Echo sounding equipment	165.107
Speed and distance indication device	165.105
Rate of turn indicator	165.106
Loran-C equipment	165.135
Chayka equipment (Russian terrestrial radio navigation system)	165.136

Global positioning system (GPS) equipment	165.130
Global navigation satellite system (GLONASS) equipment	165.131
Heading control system	165.110
Automatic radar plotting aid (ARPA) ¹	165.120
Auto-tracking aid ²	165.111
Electronic plotting aid ³	165.121
Integrated bridge system	165.140
Voyage data recorder (VDR)	165.150
Gyrocompass for high speed craft	165.203
Shipborne automatic identification system (AIS)	165.155*
Track control	165.112
Radar reflector	165.160

¹ Radar equipment used with ARPA must have separate EU and U.S. Certifications.

² Radar equipment used with ATA must have separate EU and U.S. Certifications.

³ Radar equipment used with EPA must have separate EU and U.S. Certifications.

* Radio transmitter is required to be authorized by U.S. Federal Communications Commission (FCC).

Radars are not covered by the MRAs. Only associated radar equipment such as ARPA, ATA and EPA are included in the MRAs. The USCG does not approve radars. In the U.S., the Federal Communications Commission (FSS) is responsible for the certification of radars. Therefore, the manufacturers of radars must obtain the FCC certification independently from the USCG approval process. For example, a European manufacturer may have a radar unit that includes the ARPA feature and would like to supply it to a US Flag vessel. This leads to two situations:


- (1) If the manufacturer has the MED authorization for the ARPA feature, then they may also obtain USCG approval of the ARPA under the MRA. However, the manufacturer must obtain the FCC certification on the radar before the combination radar/ARPA unit is installed on the U.S. vessel.
- (2) If the manufacturer has the USCG approval for the ARPA feature, then they may also obtain the wheel mark for the ARPA under the MRA. However, the manufacturer must obtain the [European approval] of the radar separately.

Ship borne automatic identification systems (AIS) contain radio transmitters and therefore must be type approved by the Federal Communications Commission (FCC) under Subpart J of 47 CFR 2. For MRA approval by the Coast Guard the ship borne AIS design, test reports, and quality system audit should be reviewed by the Coast Guard, in accordance with the procedures in this directive prior to FCC authorization. The Coast Guard will provide a USCG certificate of approval under the MRA. The Coast Guard will transmit a copy of this approval to the FCC for its use in approving the equipment. If the AIS has been approved by an EC or EEA EFTA Notified Body the transmitter must be approved by the FCC before the equipment can be installed on board a US flagged vessel.

2.1.3.5 Portable Accommodation Modules

All portable units built for and/or installed on US inspected vessels/facilities must follow the USCG regulations outlined within **CG-ENG Policy Letter No. 01-16** (latest revision) and be approved for use. All portable accommodation modules (PAM), or containerized workspace units must meet USCG standards for design, plan review, installation, inspection and documentation. The installation of containerized workspaces onboard all DNVGL ACP vessels must be reviewed and approved by DNVGL in accordance to the policy letter referenced.

Containerized modules which are required to be approved by the USCG include sleeping cabins, offices, hospitals, recreational spaces, dining spaces, lavatories, galleys, laundries, laboratories, workshops, wireline units, mudlogger rooms, ROV control rooms, dive control rooms, and any other similar spaces. The installation of such workspaces onboard DNVGL ACP vessels must be reviewed by DNVGL for the



following; arrangements, systems, stability, tonnage, documentation, etc. For all applicable regulations and procedures please reference the CG-ENG Policy letter 01-16 (latest revision).

In addition to the installation requirements, DNVGL may provide approval for plan review in lieu of the Marine Safety Center Approval. In order for DNVGL to provide an approval the appropriate OCMI must be contacted and must accept such an arrangement. The DNVGL approval shall be to the standards contained within CG-ENG Policy Letter No. 01-16. However, the USCG regulations allows for equivalent standards to be accepted in lieu of the standards listed in the CG-ENG Policy Letter 01-16. The current list of accepted alternative standards may be provided by Marine Safety Center.

3 46 CFR SUBCHAPTER D – TANK VESSELS

3.1 Tank Vessels – Lifesaving

3.1.1 46 CFR 199

Note: For US Interpretations to SOLAS, see Section 10 of this Supplement.

Cite: 46 CFR 199.03 Relationship to international standards

For purposes of this part, any vessel carrying a valid Passenger Ship Safety Certificate supplemented by a Record of Equipment, or a valid Cargo Ship Safety Equipment Certificate supplemented by a Record of Equipment, is considered to have met the requirements of this part if the equipment meets §199.40 and if, in addition to the requirements of SOLAS Chapter III, the vessel meets the following requirements:

- (1) Each new lifeboat and launching appliance on a tank vessel may be of aluminum construction only if its stowage location is protected with a water spray system in accordance with §199.290(b).
- (2) Each child-size lifejacket and immersion suit must be appropriately marked and stowed separately from adult or extended-size devices as required in §199.70(b)(2).
- (3) Each lifejacket and immersion suit must be marked with the vessel's name in accordance with §199.70 (b) (3) and (c) (3).
- (4) Inflatable lifejackets, if carried, must be of the same or similar design as required by §199.70(b).
- (5) Containers for lifejackets, immersion suits, and anti-exposure suits must be marked in block capital letters and numbers with the quantity, identity, and size of the equipment stowed inside the container. The equipment may be identified in words or with the appropriate symbol from IMO Resolution A.760 (18) as specified in §199.70(d).
- (6) Instructions for passengers and other non-crew must include illustrated instructions on the method of donning lifejackets as required in §199.80(c) (5).
- (7) Each life raft must be arranged to permit it to drop into the water from the deck on which it is stowed as required in §199.130(c) (3).
- (8) Lifeboats and rescue boats must be arranged to allow safe disembarkation onto the vessel after a drill in accordance with §199.110(h).
- (9) The requirements for guarding of falls in §199.153 (e) and (g) must be met.
- (10) The winch drum requirements described in §199.153(f) must be met for all survival craft winches, including multiple drum winches.
- (11) The maximum lowering speed requirements for launching arrangements using falls and a winch in §199.153 (i) and (j) must be met.
 - (i) The lowering speed for a survival craft loaded with all of its equipment must be not less than 70 percent of the speed required under paragraph (h) of this section.
 - (j) The lowering speed for a fully loaded survival craft must be not more than 1.3 meters per second (256 feet per minute).]
- (12) An auxiliary line must be kept with each line-throwing appliance in accordance with §199.170(c) (2).
- (13) Immersion suits must be carried on all cargo vessels except those operating between the 32 degrees north and 32 degrees south latitude in accordance with §199.273.
- (14) Vessels carrying immersion suits must conduct drills in accordance with §§199.180 (d) (11) and (d) (12).

Cite: 46 CFR 199.30 Equipment approval / definitions

Approved lifesaving appliance means carrying an approval granted by the Commandant under subchapter Q (46 CFR 159-165) of this chapter. For other definitions, see 46 CFR 199.30.

3.2 Tank vessels – Machinery and Hull

3.2.1 46 CFR 32

Cite: 46 CFR 32.20 5 Equipment installations

The pressure vacuum relief valve shall be of a type and size approved by the Commandant for the purpose intended. For specifications, procedures, and approval, see 46 CFR 162.017.

Cite: 46 CFR 32.50 30 Pumps, piping and hose for cargo handling

Cargo hose carried on tank vessels must be suitable for oil service and designed to withstand the pressure of the shutoff head of the cargo pump or the pump relief valve setting, less static head, but in no case less than 150 pounds per square inch [10.3 bar].

Cite: 46 CFR 32.52 – 5 (c) Bilge systems

Means shall be provided for controlling the cargo or pump room bilge pumps and their suctions or discharges in order that a flooded pump room may be pumped out. Suitable portable or manually operated pumps may be accepted as complying with this provision, or alternatively, the pump controls shall be arranged so that they are operable from inside the pump room and either from an accessible position outside the pump room, or from the pump room casing above the freeboard deck.

Cite: 46 CFR 32.53 – 10 (b) Inert gas systems

Acceptable types of water seals include the wet and semi-wet type. Other types of seals may be accepted on a case-by-case basis if approval is given by the Coast Guard Marine Safety Center. If a vapor collection system required to meet part 39 of this subchapter is connected to the inert gas system, the instruction manual required by SOLAS II-2, regulation 62.21 must include procedures relating to vapor collection operations.

3.3 Tank Vessels – Firefighting Equipment

3.3.1 46 CFR 34

Cite: 46 CFR 34.05-5 Fire extinguishing systems

A carbon dioxide, clean agent or water spray system must be installed in all lamp and paint lockers, oil rooms, and similar spaces.

Additional requirements to specific fire extinguishing systems are given in Section 10, US Interpretations to SOLAS, of this Supplement.

Cite: 46 CFR 34.05 – 10(a) Portable fire extinguishers

Portable and semi-portable fire extinguishers must be USCG type approved equipment.

Cite: 46 CFR 34.10 – 10 Fire station hydrants, hose and nozzles

The minimum hydrant and hose size shall be 1 ½ inch (38 mm). On tankers over 400 ft. (125 m) L.O.A., the minimum hydrant and hose size for exterior locations is 2 ½ inch (63.5 mm). Where 2 ½ inch (63.5 mm) hydrants and hose are required, two 1 ½ inch (38 mm) outlets with two 1 ½ inch (38 mm) hoses supplied through a Siamese connection may be substituted. Where two 1 ½ inch (38 mm) hydrants and hoses are permitted in lieu of one 2 ½ inch (63.5 mm) hydrant and hose, both of the outlets operating simultaneously are to be considered as a single outlet for the purpose of complying with the minimum number of jets criteria for fire pump capacity. Nozzles must be USCG type approved equipment. Each section of fire hose shall be lined commercial fire hose that conforms to Underwriters' Laboratories, Inc. Standard 19 or Federal Specification ZZ-H-451E.

Cite: 46 CFR 34.10 – 15 (c) Fire main systems marking

All distribution valves are required to be marked (incl. isolation valves between fire pumps and emergency fire pumps).

3.4 Tank Vessels - Operations

3.4.1 46 CFR 35

Cite: 46 CFR 35.30 - 20(c) (1) Emergency equipment – Breathing apparatus

Each self-contained breathing apparatus must be approved by the Mine Safety and Health Administration (MSHA) and by the National Institute for Occupational Safety and Health (NIOSH).

Note: The requirement for a NIOSH approved breathing apparatus also extends to EEBDs required by SOLAS II-2. For additional information see the USCG website for the Lifesaving & Fire Division (CG-ENG-4).

Cite: 46 CFR 35.40 - 10 Steam, foam, or CO2 fire smothering apparatus

Steam, foam, or CO2 fire smothering apparatus shall be marked "STEAM FIRE APPARATUS" or "FOAM FIRE APPARATUS" or "CO2 FIRE APPARATUS," as appropriate, in not less than 2- inch(50 mm) red letters.

Cite: 46 CFR 35.40 – 15 Fire hose stations

At each fire hose valve there shall be marked in not less than 2-inch (50 mm) red letters and figures: "FIRE STATION 1," 2, 3, etc.

Cite: 46 CFR 35.40 – 17 Foam hose/monitor stations

At each required foam hose/monitor valve there shall be marked in not less than 2-inch (50 mm) red letters and figures: "FOAM STATION 1," 2, 3, etc.

Cite: 46 CFR 35.40 – 20 Fireman's outfit / emergency equipment

Each locker and space where emergency equipment is stowed must be marked "EMERGENCY EQUIPMENT" or "SELF-CONTAINED BREATHING APPARATUS", as appropriate.

3.5 Tank Vessels - Liquefied Flammable Gases

3.5.1 46 CFR 38

Cite: 46 CFR 38.10 - 15 Liquefied flammable gases, safety relief valves

Safety relief valves for liquefied compressed gas service must be USCG approved equipment.

4 46 CFR SUBCHAPTER F – MARINE ENGINEERING

Note: USCG has issued additional final rules regarding ballast water management. Reference should be made to **46 CFR 162 and 33 CFR 151 Subpart D**, for additional requirements including: approval of treatment systems, applicability, standards, testing, etc. These final rules are applicable to all U.S. and foreign flagged vessels that are equipped with ballast tanks and operate in the waters of the United States.

4.1 Marine Engineering – Boilers

4.1.1 46 CFR 52

Cite: 46 CFR 52.01 2 Adoption of section I of the ASME Boiler and Pressure Vessel Code

Boilers, pressure vessels and heat exchangers are to comply with the requirements in Rules for classification: Ships – DNVGL-RU-SHIP-Pt.4, Ch.7 or the ASME Code, with additional requirements as given below. Other recognized international standards will be evaluated on a case by case basis. The submitter must in such cases provide documentation to indicate equivalency to the ASME standard.

Cite: 46 CFR 52.01 – 50 Fusible plugs

For water tube boilers with working pressure less than 30 psig and other boilers having a steam temperature less than 425° F (218° C) it is required to have fusion plugs.

Cite: 46 CFR 52.01 - 120(a) (7) Safety valves and safety relief valves

On new installations the safety valve nominal size for propulsion boilers and superheaters must not be less than 38 mm (1 1/2 in.) nor more than 102 mm (4 in.). Safety valves 38 mm to 114 mm (4 1/2 in.) may be used for replacements on existing boilers. The safety valve size for auxiliary boilers must be between 19 mm (3/4 in.) and 102 mm (4 in.). Cast iron seats and disks are not permitted.

4.1.2 46 CFR 53

Cite: 46 CFR 53.01 3 Adoption of section IV of the ASME Boiler and Pressure Vessel Code

Heating boilers for applications below 95° C and steam boilers with pressure less than 3.5 bar not covered by DNV GL Rules, are to be designed, constructed, inspected and tested in accordance with relevant requirements of Section IV of the ASME Code, with limitations and modifications as given in CFR Table 53.01 - 1(A).

Cite: 46 CFR 53.05 Pressure relieving devices

Cast iron seats and disks are not permitted.

4.2 Marine Engineering – Pressure Vessels

4.2.1 46 CFR 54

Cite: 46 CFR 54.10 – 10 Standard hydrostatic test

Pressure vessels with a design temperature greater than (>) 650 deg. F (343 deg. C) must be tested in accordance with 46 CFR 54.10 – 10 and Div. 1, Section VIII of ASME Code respectively.

Cite: 46 CFR 54.10 - 15 Pneumatic test

Pneumatic tests of welded pressure vessels are allowed only for those units which are so designed and/or supported that they cannot be safely filled with water or for those units which cannot be dried and are to be used in a service where traces of the testing medium cannot be tolerated. Pneumatic testing is not normally allowed by DNV GL, and will thus be considered in each case.

Cite: 46 CFR 54.15 Pressure relief devices

Cast iron seats and disks are not permitted.

4.3 Marine Engineering – Piping Systems and Appurtenances

4.3.1 46 CFR 56

Cite: 46 CFR 56.15 Pipe joining fittings

(i) For fittings sized three inches (76.1 mm) and below:

(A) The longitudinal joints must be fabricated by either gas or arc welding;

(B) One fitting of each size from each lot of 100 or fraction thereof must be flattened cold until the opposite walls meet without the weld developing any cracks;

See DNVGL-RU-SHIP-Pt.2, Ch. 2, Section 5 for material, manufacture, inspection, and testing requirements.

Cite: 46 CFR 56.20 -15 Valves

(a) A valve in which the closure is accomplished by resilient nonmetallic material instead of a metal to metal seat shall comply with the design, material, construction and testing for valves specified in this part.

(b) Valves employing resilient material shall be divided into three categories, Positive shutoff, Category A, and Category B, and shall be tested and used as follows:

(1) Positive shutoff valves. The closed valve must pass less than 10 ml/hr. (0.34 fluid oz./hr.) of liquid or less than 3 l/hr (0.11 cubic ft/hr) of gas per inch nominal pipe size through the line after removal of all resilient material and testing at full rated pressure. Packing material must be fire resistant. Piping subject to internal head pressure from a tank containing oil must be fitted with positive shutoff valves located at the tank in accordance with § 56.50-60(d). See Rules for classification: Ships — DNVGL-RU-SHIP-Pt.4, Ch.6, Section 5, 4.5 for further requirements for quick-acting shut-off valves. Otherwise positive shutoff valves may be used in any location in lieu of a required Category A or Category B valve.

(2) Category A valves. The closed valve must pass less than the greater of 5 percent of its fully open flow rate or 15 percent divided by the square root of the nominal pipe size (NPS) of its fully open flow rate through the line after complete removal of all resilient seating material and testing at full rated pressure; as represented by the formula: $(15\% / \text{SQRT} \times (\text{NPS}))$ (Fully open flow rate). Category A valves may be used in any location except where positive shutoff valves are required by § 56.50-60(d). Category A valves are required in the following locations:

(i) Valves at vital piping system manifolds;

(ii) Isolation valves in cross-connects between two piping systems, at least one of which is a vital system, where failure of the valve in a fire would prevent the vital system(s) from functioning as designed.

(iii) Valves providing closure for any opening in the shell of the vessel.

(3) Category B valves. The closed valve will not provide effective closure of the line or will permit appreciable leakage from the valve after the resilient material is damaged or destroyed. Category B valves are not required to be tested and may be used in any location except where a Category A or positive shutoff valve is required.

(c) If a valve designer elects to use either a calculation or actual fire testing instead of material removal and pressure testing, the calculation must employ ISA-S75.02 (incorporated by reference; see 46 CFR 56.01-2) to determine the flow coefficient (Cv), or the fire testing must be conducted in accordance with API 607

Cite: 46 CFR 56.25 15 Gaskets

Gaskets in fire main systems are required to meet the criteria for flexible pipes contained in IACS Unified Requirement F 42 or equivalent.

Cite: 46 CFR 56.50 – 55 Bilge pumps

Bilge pumps. Multi-hulled vessels require two means for pumping in the bilges of each hull.

Cite: 46 CFR 56.50 - 65(b) (1) Burner fuel-oil service systems

All vessels having oil fired boilers must have at least two fuel service pumps, each of sufficient capacity to supply all the boilers at full power, and arranged so that one may be overhauled while the other is in service. At least two fuel oil heaters of approximately equal capacity must be installed and so arranged that any heater may be overhauled while the other(s) is (are) in service. Suction and discharge strainers must be of the duplex or other type capable of being cleaned without interrupting the oil supply.

Cite: 46 CFR 56.50 – 85 Tank vent piping

Tank vent air pipes for fuel oil tanks must not be less than 2 ½ in. (63.5 mm).

Cite: 46 CFR 56.70 Welding

Welding procedures are to be in accordance with the details found in 46 CFR 56.70 and ASME Section IX (alternatively EN 288), respectively.

Cite: 46 CFR 56. 97 Pressure tests

Pressure testing may not be waived for small bore pipes as specified in DNVGL Rules. Pipes must be hydrostatically tested regardless of radiographic examination. Pressure testing of non-standard piping system components shall meet 46 CFR 56.97 – 5.

4.4 Marine Engineering – Main and Auxiliary Machinery and Related Systems

4.4.1 46 CFR 58

Cite: 46 CFR 58.10 - 5 Gasoline engine installations

a) Engine design. All installations shall be of marine type engines suitable for the intended service, designed and constructed in conformance with the requirements of this subchapter.

b) Carburetors. (1) Drip collectors shall be fitted under all carburetors, except the down-draft type, to prevent fuel leakage from reaching the bilges and so arranged as to permit ready removal of such fuel leakage. Drip collectors shall be covered with flame screens.

NOTE: It is recommended that drip collectors be drained by a device for automatic return of all drip to engine air intakes.

2) All gasoline engines must be equipped with an acceptable means of backfire flame control. Installations of backfire flame arresters bearing basic Approval Nos. 162.015 or 162.041 or engine air and fuel induction systems bearing basic Approval Nos. 162.015 or 162.042 may be continued in use as long as they are serviceable and in good condition. New installations or replacements must meet the applicable requirements of this section.

3) The following are acceptable means of backfire flame control for gasoline engines:

(i) A backfire flame arrester complying with SAE J-1928 (incorporated by reference; see 46 CFR 58.03-1) or UL 1111 (incorporated by reference; see 46 CFR 58.03-1) and marked accordingly. The flame arrester must be suitably secured to the air intake with a flametight connection.

(ii) An engine air and fuel induction system which provides adequate protection from propagation of backfire flame to the atmosphere equivalent to that provided by an acceptable backfire flame arrester. A gasoline engine utilizing an air and fuel induction system, and operated without an approved backfire flame arrester, must either include a reed valve assembly or be installed in accordance with SAE J-1928.

(iii) An arrangement of the carburetor or engine air induction system that will disperse any flames caused by engine backfire. The flames must be dispersed to the atmosphere outside the vessel in such a manner that the flames will not endanger the vessel, persons, on board, or nearby vessels and structures. Flame dispersion may be achieved by attachments to the carburetor or location of the engine air induction system. All attachments must be of metallic construction with flamtight connections and firmly secured to withstand vibration, shock, and engine backfire. Such installations do not require formal approval and labeling but must comply with this sub-part.

c) Exhaust manifold. The exhaust manifold shall either be water-jacketed and cooled by discharge from a pump which operates whenever the engine is running, or woodwork within nine inches shall be protected by ¼ inch asbestos board covered with not less than No. 22 USSG (U.S. standard gage) galvanized sheet iron or non-ferrous metal. A dead air space of 1/4 -inch shall be left between the protecting asbestos and the wood, and a clearance of not less than two inches maintained between the manifold and the surface of such protection.

d) Exhaust pipe.

(1) Exhaust pipe installations shall conform to the requirements of the American Boat and Yacht Council Standard P-1 "Safe Installation for Exhaust Systems" and National Fire Protection Association Standard NFPA 302, part 1, section 23 and the following additional requirements:

(i) All exhaust installations with pressures in excess of 15 pounds per square inch gage or employing runs passing through living or working spaces shall meet the material requirements of part 56 of this subchapter.

(ii) Horizontal dry exhaust pipes are permitted only if they do not pass through living or berthing spaces, they terminate above the deepest load waterline and are so arranged as to prevent entry of cold water from rough or boarding seas, and they are constructed of corrosion resisting material "at the hull penetration."

4.5 Marine Engineering – Gas Turbine Installations

4.5.1 46 CFR 58.10 – 15

Cite: 46 CFR 58.10 – 15 Gas turbine installations

a) Standards. The design, construction, workmanship and tests of gas turbines and their associated machinery shall be at least equivalent to the standards of DNV GL Rules for Ships.

f) Automatic shutdown. Automatic shutdown shall occur under the following conditions:

(i) Overspeed. (*Note: DNV GL rules do not require shutdown in case of gas generator overspeed, only in case of power turbine overspeed.*)

(2) Audible or visible alarms shall also be provided for:

(i) Excessive gas temperature, measured at the turbine inlet, gas generator, interstage turbine or turbine exhaust. (*Note: DNV GL rules require alarm only in case of high turbine inlet temperature.*)

4.6 Marine Engineering – Main and Auxiliary steering Gear

4.6.1 46 CFR 58.25 - 10

Cite: 46 CFR 58.25 - 10 Main and auxiliary steering gear

Except on a vessel with an integrated system of propulsion and steering, no thruster may count as part of a vessel's required steering capability.

An auxiliary steering gear must be provided for all self-propelled vessels, except:

(d) Double-ended ferryboat with independent main steering gear fitted at each end of the vessel.

(e) When the main steering gear includes two or more identical power units (with requirements equal to Rules for classification: Ships – DNVGL-RU-SHIP-Pt. 4, Ch. 10, Section 1, 2.).

Cite: 46 CFR 58.25 -15 Voice communications

Each vessel must be provided with a sound-powered telephone system, complying with subpart 113.30 of this Section, to communicate between the pilothouse and the steering-gear compartment, unless an alternative means of communication between them has been approved by the Commanding Officer, Marine Safety Center.

Cite: 46 CFR 58.25 – 20 Piping for steering gear

(d) Neither a split flange nor a flareless fitting of the grip or bite type, addressed by §56.30–25 of this subchapter, may be used in hydraulic piping for steering gear.

Cite: 46 CFR 58.25 – 45 Buffers

For each vessel on an ocean, coastwise, or Great Lakes voyage, steering gear other than hydraulic must be designed with suitable buffering arrangements to relieve the gear from shocks to the rudder.

Cite: 46 CFR 58.25 – 50 Rudder stops

(a) Power-operated steering gear must have arrangements for cutting off power to the gear before the rudder reaches the stops. These arrangements must be synchronized with the rudder stock or with the gear itself rather than be within the control system for the steering gear, and must work by limit switches that interrupt output of the control system or by other means acceptable to the Commanding Officer, Marine Safety Center.

(b) Strong and effective structural rudder stops must be fitted; except that, where adequate positive stops are provided within the steering gear, such structural stops need not be fitted.

Cite: 46 CFR 58.25 – 70 Steering-gear control system

(c) Each steering-gear control system must have in the pilothouse a switch arranged so that one operation of the switch's lever automatically supplies power to a complete system and its associated power unit or units. This switch must be—

(1) Operated by one lever;

(2) Arranged so that not more than one control system and its associated power unit or units can be energized from the pilothouse at any one time;

(3) Arranged so that the lever passes through “off” during transfer of control from one control system to another; and

(4) Arranged so that the switches for each control system are in separate enclosures or are separated by fire-resistant barriers.

Cite: 46 CFR 58.25 – 75 Materials

(a) Materials used for the mechanical or hydraulic transmission of power to the rudder stock must have an elongation of at least 15% in 5 centimeters (2 inches); otherwise, components used for this purpose must be shock-tested in accordance with subpart 58.30 of this part. (DNV GL requires minimum 12% elongation).

(b) No materials with low melting-points, including such materials as aluminum and nonmetallic seals, may be used in control systems for steering gear or in power actuating systems unless—

- (1) The materials are within a compartment having little or no risk of fire;
- (2) Because of redundancy in the system, damage by fire to any component would not prevent immediate restoration of steering capability; or
- (3) The materials are within a steering-gear power actuating system.

4.7 Marine Engineering – Periodic Tests and Inspections

4.7.1 46 CFR 61

Cite: 46 CFR 61.05 - 10 Boilers in service

Hydrostatic testing and survey of boilers is to be carried out with intervals and extent as given in this regulation. (46 CFR 61.05-10 requires increased inspection (annual) on fire tube boilers for propulsion)

Cite: 46 CFR 61.10 - 5 Pressure vessels in service

Hydrostatic testing and survey of pressure vessels is to be carried out with intervals and extent as given in this regulation for pressure vessels listed on the vessel's COI.

Cite: 46 CFR 61.15 - 10 Liquefied petroleum gas piping for heating and cooking

Liquefied petroleum gas piping for heating and cooking are to be tested as required in this regulation.

(a) Leak tests as described in paragraph (b) of this section shall be conducted at least once each month, at each inspection for certification, and at each periodic inspection.

Cite: 46 CFR 61.15 - 12 Nonmetallic expansion joints

Non-metallic expansion joints must be surveyed and replaced as required in this regulation.

Cite: 46 CFR 61.40 Design verification and periodic testing of vital system automation

One copy of a qualitative failure analysis must be submitted for propulsion controls, microprocessor based system hardware, safety controls, automated electric power management, automation required to be independent that is not physically separate and any other automation that in the judgment of the reviewing authority potentially constitutes a safety hazard to the vessel or personnel in case of failure.

The systems to which these requirements apply include:

1. Any equipment or system that is automatically controlled or monitored
2. Any equipment or system that is remotely controlled or monitored
3. Any equipment or system that utilizes automation for the purposes of replacing specific personnel or reduce overall crew requirements, i.e. minimally or un-manned machinery spaces

Note: The qualitative failure analysis is intended to assist in evaluating the safety and reliability of the design. It should be conducted to a level of detail necessary to demonstrate compliance with applicable requirements and should follow standard qualitative analysis procedures. Assumptions, operating conditions considered, failures considered, cause and effect relationships, how failures are detected by the crew, alternatives available to the crew, and necessary design verification tests should be included. Questions regarding failure analysis should be referred to the reviewing authority at an early stage of design. A Design Verification test is to be performed, immediately after the installation of the automated equipment or before issuance of the initial Certificate of Inspection, to verify that automated systems are designed, constructed and operate in accordance with applicable requirements. In addition, Periodic Safety tests must be conducted annually to demonstrate the proper operation of the primary and alternate controls, alarms, power sources, transfer override arrangements, interlocks and safety controls. Systems addressed must include fire detection and extinguishing, flooding safety, propulsion, maneuvering electric power generation and distribution and emergency internal communications.

Synthetic signals or simulated test conditions can be allowed if test equipment maintained in good order and calibrated with appropriate documentation to the satisfaction of the attending surveyor.

Design Verification and Periodic Safety test procedures are to be submitted for approval and retained aboard the vessel. Test procedure documents must be in a step-by-step or checkoff list format. Each test instruction must specify equipment status, apparatus necessary to perform the tests, safety precautions, safety control and alarm setpoints, the procedure to be followed, and the expected test result. Test techniques must not simulate monitored system conditions by maladjustments, artificial signals, improper wiring, tampering, or revision of the system unless the test would damage equipment or endanger personnel. The Design Verification and Periodic Safety Tests are to be witnessed by the Surveyor. Other test techniques are to be submitted to the USCG (G-MSE) for approval on a case-by-case basis.

Vessels with minimally attended or periodically unattended machinery plants must have a planned maintenance program to ensure continued safe operation of all vital systems. The program must include maintenance and repair manuals for work to be accomplished by maintenance personnel and lists for routine inspection and maintenance procedures. The planned maintenance program must be functioning prior to the completion of the evaluation period for reduced manning.

Maintenance and repair manuals must include details as to what, when and how to troubleshoot, repair and test the installed equipment and what parts are necessary to accomplish the procedures. Schematic and logic diagrams must be included in this documentation. Manuals must clearly delineate information that is not applicable to the installed equipment.

4.8 Marine Engineering – Vital System Automation

4.8.1 46 CFR 62

Cite: 46 CFR 62.20 – 3 (a) (2) Vital system automation, plan submittal

A planned maintenance program for all vital systems. (Note: Covered for E0-class.)

Cite: 46 CFR 62.25 – 20 (d) (4) Instrumentation, alarms and centralized stations

- (4) Flooding safety, fire, loss of power and engineer's assistance-needed alarms extended from the machinery spaces to a remote location must not have a duty crewmember selector. Note: Other alarms may be provided with such a selector, provided there is no off position.

Cite: 46CFR 62.30 – 5 (b) (2) Reliability and safety criteria, all automated vital systems

Independent sensors are not required except that sensors for primary speed, pitch or direction of rotation control in closed loop propulsion control systems must be independent and physically separate from required safety control, alarm or instrumentation sensors.

Cite: 46 CFR 62.35 – 5 (e) Remote propulsion control systems

(e) Control system details.

- (1) Each operator control device must have a detent at the zero thrust position.

Cite: 46 CFR 62.35 – 15 (a) Fire safety

All required fire pump remote control locations must include the controls necessary to charge the fire main and:

- (1) A fire main pressure indicator; or
- (2) A fire main low pressure alarm.

Cite: 46 CFR 62.50 - 20 Automated self-propelled vessel manning

Ships applying the USCG for minimally attended machinery plants in accordance with 46 CFR 65.50- 20 shall satisfy the additional class notation ECO, Rules for classification: Ships — DNVGL-RU-SHIP-Pt.6 Ch. 2, Section 2 with the following additions:

- (a) (1) Navigating bridge propulsion control must be provided.
- (b) (1) A personnel alarm must be provided and must annunciate on the bridge if not routinely acknowledged neither at the centralized control station nor in the machinery spaces.
- (b) (3) For minimally attended machinery plants (ECO) all required audible alarms must annunciate throughout the engineering control center and machinery spaces.
- (c) Fire detection and alarms. For minimally attended machinery plants (ECO) an approved automatic fire detection and alarm system must be provided to monitor all machinery spaces. The system must activate all alarms at the engineering control center, the navigating bridge, and throughout the machinery spaces and engineers' accommodations. The engineering control center and bridge alarms must visually indicate which machinery space is on fire, as applicable.
- Note: For purposes of this part, the specific location of fires that are not in machinery spaces need not be indicated.
- (d) Control of the fire pumps such:
- (1) The centralized control station must include control of the main machinery space fire pumps.
 - (2) Remote control of a required fire pump must be provided from the navigating bridge. Where one or more fire pumps is required to be independent of the main machinery space, at least one such pump must be controlled from the navigating bridge
- (g) Electrical systems. For minimally attended machinery plants (ECO) the engineering control center must include the controls and instrumentation necessary to place the ship service and propulsion generators in service in 30 seconds. The main distribution and propulsion switchboards and generator controls must either be located at the engineering control center, if the engineering control center is within the boundaries of the main machinery space, or the controls and instrumentation must be duplicated at the engineering control center. Controls at the switchboard must be able to override those at the engineering control center, if separate.

4.9 Marine Engineering – Automatic Auxiliary Boilers

4.9.1 46 CFR 63

Cite: 46 CFR 63.20 – 1 Specific control system requirements

- (a) Primary safety control system. Following emergency safety trip control operation, the airflow to the boiler must not automatically increase. For this condition post-purge must be accomplished manually.
- (c) Float chamber low water cut-off controls using stuffing boxes to transmit the motion of the float from the chamber to the external switches are prohibited.

4.10 Marine Engineering – Incinerators

4.10.1 46 CFR 63.25-9

Cite: 46 CFR 63.25-9 Incinerators

Each incinerator installed on or after March 26, 1998 must meet the requirements of IMO Resolution MEPC.76 (40) or equivalent. A U.S. Coast Guard Certificate of Approval is required for each incinerator.

Compliance with the following standards are considered to meet IMO Res. MEPC.76 (40):

- ISO 13617; or
- ASTM F 1323 and Annexes A1-A3 of IMO Res. MEPC.76 (40).

5 46 CFR SUBCHAPTER H – PASSENGER VESSELS

5.1 Passenger Vessels - General

5.1.1 General

For US Interpretations to SOLAS, see Section 10 of this Supplement. Section 10.2.9 contains additional interpretations to SOLAS Ch. II-2 for passenger vessels.

5.2 Passenger Vessels - Lifesaving

5.2.1 46 CFR 199

Cite: 46 CFR 199 Lifesaving systems

Additional items not covered by SOLAS are the same as given for Tank Vessels in 46 CFR 199.03 (Chapter 3). The following item under this Cite is additional for passenger vessels:

Cite: 46 CFR 199.214 Immersion suits and thermal protective aids

Immersion suits are not required for passenger vessels operating only on routes between 32 degrees north and 32 degrees south latitudes.

5.3 Passenger Vessels – Construction and Arrangement

5.3.1 46 CFR 72

Cite: 46 CFR 72.10 – 20 Means of escape

No means shall be provided for locking doors giving access to either of the two required means of escape, except that crash doors or locking devices, capable of being easily forced in an emergency, may be employed provided a permanent and conspicuous notice to this effect is attached to both sides of the door. This paragraph shall not apply to outside doors to deckhouses where such doors are locked by key only and such key is under the control of one of the vessel's officers.

Cite: 46 CFR 72.10 – 35 Means of escape from public spaces

In all cases, public spaces having a deck area of over 300 square feet (28 square meters) shall have at least two exits. Where practicable, these exits shall give egress to different corridors, rooms, or spaces to minimize the possibility of one incident blocking both exits.

Cite: 46 CFR 72.15 - 10 Ventilation on vessels using fuel with flash point 110°F (43°C) or lower

(a) Where liquid fuel having a flashpoint of 110 degrees F (43°C) or lower is used for main or auxiliary machinery or for starting purposes, the spaces containing such machinery or fuel tanks shall have natural supply and mechanical ventilation as required by this section.

(b) The requirements for the mechanical exhaust system shall be such as to assure the air changes as noted in table 72.15-10 (b), depending upon the size of the space.

Size of Space (ft ³)		Air Changes per minute
Over	Not Over	
	500	2
500	1000	3
1000	1500	4
1500		5

TABLE 72.15-10(B)

(c) Exhaust blower motors shall be outside of the ducts, and if mounted in any compartment required to be ventilated by this section, shall be of the explosion proof type. Blower blades shall be nonsparking with reference to their housings.

(d) Exhaust blower switches shall be located outside of any space required to be ventilated by this section, and shall be of the type interlocked with the ignition switch so that the blowers are started before the engine ignition is switched on. A red warning sign at the switch shall state that the blowers shall be operated prior to starting the engines for a sufficient time to insure at least one complete change of air in the compartments.

(e) The area of the ducts shall be such as to limit the air velocity to a maximum of 2,000 feet per minute (10.2 m/s). Ducts may be of any shape, provided that in no case shall 1 dimension exceed twice the other.

(f) At least 2 inlet ducts shall be located at 1 end of the compartment and they shall extend to the lowest part of the compartment or bilge on each side. Similar exhaust ducts shall be led to the mechanical exhaust system from the lowest part of the compartment or bilge on each side of the compartment at the end opposite from that at which the inlet ducts are fitted.

(g) All ducts shall be constructed of non-ferrous metal or galvanized ferrous metal not less than No. 22 USSG, intact and gas tight from end to end and shall be of substantial construction. The ducts shall lead as direct as possible and be properly fastened and supported.

(h) All supply ducts shall be provided with cowls or scoops having a free area not less than twice the required duct area. When the cowls or scoops are screened, the mouth area shall be in-creased to compensate for the area of the screen wire. Dampers shall not be fitted in the supply ducts. Cowls or scoops shall be kept open at all times except when the stress of weather is such as to endanger the vessel if the openings are not temporarily closed. Supply and exhaust openings shall not be located where the natural flow of air is unduly obstructed, or adjacent to possible sources of vapor ignition, nor shall they be so located that exhaust air may be taken into the supply vents.

Cite: 46 CFR 72.15 – 15 (c) (2) Ventilation for closed spaces

(2) The quantity of ventilating air shall be not less than 1 cubic foot per minute per square foot of deck area.

5.4 Passenger Vessels – Fire Protection Equipment

5.4.1 46 CFR 76

Cite: 46 CFR 76.05 - 20 Fixed fire extinguishing systems

Fixed fire extinguishing systems must be installed, as required by table 76.05.

1 (a). A fixed carbon dioxide, clean agent or water spray system must be installed in all lamp and paint lockers.

Additional requirements to specific fire extinguishing systems are compiled in Section 10 US Interpretations to SOLAS of this Supplement.

Cite: 46 CFR 76.05 – 25(a) Portable fire extinguishers

Portable and semi-portable fire extinguishers must be USCG type approved equipment.

Cite: 46 CFR 76.10 – 10(a) Fire station hydrants, hose and nozzles

The size of fire hydrants, hose, and nozzles and the length of hose required shall be as noted in Table 76.10 – 5(a). With respect to this Supplement, the requirement for hydrant and hose size on passenger vessels of 1500 gross tons and over is relevant. In the said table, the minimum size is given as 2 ½ inch (63.5 mm) for a hose length of 50 feet (15 m).

The hydrants in interior locations may, however, have Siamese connections for 1 ½ inch (38 mm). In these cases, the hose shall be 75 feet (23 m) in length, and only one hose will be required at each fire station. However, if all such stations can be satisfactorily served with 50 foot (15 m) lengths, 50 foot (15 m) hose may be used.

Cite: 46 CFR 76.10 – 10(j) Nozzles

Nozzles must be USCG approved equipment.

Cite: 76.10 – 10(n) Fire hose

(n)(2) Each section of firehose must be lined commercial firehose that conforms to UL 19 (incorporated by reference; see 46 CFR 76.01-2). Hose that bears the label of Underwriters' Laboratories, Inc. as lined firehose is accepted as conforming to this requirement.

Cite: 46 CFR 76.23 – 20 (b) Manual sprinkling systems

All piping, valves and fittings of ferrous materials shall be protected inside and outside against corrosion unless specifically approved otherwise by the Commandant.

Cite: 46 CFR 76.27 Electric fire detecting system

Each fire detecting zone must not include spaces on more than one deck, except:

(a) Adjacent and communicating spaces on different decks in the ends of the vessel having a combined ceiling area of not more than 279 m² (3000 square feet).

(b) Isolated rooms or lockers in such spaces as mast houses, wheelhouse top, etc., which are easily communicable with the area of the fire-detecting circuit to which they are connected.

(c) Systems with indicators for individual spaces. The fire detecting zone must not contain more than 50 protected rooms or spaces the detectors, the detecting cabinet and alarms must be of an approved type. The fire detecting system must be used for no other purpose, except it may be incorporated with the manual alarm system. All wiring and electrical circuits and equipment shall meet the applicable requirements of subchapter J (see 46 CFR 113.10 below). A framed chart or diagram must be installed in the wheelhouse or control station adjacent to the detecting cabinet indicating the location of the detecting zones and giving operating instructions.

Cite: 46 CFR 76.33 Smoke detecting system (Sample extraction smoke detecting system)

The accumulators, detecting cabinet, interconnecting valves with the fire extinguishing system, alarms, and indicating devices shall be of an approved type. All wiring and electrical circuits and equipment shall meet the applicable requirements of subchapter J (see 46 CFR 113.10 below).

Cite: 46 CFR 76.35 Manual alarm system

A sufficient number of call points must be employed such that a person escaping from any space would find an alarm box convenient on the normal route of escape. The manual alarm boxes, cabinet, and alarms shall be of an approved type. The manual alarm system must be used for no other purpose, except it may be incorporated with the fire detecting system. All wiring and electrical circuits and equipment shall meet the applicable requirements of subchapter J (see 46 CFR 113.10 below). Manual fire alarm boxes shall be clearly and permanently marked "IN CASE OF FIRE BREAK GLASS" in at least 12.5 mm (1/2 in) letters. Detector spacing shall be in accordance with the manufacturer's recommendation. Detector spacing in spaces with ceilings greater than 3 m (10 ft) must be corrected in accordance with NFPA 72E.

Cite: 46 CFR 113.10 Fire and smoke detecting and alarm systems

Fire protection systems must be USCG approved equipment. A conductor must not be used as a common return from more than one zone. Each connection box that has conductors for more than one zone must be watertight. There must be at least two sources of power for the electrical equipment of each fire detecting and alarm system. The normal source must be the main power source. The other source must be the emergency power source or an automatically charged battery. If the other source is an automatically charged battery, the charger must be supplied from the final emergency power source. Upon loss of power to the system from the normal source, the system must be automatically supplied from the other source. The capacity of each branch circuit providing power to a fire detection or alarm system must not be less than 125 percent of the maximum load.

5.5 Passenger Vessels – Emergency Equipment

5.5.1 46 CFR 77

Cite: 46 CFR 77.30 – 5 Breathing apparatus

Each self-contained breathing apparatus must be approved by the Mine Safety and Health Administration (MSHA) and by the National Institute for Occupational Safety and Health (NIOSH).

5.6 Passenger Vessels – Operations

5.6.1 46 CFR 78

Cite: 46 CFR 78.47 - 13 Markings for fire and emergency equipment

The fire detecting and manual alarm, automatic sprinkler, and smoke detecting alarm bells in the engine room shall be identified by at least 1 inch (25 mm) red lettering "FIRE ALARM", "SPRINKLER ALARM", or "SMOKE DETECTING ALARM" as appropriate.

Cite: 46 CFR 78.47 - 17 Markings for fire and emergency equipment

The control cabinets or spaces containing valves or manifolds for the various fire extinguishing systems shall be distinctly marked in conspicuous red letters at least 2 inches (50 mm) high – "STEAM FIRE APPARATUS", "CARBON DIOXIDE FIRE APPARATUS", "FOAM FIRE APPARATUS", "WATER SPRAY FIRE APPARATUS", "MANUAL SPRINKLING SYSTEM" or "AUTOMATIC SPRINKLING SYSTEM", as the case may be.

Cite: 46 CFR 78.47 – 25 Fireman's outfit / Emergency squad

Lockers or spaces containing equipment for the use of the emergency squad shall be marked "EMERGENCY SQUAD EQUIPMENT."



Cite: 46 CFR 78.47 – 20(a) Fire hose stations

Each fire hydrant shall be identified in red letters and figures at least 2 inches (50 mm) high "FIRE STATION NO 1," "2," "3," etc. Where the hose is not stowed in the open or behind glass so as to be readily seen, this identification shall be so placed as to be readily seen from a distance.

Cite: 46 CFR 78.47 – 37 Marking of watertight doors

See Section 9 on Stability.

Cite: 46 CFR 78.47 – 40 Exit signs

Small rooms or spaces having a secondary means of escape which is not obviously apparent shall have a suitable sign in red letters "EMERGENCY EXIT" directing attention to such escape.

6 46 CFR SUBCHAPTER I – CARGO AND MISCELLANEOUS VESSELS

6.1 Cargo and Miscellaneous Vessels - General

6.1.1 General

For US Interpretations to SOLAS, see Section 10 of this Supplement.

6.2 Cargo and Miscellaneous Vessels – Lifesaving

6.2.1 46 CFR

Cite: 46 CFR 199 Lifesaving systems

Additional items not covered by SOLAS are the same as given for Tank Vessels in 46 CFR 199.03 (Chapter 3).

6.3 Cargo and Miscellaneous Vessels – Inspection and Certification

6.3.1 46 CFR 91

Cite: 46 CFR 91.25-25 Inspection for certification – Hull equipment

Plans and specifications for cargo gear must be approved by either DNVGL or the International Cargo Gear Bureau, Inc. (ICGB), 321 West 44th Street, New York NY 10036 (www.icgb.com).

6.4 Cargo and Miscellaneous Vessels – Construction and Arrangement

6.4.1 46 CFR 92

Cite: 46 CFR 92.07–1(c) General fire protections - Application

Only method IC, as defined in SOLAS Ch. II-2/Reg. 9.2.3.1.1 shall be used.

Cite: 46 CFR 92.10–5 Means of escape – Two means required

There shall be at least two means of escape from all general areas accessible to the passengers, if carried, or where the crew may be quartered or normally employed. At least one of these two means of escape shall be independent of watertight doors.

Cite: 46 CFR 92.10-20 Means of escape – No means for locking doors

No means shall be provided for locking doors giving access to either of the two required means of escape, except that crash doors or locking devices, capable of being easily forced in an emergency, may be employed provided a permanent and conspicuous notice to this effect is attached to both sides of the door. This paragraph shall not apply to outside doors to deckhouses where such doors are locked by key only and such key is under the control of one of the vessel's officers.

Cite: 46 CFR 92.15-5 Ventilation - Vessels using fuel having a flashpoint of 110 Degrees or lower

(a) Where liquid fuel having a flashpoint of 110 degrees F. or lower is used for main or auxiliary machinery or for starting purposes, the spaces containing such machinery or fuel tanks shall have ventilation as required by this section.

(1) At least 2 ventilators fitted with cowls or their equivalent for the purpose of properly and effectively ventilating the bilges of every engine and fuel-tank compartment in order to remove any flammable or explosive gases.

(2) Vessels constructed so that the greater portions of the bilges under the engine and fuel tanks are open or exposed to the natural atmosphere at all times are not required to be fitted with ventilators

Cite: 46 CFR 92.15-15 Ventilation - Ventilation for crew quarters and, where provided passenger spaces

(a) All living spaces shall be adequately ventilated in a manner suitable to the purpose of the space.

(b) On vessels of 100 gross tons and over, except for such spaces as are so located that under all ordinary conditions of weather, windows, ports, sky-lights, etc., and doors to passageways can be kept open, all crew spaces shall be ventilated by a mechanical system, unless it can be shown that a natural system will provide adequate ventilation. However, vessels which trade regularly in the tropics shall, in general, be fitted with a mechanical ventilation system.

6.5 Cargo and Miscellaneous Vessels – Fire Protection Equipment

6.5.1 46 CFR 95

Cite: 46 CFR 95.05-1 Fire detecting and extinguishing equipment where required - Fire detecting, manual alarm, and supervised patrol systems

If fire detecting, manual alarm, and supervised patrol systems are installed, the systems shall meet the applicable requirements for Passenger Vessels (see items 76.27, 76.33 and 76.35).

Cite: 46 CFR 95.05–10 Fire detecting and extinguishing equipment where required - Fixed fire extinguishing systems

A fixed carbon dioxide, clean agent or water spray system must be installed in all lamp and paint lockers, oil rooms, and similar spaces.

Additional requirements to specific fire extinguishing systems are compiled in Section 10 US Interpretations to SOLAS of this Supplement.

Cite: 46 CFR 95.05–15(a) Fire detecting and extinguishing equipment where required - Hand portable fire extinguishers and semi-portable fire extinguishing systems

Portable and semi-portable fire extinguishers must be USCG type - approved equipment.

Cite: 46 CFR 95.10-10(a) Fire main system details - Fire hose, hydrants and nozzles

The size of fire hydrants, hose, and nozzles and the length of hose required shall be as noted in Table 95.10 – 5(a).

Gross tons		Minimum number of pumps	Hose and hydrant size, inches	Nozzle orifice size, inches	Length of hose feet
Over	Not over				
	100	¹ 1	¹ 1 1/2	¹ 1 1/2	¹ 50
100	1,000	1	1 1/2	5/8	50
1,000	1,500	2	1 1/2	5/8	50
1,500	2	² 2 1/2	² 7/8	² 50	

TABLE 95.10-5(a)

¹On vessels of 65 feet in length or less, 3/4-inch hose of good commercial grade together with a commercial garden hose nozzle may be used. The pump may be hand operated and the length of hose shall be sufficient to assure coverage of all parts of the vessel.

²75 feet of 1 1/2-inch hose and 5/8-inch nozzle may be used where specified by §95.10-10(b) for interior locations and 50 feet of 1 1/2-inch hose may be used in exterior locations on vessels in other than ocean or coastwise service.

With respect to this Supplement, the requirement for hydrant and hose size on cargo vessels of 1500 gross tons and over is relevant. In said table, the minimum size is given as 2-1/2 inch (63.5 mm) for a hose length of 50 feet.

The hydrants in interior locations may, however, have Siamese connections for 1-1/2 inch (38 mm). In these cases, the hose shall be 75 feet in length, and only one hose will be required at each fire station. However, if all such stations can be satisfactorily served with 50 foot lengths, 50 foot hose may be used.

For hydrants in exterior locations on vessels in other than ocean or coastwise service, 50 feet of 1-1/2 inch (38 mm) hose may be used.

Cite: 46 CFR 95.10-10(i) Fire main system details – Fire hydrants and hose

Nozzles must be USCG approved equipment.

Cite: 46 CFR 95.10-10(n) Fire main system details – Fire hydrants and hose

Each section of fire hose must be lined commercial fire hose that conforms to Underwriters' Laboratories, Inc. Standard 19.

Cite: 46 CFR 95.10-15(b) Fire main system details - Piping

All distribution cut-off valves are required to be marked (incl. isolation valves between fire pumps and emergency fire pumps).

6.6 Cargo and Miscellaneous Vessels – Vessel Control and Miscellaneous Systems and Equipment

6.6.1 46 CFR 96

Cite: 46 CFR 96.30-5 Breathing apparatus

Each self-contained breathing apparatus must be approved by the Mine Safety and Health Administration (MSHA) and by the National Institute for Occupational Safety and Health (NIOSH).

Note: The requirement for a NIOSH approved breathing apparatus also extends to EEBDs required by SOLAS II-2. For additional information see the USCG website for the Lifesaving & Fire Division (CG-ENG-4).

6.7 Cargo and Miscellaneous Vessels – Operations

6.7.1 46 CFR 97

Cite: 46 CFR 97.37–15(a) Markings for fire and emergency equipment - Fire hose station

Each fire hydrant shall be identified in red letters and figures at least two inches (50 mm) high "FIRE STATION NO. 1," "2," "3," etc. Where the hose is not stowed in the open or behind glass so as to be readily seen, this identification shall be so placed as to be readily seen from a distance.

Cite: 46 CFR 97.37–20 Markings for fire and emergency equipment - Fireman's outfit / self-contained breathing apparatus

Lockers or spaces containing self-contained breathing apparatus shall be marked "SELFCONTAINED BREATHING APPARATUS."

6.8 Cargo and Miscellaneous Vessels – Special Construction Arrangement and other Provisions for Certain Dangerous Cargoes in Bulk

6.8.1 46 CFR 98

Cite: 46 CFR 98.25 Anhydrous ammonia in bulk

DNVGL does not accept carriage of anhydrous ammonia in bulk on other vessels than gas carriers.

Cite: 46 CFR 98.30–3 Portable tanks and intermediate bulk container

DNVGL does normally not accept transfer of above materials to or from portable tanks on vessels.

Exemptions have been given for heli-fuel and offshore supply vessels. Portable tanks required to be IMDG certified. The IMDG requirements are equivalent to the requirements of 46 CFR 98.30 – 3, except for annual inspection of pressure/vacuum devices.

7 46 CFR SUBCHAPTER J – ELECTRICAL ENGINEERING

7.1 Electrical Engineering - General

7.1.1 46 CFR 111

Cite: 46 CFR 111.12 – 1 (c) Generator construction and circuits, prime movers

Each prime mover must shut down automatically upon loss of lubricating pressure to the generator bearings if the generator is directly coupled to the engine. If the generator is operating from a power take-off, such as a shaft driven generator on a main propulsion engine, the generator must automatically declutch (disconnect) from the prime mover upon loss of lubricating pressure to generator bearings.

Cite: 46 CFR 111.12 – 9 (a) Generator construction and circuits, generator cables

The current-carrying capacity of generator cables must not be:

- 1) Less than 115 percent of the continuous generator rating; or
- 2) Less than 115 percent of the over load for a machine with a 2 hour or greater overload rating.

Cite: 46 CFR 111.30 - 29(g) Emergency switchboards

Each emergency switchboard must have a secondary or manual method of adjusting the generator output in case of failure of the automatic voltage regulator.

Cite: 46 CFR 111.60 – 4 (a) Minimum cable conductor size

Each power and lighting cable conductor must be #14 AWG (2.10 mm²) or larger.

Cite: 46 CFR 111.60 – 7 Demand loads

Generator, feeder and bus-tie cables must be selected on the basis of a computed load of not less than given in the following table:

Type of Circuit	Demand Load
Generator cables	115 percent of continuous generator rating
Switchboard bus-tie, except ship's service to emergency switchboard bus-tie	75 percent of generating capacity of the larger switchboard
Emergency switchboard bus-tie	115 percent of continuous rating of emergency switchboard
Motor feeders	Article 430, National Electric Code
Galley equipment feeder	100 percent of either the first 50 KW or one-half the connected load, whichever is the larger, plus 65 percent of the remaining connected load, plus 50 percent of the rating of the spare switches or circuit breakers in the distribution panel.
Lighting feeder	100 percent of the load plus the average active circuit load for the spare switches or circuit breakers on the distribution panels.
Grounded neutral of a dual voltage leader	100 percent of the capacity of the ungrounded conductors when grounded neutral is not protected by a circuit breaker overcurrent trip or not less than 50 percent of the capacity of the ungrounded conductors when the grounded neutral is protected by a circuit breaker overcurrent trip or overcurrent alarm.

Cite: 46 CFR 111.60 – 19 (a) Cable splices

A cable must not be spliced in a hazardous location, except in intrinsically safe systems.

Cite: 46 CFR 111.75 – 5 (b) Lighting branch circuits

Connected load - the connected load on a lighting branch circuit must not be more than 80 percent of the rating of the overcurrent protective device, computed on the basis of the fixture ratings and in accordance with IEEE Std 45-2002, Section 5.4.2.

Cite: 46 CFR 111.75 - 17(d) (2) Navigation lights

Requirement for navigation light to be independently lab-tested to UL 1104 or an equivalent standard.

Cite: 46 CFR 111.95 Electric power-Operated boat winches

§ 111.95 – 1 Applicability.

(a) The electric installation of each electric power-operated boat winch must meet the requirements in this subpart, except that limit switches must be adapted to the installation if there are no gravity davits.

(b) The provisions of this subpart supplement the requirements for boat winches in other parts of this chapter under which vessels are certified and in the general part on Equipment Approval (page 10).

§ 111.95 – 3 General requirements.

(c) Each main line emergency disconnecting switch, if accessible to an unauthorized person, must have a means to lock the switch in the open-circuit position with a padlock or its equivalent. The switch must not lock in the closed-circuit position.

§ 111.95 – 7 Wiring of boat winch components.

(a) If the motor controller of a boat winch power unit is next to the winch, the main line emergency switch must disconnect all parts of the boat winch power unit, including the motor controller and limit switches, from all sources of potential. Other power circuit switches must be connected in series with the main line emergency switch and must be ahead of the motor controller. The main line emergency switch must be the motor and controller disconnect required by Subpart 111.70 and must have a horsepower rating of at least that of the winch motor.

(b) If the motor controller of a boat winch power unit is remote from the winch, there must be a switch at the controller that can disconnect the entire winch electric installation from all sources of potential. The switch must be in series with and on the supply side of the main line emergency switch.

(c) Each davit arm limit switch, whether connected in the power circuit or in the control circuit, must disconnect all ungrounded conductors of the circuit controlled.

(d) If one motor is used with two winches, there must be a main line emergency switch, a clutch interlock switch, and a master switch for each winch, except that a single main line emergency switch located as required by paragraph (e) of this section may be used for both winches. The main line emergency switches must be connected, in series, ahead of the motor controller. The master switches must be connected in parallel and each, in series, with the corresponding clutch interlock switch for that winch. Each clutch interlock switch must open the circuit to its master switch, except when the power unit is clutched to the associated winch. There must be a means to prevent the power unit from being clutched to both winches simultaneously.

(e) The main line emergency disconnecting switch must be adjacent to the master switch, within reach of the winch operator, accessible to the person in charge of the boat stowage, and for gravity davit installations, in a position from which the movement of boat davit arms can be observed as they approach the final stowed position.

Cite: 46 CFR 111.105 – 29 Combustible liquid cargo carriers

Each vessel that carries combustible liquid cargo with a closed- cup flashpoint of 60 degrees C (140 degrees F) or higher is to have:

- (1) Only intrinsically safe electric systems in cargo tanks; and
- (2) No storage battery in any cargo handling room.

If a submerged cargo pump motor is in a cargo tank, it is to comply with the following requirements:

- (1) Low liquid level, motor current, or pump discharge pressure must automatically shutdown power to the motor if the pump loses suction;
- (2) An audible and visual alarm must be actuated by the shutdown of the motor; and
- (3) There must be a lockable circuit breaker or lockable switch that disconnects power to the motor.

Where the cargo is heated to within 15 deg.C of its flashpoint, the cargo pump room is to comply with the following requirements: Cargo handling rooms. A cargo handling room must not have any electric cable or other electric equipment, except:

- (1) Intrinsically safe equipment;
- (2) Explosion proof lighting fixtures;
- (3) Cables supplying intrinsically safe equipment in the cargo handling room; and

(4) Marine shipboard cables that supply explosion proof lighting fixtures that are in the cargo handling room. Weather locations are to comply with the following. The following locations in the weather are Class I, Division 1 (Zone 1) locations (except the open deck area on an inorganic acid carrier which is considered a non-hazardous location) and may have only approved intrinsically safe, explosion proof, or purged and pressurized electrical equipment, and through runs of marine shipboard cable if the location is—

- (1) Within 10 feet (3 m) of:
 - (i) A cargo tank vent outlet;
 - (ii) A cargo tank ullage opening;
 - (iii) A cargo pipe flange;
 - (iv) A cargo valve;
 - (v) A cargo handling room entrance; or
 - (vi) A cargo handling room ventilation opening; or
- (2) On a tanker and on the open deck over the cargo area and 10 feet (3 m) forward and aft of the cargo area on the open deck and up to 8 feet (2.4 m) above the deck.
- (3) Within 5 meters (16 ft) of cargo pressure/vacuum valves with an unlimited height; or
- (4) Within 10 meters (33 ft) of vent outlets for free flow of vapor mixtures and high velocity vent outlets for the passage of large amounts of vapor, air or inert gas mixtures during cargo loading and ballasting or during discharging.

Cite: 46 CFR 111.105 – 31 Flammable or combustible cargo with a flashpoint below 60°C (140°F), carriers of liquid-Sulphur or inorganic acid

Ships carrying carbon disulfide shall have only intrinsically safe equipment in the following locations:

- Cargo tanks,
- Cargo handling rooms,
- Enclosed spaces,
- Cargo hose storage spaces,
- Spaces containing cargo piping and hazardous locations in the weather.

Cite: 46 CFR 112.15 - 1 Emergency Loads: Purpose; preemptive effect.

(a) The purpose of this part is to ensure a dependable, independent, and dedicated emergency power source with sufficient capacity to supply those services that are necessary for the safety of the

passengers, crew, and other persons in an emergency and those additional loads that may be authorized under paragraph (c) of this section.

(b) No load may be powered from an emergency power source, except:

- (1) A load required by this part to be powered from the emergency power source;
- (2) A bus-tie to the main switchboard that meets §112.05-3; and
- (3) Emergency loads that may be necessary to maintain or restore the propulsion plant, such as control systems, controllable pitch propellers, hydraulic pumps, control air compressors, and machinery necessary for dead-ship start-up.

(c) Other loads may be authorized by the Commanding Officer, Marine Safety Center (MSC), to be connected to the emergency source of power to provide an increased level of safety in recognition of a unique vessel mission or configuration. When these loads are authorized, the emergency power source must—

- (1) Be sized to supply these loads using a unity (1.0) service factor; or
- (2) Be provided with automatic load shedding that removes these loads and operates before the emergency generator trips due to overload. The automatic load shedding circuit breakers must be manually reset.

(d) The regulations in this part have preemptive effect over State or local regulations in the same field.

Cite: 46 CFR 112.15 - 5 Emergency loads

Final (including temporary) emergency loads.

On vessels required to have final emergency power sources, the following emergency lighting and power loads must be arranged so that they can be energized from the final emergency power source:

1 (e) Illumination to allow safe operation of each power operated watertight door.

(f) At least one light in each space where a person may be maintaining, repairing or operating equipment, stowing or drawing stores or equipment, or transiting, such as public spaces, work spaces, machinery spaces, workshops, galleys, bow thruster rooms, storage areas, underdeck passageways in cargo areas, windlass rooms, accessible duct keels with valve operators, cargo handling rooms and holds of roll on/roll-off vessels.

(g) All lighting relative to helicopter operations and landing if installed, unless provided by another source power (such as independent batteries separately charged by solar cells).

5 (c) Each charging panel for:

- (1) Temporary emergency batteries;
- (2) Starting batteries for diesel engines or gas turbines that drive emergency generators; and
- (3) General alarm batteries.

(g) If necessary, the lube oil pump for each propulsion turbine and reduction gear, propulsion diesel reduction gear, and ship's service generator turbine which needs external lubrication.

(h) Each rudder angle indicator.

(i) Each general emergency flashing light required.

(o) Each emergency generator starting compressor.

(r) Each vital system automation load required.

(s) Motor-operated valves for each cargo oil and fuel oil system, if the emergency power source is the source of power.

(v) Each smoke extraction fan (not including smoke detector sampling).

Cite: 46 CFR 112.20 – 5 Failure of power from the normal source or final emergency power source

(a) On vessels which are required to install a transitional source of power, see Rules for classification: Ships – DNVGL-RU-SHIP-Pt.4, Ch. 8, Section 2, 3.2. If there is a reduction of potential of the normal source by 15 to 40 percent, the loads consumers listed in DNV GL rules Table 1 (reference 46 CFR 112.15-1 for CFR list of emergency consumers) must be automatically supplied from the temporary emergency power source.

(b) For systems in which a reduction of frequency of the normal source or final emergency power source adversely affects the emergency system and emergency loads, there must be means to transfer the consumer loads required under (a) to the temporary emergency power source upon a reduction in the frequency of the normal source or final emergency power source.

7.2 Electrical Engineering - Emergency Lighting and Power Systems

7.2.1 46 CFR 112

Cite: 46 CFR 112.20 – 15 Transfer of emergency loads

(a) When the potential of the final emergency power source reaches 85 to 95 percent of normal value, the emergency loads under 112.15 - 5 must transfer automatically to the final emergency power source and, on a passenger vessel, this transfer must be accomplished in no more than 45 seconds after failure of the normal source of power.

(b) When the potential from the normal source has been restored, the emergency loads must be manually or automatically transferred to the normal source, and the final emergency power source must be manually or automatically stopped.

(c) If the potential of the final emergency power source is less than 75 to 85 percent of normal value while supplying the emergency loads, the temporary emergency loads under 112.15 – 1 must transfer automatically to the temporary emergency power source.

Cite: 46 CFR 112.45 Visible indicators

There must be visible indicators in the machinery space to show when the automatically controlled emergency power source is supplying the emergency loads.

Cite: 46 CFR 112.50 – 1 (g) Emergency diesel and gas turbine engine driven generator sets

The generator set must shut down automatically upon loss of lubricating oil pressure, over-speed, or operation of a fixed fire extinguishing system in the emergency generator room (see § 111.12–1(b) for detailed overspeed trip requirements).

Cite: 46 CFR 112.55 - 5 Emergency lighting loads

When supplying emergency lighting loads, the storage battery initial voltage must not exceed the standard system voltage by more than 5 percent.

Cite: 46 CFR 112.55 – 10 (d) Storage battery charging

There must be an instrument to show the rate of charge.

7.3 Electrical Engineering - Communication and Alarm Systems and Equipment

7.3.1 46 CFR 113

46 CFR 113 Communication and alarm systems and equipment

Cite: 46 CFR 113.30 – 5 (g) Internal communications

Lookout - Each vessel must have a means of communication between the navigating bridge and the bow or forward lookout station unless direct voice communication is possible.

Cite: 46 CFR 113.35 – 3 Engine order telegraph systems

The engine room telegraph required is to comply with the following:

- a separate engine room telegraph is to be provided for each engine
- on a double-ended vessel that has two navigating bridges, this system is to be between the engine room and each navigating bridge.

Cite: 46 CFR 113.35 – 5 Electric engine order telegraph systems

(a) Each electric engine order telegraph system must have transmitters and indicators that are electrically connected to each other.

(b) Each engine room indicator must be capable of acknowledgement of orders.

(c) There must be an audible signal at each instrument. The signal at both locations must sound continuously when the transmitter and the indicator do not show the same order.

(d) Each telegraph instrument must meet the protection requirements in DNV GL rules.

(e) Each system must have an alarm which—

- (1) Automatically sounds and visually signals a loss of power to the system
- (2) Is on the navigating bridge; and
- (3) Has a means to reduce the audible signal from 100 percent to not less than 50 percent.

Cite: 46 CFR 113.35 – 7 Electric engine order telegraph systems: Operation

(a) Where two or more transmitters, located on or on top of, or on the wings of, the navigating bridge operate a common indicator in the engine room, the transmitters must:

- (1) Operate in synchronism as required in paragraph (b) of this section; or
- (2) Operate under the control of a transmitter transfer control in accordance with paragraph (c) of this section.

(b) All transmitter handles and pointers must operate in synchronism. Where the transmitters are mechanically interlocked to effect synchronous operation, the requirements of Sec. 113.35 – 13 must be met.

(c) Except for a transmitter in an unattended navigating bridge on a double-ended vessel, each transmitter must operate under the control of a transmitter transfer control so that movement of any one transmitter handle automatically connects that transmitter electrically to the engine room indicator and simultaneously disconnects electrically all other transmitters. The reply pointers of all transmitters must operate in synchronism at all times.

(d) On a double-ended vessel that has two navigating bridges, a manually operated transfer switch which will disconnect the system in the unattended navigating bridge must be provided.

Cite: 46 CFR 113.35 – 9 Mechanical engine order telegraph systems

(a) Each mechanical engine order telegraph system is to consist of transmitters and indicators mechanically connected to each other, as by means of chains and wires. (b) Each transmitter and each indicator is to have an audible signal device to indicate, in the case of an indicator, the receipt of an order, and in the case of a transmitter, the acknowledgement of an order. The audible signal device is to not be dependent upon any source of power for operation other than that of the movement of the transmitter or indicator handle.

Cite: 46 CFR 113.35 – 13 Mechanical engine order telegraph systems: Operation

If more than one transmitter operates a common indicator in the engine room, all the transmitters is to be mechanically interlocked and operate in synchronism. A failure of the transmission wire or chain at any transmitter is to not interrupt or disable any other transmitter.

Cite: 46 CFR 113.35 – 15 Mechanical engine order telegraph systems: Application

If a mechanical engine order telegraph system is installed on any vessel to provide the communication required by this subpart, the length of cables or other mechanical limitations is to not prevent the efficient operation of the system.

Cite: 46 CFR 113.35 – 17 Vessels with navigating bridge control

Where ships are arranged with Bridge control of propulsion machinery in accordance with Rules for classification: Ships — DNVGL-RU-SHIP-Pt.4, Ch.1, Section 4, 1.4, each telegraph transmitter that prevents movement to the "Navigating Bridge Control" position without positive action by the operator.

Cite: 46 CFR 113.43 - 1, 3, 5 Steering failure alarm systems

1) This subpart applies to each vessel of 1600 gross tons and over that has power driven main or auxiliary steering gear.

3 (a). Each vessel must have steering failure alarm system that actuates an audible and visible alarm in the pilothouse when the actual position of the rudder differs by more than 5 degrees from the rudder position ordered by the follow-up control systems, for more than:

- (1) 30 seconds for ordered rudder position changes of 70 degrees;
- (2) 6.5 seconds for ordered rudder position changes of 5 degrees; and
- (3) The time period calculated by the following formula for ordered rudder position changes between 5 degrees and 70 degrees:

$$t = (R / 2.76) + 4.64$$

Where t = maximum time delay in seconds and R = ordered rudder change in degrees.

5. Each steering failure system must be supplied by a circuit that is independent of other steering gear alarm circuits.

8 46 CFR SUBCHAPTER L – OFFSHORE SUPPLY VESSELS

This Section includes additional Supplemental Requirements for Offshore Supply Vessels, except liftboats, certified under 46 CFR Subchapter L.

Note: USCG has issued additional interim final rules for large Offshore Supply Vessels. Reference should be made to **Federal Register Vol. 79, No. 159 – Offshore Supply Vessels of at Least 6,000 GT ITC** for additional requirements including: mandatory certificates, lifesaving appliances, carriage of more than 36 offshore workers, carriage of noxious and flammable liquid bulk cargoes, and electrical equipment in hazardous areas. These interim final rules are applicable to all large OSVs in ACP.

8.1 Offshore Supply Vessels - General

8.1.1 46 CFR 125

Note: USCG is currently updating the requirements for both MODUs and Non-MODUs that conduct Outer Continental Shelf Activities using Dynamic Positioning. For guidance concerning OSVs, please refer to "Notice of Recommended Interim Voluntary Guidance" published in the Federal Register on October 12, 2012 (77 FR 62247). This Supplement will be updated when requirements are finalized.

Cite: 46 CFR 125.110 Carriage of flammable or combustible liquid cargoes in bulk

CG-ENG Policy Letter 03-12, Rev. 1 "Policy on the Implementation of IMO Resolution A.673 (16), Guidelines for the Transport and Handling of Limited Amounts of Hazardous and Noxious Liquid Substances in Bulk on Offshore Support Vessels, For New and Existing U.S. Offshore Supply Vessels," contains guidance on the implementation of IMO Res. A.673 (16) as it relates to offshore supply vessels carrying limited amounts of hazardous and noxious liquid cargoes in bulk.

(b) An OSV may carry the following in integral tanks:

- (1) Grade-D combustible liquids (having an open cup flashpoint below 150 degrees F [65.5 Degrees C] and above 80 degrees F [26.5 degrees C]), in quantities not to exceed 20 percent of the vessel's deadweight, except that the vessel may carry drilling fluids and excess fuel oil, Grade-E as well as Grade-D, without limit.
- (2) Grade-E combustible liquids (having an open cup flashpoint of 150 degrees F [65.5 degrees C] or above) , in quantities not to exceed 20 percent of the vessel's deadweight, except that the vessel may carry drilling fluids and excess fuel oil, Grade-D as well as Grade-E, without limit.
- (3) An OSV may carry the following in fixed independent tanks on deck:
Grade-B (flammable liquids having an open cup flashpoint below 80 degrees F [26.5 degrees C] and having a Reid vapor pressure under 14 pounds [6.4 kg] and over 8 ½ pounds [3.9 kg]) and lower-grade flammable and combustible liquids, in quantities not to exceed 20 percent of the vessel's deadweight.
- (5) An OSV may carry hazardous materials in portable tanks, in compliance with part 64 and subpart 98.30 of this chapter. A portable tank may be filled or discharged aboard the vessel if authorized by an endorsement on the vessel's Certificate of Inspection.

Note: The amounts specified in the above cited CFR may be exceeded, provided the provisions listed within CG-ENG Policy Letter 03-12 Paragraph 1.1.4 are complied with.

Cite: 46 CFR 125.120 Carriage of noxious liquid substances in bulk

CG-ENG Policy Letter 03-12 (current version), "Policy on the Implementation of IMO Resolution A.673 (16) for the Transport and Handling of Limited Amounts of Hazardous and Noxious Liquid Substances in Bulk on Offshore Supply Vessels for New and Existing U.S. Offshore Supply Vessels" provides voluntary guidance on the implementation of IMO Res. A.673 (16) as it relates to offshore supply vessels carrying limited amounts of hazardous and noxious liquid cargoes in bulk. Policy Letter 03-12 includes the following:

- (a) Vessels enrolled in the Coast Guard's Alternate Compliance Program (ACP) shall meet this policy.
- (b) OSVs that operate exclusively in waters subject to U.S. jurisdiction must have a Certificate of Inspection (COI) endorsed or an authorized attachment to the COI, with the name of each NLS cargo authorized for carriage, but are not required to maintain a NLS Certificate.
- (c) Such OSVs are required to have a Certificate of Fitness (COF) – Coast Guard Form CG-5148C, Rev. 02-09, or a valid International Pollution Prevention Certificate for the carriage of Noxious Liquid Substances in Bulk (NLS Certificate)
- (d) Any OSV that meets the damage stability requirements contained in paragraph 2.1.2 may carry unlimited amounts of drilling fluids as defined in paragraph 1.3.11. However, the carriage of all other cargos identified in paragraph 1.2.2 must not exceed a total aggregate volume in cubic meters equal to 20% of the vessel's deadweight, calculated at a cargo specific gravity of 1.0.
- (e) If the damage stability requirements of paragraph 2.1.2 are not met, an OSV may not carry more than the limited quantities specified in paragraph 1.1.4 above (i.e. the lesser of 800 m³ or a volume in cubic meters equal to 40% of the vessel's deadweight).
- (f) Consistent with Marine Safety Manual (MSM) Volume II, Section F, Ch. 2.C.1 the filling and discharge of a portable tank while the tank is still aboard the vessel is considered a "bulk" transfer.
- (g) An OSV may carry any hazardous material in a portable tank provided that it is authorized in accordance with 49 CFR parts 171-180 or the International Maritime Dangerous Goods (IMDG) Code, provided the portable tank is not loaded or discharged while onboard the OSV.

See Policy Letter 03-12 (current version) for complete requirements.

Note: The amounts specified in the above cited CFR may be exceeded, provided the provisions listed within CG-ENG Policy Letter 03-13 Paragraph 1.1.4 are complied with.

8.2 Offshore Supply Vessels – Lifesaving Systems

8.2.1 46 CFR 125

Reference is made to 46 CFR 133 on "Lifesaving Systems". This subpart is based on Chapter III of SOLAS. Additional items not covered by SOLAS and DNV GL rules include the following requirements from 46 CFR 125 and by reference 133.

Cite: 125.150 Lifesaving systems.

Lifesaving appliances and arrangements must comply with part 133 of this subchapter.

Reference is made to 46 CFR 133 on "Lifesaving Systems". This subpart is based on Chapter III of SOLAS. Additional items not covered by SOLAS and DNV GL rules are given in 46 CFR 133 as follows:

Cite: 46 CFR 133.07 Additional equipment and requirements

The OCMI may require an OSV to carry specialized or additional lifesaving equipment other than as required in 46 CFR part 133 if the OCMI determines that the conditions of a voyage present uniquely hazardous circumstances which are not adequately addressed by existing requirements.

Cite: 46 CFR 133.70 (c) (3) Markings

Each immersion suit or anti-exposure suit must be marked in such a way as to identify the person or OSV to which it belongs.

Cite: 46 CFR 133.70 (d) Lifejacket, immersion suit, and anti-exposure suit containers

Each lifejacket, immersion suit, and anti-exposure suit container must be marked in block capital letters and numbers with the quantity, identity, and size of the equipment stowed inside the container. The equipment may be identified in words, or with the appropriate symbol from IMO Resolution A.760 (18).

Cite: 46 CFR 133.105 (a) (4) Lifefloats

Such alternative devices may be used for some trades, subject to approval by the USCG.

Cite: 46 CFR 133.130 (a) (8) Stowage of survival craft

Each survival craft must not require lifting from its stowed position in order to launch, except that--

- i. A davit-launched life raft may be lifted by a manually powered winch from its stowed position to its embarkation position; or
- ii. A survival craft that weights 185 kilograms (407.8 pounds) or less may require lifting of not more than 300 millimeters (1 foot).

8.3 Offshore Supply Vessels – Inspection and Certification

8.3.1 46 CFR 126

Cite: 46 CFR 126.130 Carriage of offshore workers cranes

Cranes installed on OSVs are to be certified by an organization approved by USCG as a crane certifying authority.

Cite: 46 CFR 126.170 Carriage of offshore workers

(a) Offshore workers may be carried aboard an OSV in compliance with this subchapter. The maximum number of offshore workers authorized for carriage will be endorsed on the vessel's Certificate of Inspection; but in no case will the number of offshore workers authorized for carriage exceed 36.

(b) No more than 12 offshore workers may be carried aboard an OSV certificated under this subchapter when on an international voyage, unless the vessel holds a valid passenger-ship-safety certificate (Form CG-968) issued in compliance with the International Convention for the Safety of Life at Sea, 1974, as amended (SOLAS 74/83).

Note: Large Offshore Supply Vessels meeting the requirements outlined in the Interim Rule for Offshore Supply Vessels of at Least 6,000 GT ITC may be allowed to carry more than 36 offshore workers if the OSV meets stability, marine engineering, fire protection, and lifesaving provisions set forth in the interim rule. See Federal Register Vol. 79, No. 159 – Offshore Supply Vessels of at Least 6,000 GT ITC for detailed requirements.

8.4 Offshore Supply Vessels – Construction and Arrangement

8.4.1 46 CFR 127

Cite: 46 CFR 127.220 General fire protection

Emergency Source of Power

(d) Except as provided in paragraph (e), when a compartment containing the emergency source of electric power, or vital components of that source, adjoins a space containing either the ship's service generator or machinery necessary for the operation of the ship's service generator, each common bulkhead and deck must be of "A-60" Class construction.

(e) The "A-60" Class construction required by paragraph (a) is unnecessary if the emergency source of electrical power is in a ventilated battery locker that:

- (1) Is located above the main deck;
- (2) Is located in the open; and
- (3) Has no boundaries contiguous with other decks or bulkheads.

Cite: 46 CFR 127.240 Means of escape

(b) At least one of the two means of escape must be independent of watertight doors. Equivalent arrangements may be approved case-by-case (ref. Marine Safety Center Technical Note MTN 03-00).

(e) A vertical ladder ending at a deck scuttle may be the second means of escape if the--

- (1) Primary means of escape is a stairway or passageway;
- (2) Installation of another stairway or passageway is impracticable;
- (3) Scuttle is located where stowed deck cargo could not interfere;
- (4) Scuttle is fitted with a quick-acting release, and with a hold back device to hold it open; and
- (5) Scuttle meets the requirements for location, strength, and height of coaming in subchapter E of this chapter.

(f) Each vertical ladder must--

- (1) Have rungs that are--
 - (i) At least 410 millimeters (16 inches) long;
 - (ii) At most 300 millimeters (12 inches) apart, uniform for the length of the ladder; and
 - (iii) At least 180 millimeters (7 inches) from the nearest permanent object in back of the ladder;
- (2) Have at least 115 millimeters (4 ½ inches) of clearance above each rung;
- (3) Be made of incombustible materials; and
- (4) Have an angle of inclination with the horizontal, greater than 70 degrees but not more than 90 degrees.

Cite: 46 CFR 127.260 Ventilation for accommodations

(a) Each accommodation space must be adequately ventilated in a manner suitable to the purpose of the space.

(b) Each vessel of 100 gross tons and over must be provided with a mechanical ventilation system unless the cognizant OCMI is satisfied that a natural system, such as openings windows, port lights, or doors, will accomplish adequate ventilation in ordinary weather.

Cite: 46 CFR 127.280 Construction and arrangement of quarters for crew members and accommodations for offshore workers

(a) The following requirements apply to quarters for crew members on each vessel in the ACP program (500 or more gross tons):

- (1) Quarters for crew members must be divided into staterooms none of which berths more than four members.
- (2) Each stateroom for use by crew members must—
 - (i) Have clear headroom of at least 1.9 meters (6 feet, 3 inches); and
 - (ii) Contain at least 2.8 square meters (30 square feet) of deck and at least 6 cubic meters (210 cubic feet) of space for each member accommodated. The presence in a stateroom of equipment for use by the occupants does not diminish the area or volume of the room.
 - (iii) There must be at least one toilet, one washbasin, and one shower or bathtub for every eight or fewer crew members who do not occupy a stateroom to which a private or a semiprivate facility is attached.

(b) The following requirements apply to accommodations for offshore workers on each vessel in the ACP program (500 or more gross tons):

(1) Each offshore worker aboard must be provided with adequate fixed seating. The width of each seat should be at least 460 millimeters (18 inches). The spacing of fixed seating must be sufficient to allow ready escape in case of fire or other emergency. The following are minimal requirements:

- (i) Aisles 4.6 meters (15 feet) in length or less must not be less than 610 millimeters (24 inches) wide.
- (ii) Aisles more than 4.6 meters (15 feet) in length must not be less than 760 millimeters (30 inches) wide.
- (iii) Where the seating is in rows, the distance from seat front to seat front must not be less than 760 millimeters (30 inches).

(2) If the intended operation of a vessel is to carry offshore workers aboard for more than 24 hours, quarters for them must be provided. Each stateroom for use by them must—

- (i) Berth no more than six workers;
- (ii) Have clear headroom of at least 1.9 meters (6 feet, 3 inches); and
- (iii) Contain at least 1.9 square meters (20 square feet) of deck and at least 4 cubic meters (140 cubic feet) of space for each worker accommodated. The presence in a stateroom of equipment for use by the occupants does not diminish the area or volume of the room.

(3) Toilets and washbasins for use by offshore workers must meet the requirements of paragraph (a) (3) of this section.

(c) Each crew member and offshore worker aboard a vessel of less than 100 gross tons must be provided with accommodations of adequate size and construction, and with equipment for his or her protection and convenience suitable to the size, facilities, and service of the vessel.

(d) For each vessel of 100 or more gross tons, the bulkheads and decks separating accommodations for crew members and offshore workers from machinery spaces must be of "A" Class construction as defined by §92.07-5 of this chapter.

(e) After reviewing the arrangement drawings required by §127.110 of this part, the cognizant OCMI will determine, and record on the vessel's Certificate of Inspection, the number of offshore workers that the vessel may carry.

Cite: 46 CFR 127.430 Visibility from pilothouse

DNV GL does not allow polarized or tinted windows to be used on Offshore Supply Vessels.

Cite: 46 CFR 127.440 Operability of window coverings

Any coverings or protection placed over a window or porthole that could be used as a means of escape must be able to be readily removed or opened. It must be possible to open or remove the covering or protection without anyone having to go onto a weather deck. It may be necessary to break the glass of a window or porthole before removing or opening the covering or protection.

8.5 Offshore Supply Vessels – Marine Engineering and Equipment

8.5.1 46 CFR 128

Cite: 46 CFR 128.420 Keel cooler installations

(b) Approved metallic flexible connections may be located below the deepest-load waterline if the system is a closed loop below the waterline and if its vent is located above the waterline.

(c) Fillet welds may be used in the attachment of channels and half-round pipe sections to the bottom of the vessel.

(d) Short lengths of approved nonmetallic flexible hose fixed by metallic or non-metallic hose-clamps may be used at machinery connections if—

- (1) The clamps are of a corrosion-resistant material;
- (2) The clamps do not depend on spring tension for their holding power;
- (3) Two of the clamps are used on each end of the hose, except that one clamp may be used on an end expanded or beaded to provide a positive stop against hose slippage; and
- (4) The clamps are resistant to vibration, high temperature, and brittleness.

Cite: 46 CFR 128.430 Non-integral keel cooler installations

(a) Each hull penetration for a non-integral keel cooler installation must be made through a cofferdam or at a sea-chest and must be provided with isolation valves fitted as close to the sea inlet as possible.

(b) Each non-integral keel cooler must be protected against damage from debris and grounding by protective guards or by recessing the cooler into the hull.

Cite: 46 CFR 128.440 Bilge systems

In general, bilge systems for OSVs must comply with normal Class rules, however, the following exception is granted by 46 CFR 128.440:

(b) If the steering room, engine room, centerline passageway, forward machinery space, and compartment containing the dry-mud tanks are the only below-deck spaces that must be fitted with bilge suctions, the vessel may be equipped to the standards of 46 CFR 56.50-50 and 56.50-57 of this chapter applicable to a dry-cargo vessel of less than 55 meters (180 feet) in length.

Cite: 46 CFR 128.450 Liquid mud systems

(a) Liquid mud piping systems may use resiliently seated valves of Category A to comply with 46 CFR 56.20-15 and 56.50-60.

(b) Tanks for oil-based liquid mud must be fitted with tank vents equipped with flame screens. Vents must not discharge to the interior of the vessel.

8.6 Offshore Supply Vessels – Electrical Installations

8.6.1 46 CFR 129

Cite: 46 CFR 129.326 Dual-voltage generators

If a dual-voltage generator is installed on an OSV –

- (a) The neutral of the dual-voltage system must be solidly grounded at the switchboard's neutral bus and be accessible for checking the insulation resistance of the generator.

Cite: 46 CFR 129.375 System grounding

(a) If a grounded distribution system is provided, there must be only one connection to ground, regardless of the number of power sources. This connection must be at the main switchboard.

Cite: 46 CFR 129.380 Overcurrent protection

- (b) Each generator must be protected by an overcurrent device set at a value not exceeding 115 percent of the generator's full-load rating.

Cite: 46 CFR 129.520 Hazardous areas

(a) No OSV that carries flammable or combustible liquid with a flashpoint of below 140°F (60°C), or carries hazardous cargoes on deck or in integral tanks, or is involved in servicing wells, may have electrical equipment installed in pump rooms, in hose-storage spaces, or within 3 meters (10 feet) of a source of vapor on a weather deck unless the equipment is explosion-proof or intrinsically safe.

Cite: 46 CFR 129.550 Power for cooking and heating

(b) The use of gasoline for cooking, heating, or lighting is prohibited.

(c) The use of liquefied petroleum gas for cooking, heating, or other purposes must comply with subpart 58.16 of 46 CFR.

8.7 Offshore Supply Vessels – Vessel Control and Miscellaneous Equipment and Systems

8.7.1 46 CFR 130

Cite: 46 CFR 130.310 Radar

Each vessel of 100 or more gross tons must be fitted with a general marine radar in the pilothouse.

Cite: 46 CFR 130.440 Communications system

(a) Each OSV must have a communications system to immediately summon a crew member to the machinery space wherever one of the alarms required by Sec. 130.460 of this subpart is activated.

(b) The communications system must be either--

(1) An alarm that--

(i) Is dedicated for this purpose;

(ii) Sounds in the crew accommodations and the normally manned spaces; and

(iii) Is operable from the pilothouse; or

(2) A telephone operated from the pilothouse that reaches the master's stateroom, engineer's stateroom, engine room, and crew accommodations that either--

(i) Is a sound-powered telephone; or

(ii) Gets its power from the emergency switchboard or from an independent battery continuously charged by its own charger.

46 CFR 131 Operations

Cite: 46 CFR 131.880 Fire hoses and axes

Each fire hose and axe must be marked with the vessel's name.

8.8 Offshore Supply Vessels – Fire Protection

8.8.1 46 CFR 132

Cite: 46 CFR 132.120 Fire pumps – (Fire monitors)

(h) When a fire monitor is connected to the fire main system, it must be lead from a discharge manifold near the fire pump. Each fire monitor must be fitted with a shut-off valve at the monitor and at the connection to the fire pump discharge manifold.

Cite: 46 CFR 132.130 Fire stations

- (e) Each outlet at a fire hydrant must be at least 38 millimeters (1 1/2 inch) in diameter and, to minimize the possibility of kinking, must be fitted so that no hose leads upward from it.
- (g) Each fire station must have at least one length of fire hose. Each hose on the station must have a fire nozzle approved under subpart 162.027 of this chapter that can discharge both solid stream and water spray.
- (k) Each fire hydrant must have a fire hose 15.2 meters (50 feet) in length, with a minimum diameter of 38 millimeters (1 1/2 inches), connected to an outlet, for use at any time.
- (m) A suitable hose rack or other device must be provided for each fire hose. Each rack on a weather deck must be placed so as to protect its hose from heavy weather.
- (n) Each section of fire hose must be lined commercial fire hose that conforms to Underwriters' Laboratories, Inc. Standard 19 or Federal Specification ZZ-H-451E. Hose that bears the UL label as lined fire hose complies with this section.

Cite: 46 CFR 132.310 Fixed fire-extinguishing systems for paint lockers

- (b)(1) A fixed gaseous or other approved fire-extinguishing system meeting all cargo ship requirements is required for paint lockers, except those less than 1.7 cubic meters (60 cubic feet) in volume; accessible only from the weather deck; and not adjacent to a tank for flammable or combustible liquids.

8.9 Offshore Supply Vessels – Stability

8.9.1 46 CFR 174

Note: For general requirements to stability, see Ch. 9, Structures and Stability, and Ch. 10, US Interpretations to SOLAS.

Cite: 46 CFR 174.195-207 Damage stability

OSVs are to comply with the subdivision and damage stability requirements contained in either:

- (a) **IMO Res. MSC.235 (82), Section 3** (covered by DNV GL class notation SF), or
- (b) **46 CFR 174.195, 174.200, 174.205, and 174.207**, as referenced below:

Cite: 46 174.195 Bulkheads in machinery spaces

- (a) The bulkhead in each machinery space of each OSV must be watertight to the bulkhead deck
- (b) Each penetration of, and each opening in, a bulkhead in a machinery space must—
 - (1) Be kept as high and as far inboard as practicable; and
 - (2) Except as provided by §174.210 and by paragraph (c) of this section, have means to make it watertight.
- (c) No penetration of a bulkhead in a machinery space by a ventilation duct need have means to make the bulkhead watertight if—
 - (1) Every part of the duct is at least 760 millimeter (30 inches) from the side of the OSV; and
 - (2) The duct is continuously watertight from the penetration to the main deck.

(d) Each penetration of a bulkhead in a machinery space by piping must meet the design requirements for material and pressure in subchapter F.

Cite: 46 CFR 174.200 Damaged stability in machinery spaces for all OSVs

Each OSV must be shown by design calculations to comply, under each afloat condition of loading and operation, with Sec. 174.207 in case of damage between any two watertight bulkheads in each machinery space.

Cite: 46 CFR 174.205 Additional damaged stability for OSVs carrying more than 16 offshore workers

(a) *Calculations.* Each OSV carrying more than 16 offshore workers must be shown by design calculations to comply, under each afloat condition of loading and operation, with §174.207 in case of the damage specified by paragraph (b) of this section.

(b) *Character of damage.* For paragraph (a) of this section, design calculations must show that the OSV can survive damage at any place other than either the collision bulkhead or a transverse watertight bulkhead unless—

- (1) The transverse watertight bulkhead is closer than the longitudinal extent of damage, specified by Table 174.207(a), to the adjacent transverse watertight bulkhead; or
- (2) The transverse watertight bulkhead has a step or a recess, which must be assumed damaged, if it is both more than 3 meters (10 feet) in length and located within the transverse extent of damage specified by Table 174.207(a).

Cite: CFR 174.207 Damaged stability criteria

(a) *Extent of damage.* Damage must consist of penetrations having the dimensions specified by table 174.207(a), except that, if the most disabling penetrations are smaller than the penetrations specified by the table, damage must consist of the smaller penetrations.

(b) *Permeability of spaces.* The permeability of a floodable space must be as specified by Table 174.207(b).

(c) *Survival conditions.* An OSV is presumed to survive assumed damage if it meets the following conditions in the final stage of flooding:

(1) *Final waterline.* The final waterline, in the final stage of sinkage, heel, and trim, must be below the lower edge of an opening through which progressive flooding may take place, such as an air pipe, a tonnage opening, an opening closed by a weather tight door or hatch-cover, or a tank vent fitted with a ball check valve. This opening does not include an opening closed by a—

- (i) Watertight manhole-cover;
- (ii) Flush scuttle;
- (iii) Small hatch-cover for a watertight cargo-tank that maintains the high integrity of the deck;
- (iv) Watertight door in compliance with §174.210; or
- (v) Side scuttle of the non-opening type.

(2) *Angle of heel.* The angle of heel must not exceed 15 degrees.

(3) *Range of stability.* Through an angle of 20 degrees beyond its position of equilibrium after flooding, an OSV must meet the following conditions:

- (i) The righting arm curve must be positive.
- (ii) The righting arm must be at least 100 millimeters (4 inches).
- (iii) Each submerged opening must be weather tight. (A tank vent fitted with a ball check-valve is weather tight.)

(4) *Progressive flooding.* Piping, ducts, or tunnels within the assumed extent of damage must be either—

- (i) Equipped with arrangements, such as stop check-valves, to prevent progressive flooding of the spaces with which they connect; or
- (ii) Assumed in the calculations required by paragraph (a) of this section to permit progressive flooding of the spaces with which they connect.

(d) *Buoyancy of superstructure.* For paragraph (a) of this section, the buoyancy of any superstructure directly above the side damage must be considered in the most unfavorable condition.

Table 174.207(a) – Extent of Damage

Collision Penetration	
Longitudinal extent (vessels with LBP not greater than 45 meters [145 feet])	.1L or 1.8 meters (6 feet); whichever is greater in length
Longitudinal extent (vessels with LBP greater than 45 meters [143 feet])	3 meters (10 feet) + .03L
Transverse extent*	760 millimeters (30 inches)
Vertical extent	From baseline upward without limit

*The transverse penetration applies inboard from the side of the vessel, at right angles to the centerline, at the level of the deepest load waterline.

Table 174.207(b) – Permeability of Spaces

Spaces and tanks	Permeability
Storerooms	60 percent
Accommodations	95 percent
Machinery	85 percent
Voids and passageways	95 percent
Dry-bulk tanks	0 (*) or 95 percent
Consumable-liquid tanks	0 (*) or 95 percent
Other liquid tanks	0 (*) 0 (**) or 95 percent

*Whichever results in the more disabling condition.

**If tanks are partly filled, the permeability must be determined from the actual density and amount of liquid carried.

9 STRUCTURES AND STABILITY

9.1 Structures

9.1.1 General

There are no supplemental structural requirements.

9.2 Stability

9.2.1 Passenger Vessels

Cite: 46 171.122(f) Watertight integrity, passenger vessels

Each opening in an exposed weather deck must have a coaming of at least 6 inches (15.2 centimeters) and a means for closing it weather tight.

Cite: 46 CFR 78.48 – 37 Marking of watertight doors, passenger vessels

All watertight doors in subdivision bulkheads shall be numbered conspicuously on both sides on an etched plate or equivalent in not less than 3/8 inch letters and figures "W. T. D. 1," "2," "3," etc. If a stenciled or similar notice is used, the letters and figures shall be at least 1 inch high. If the construction is such that the number cannot be seen with the door in the open position, a similar number shall be placed on the frame or other location immediately adjacent to the door. All watertight door remote control stations shall be marked in the same manner, and in addition, the direction of operation of the lever or wheel to open and close the door shall be conspicuously marked.

Class 1 doors fitted in accordance with the requirements in §170.255 of this chapter must additionally be marked "RECLOSE AFTER USE."

9.2.2 Dry cargo Vessels

46 CFR 174 Subpart J - Special rules pertaining to dry cargo ships


Cite: 46 CFR 174.350 Specific applicability

This subpart applies to each new ship of 500 gross tons or over, as calculated by the International Convention on Tonnage Measurement of Ships, 1969, designed primarily for the carriage of dry cargoes, including roll-on/roll-off ships and integrated tug and barges (ITBs) when operating as a combined unit.

Cite: 46 CFR 174.355 Definitions

New ship means a ship:

- (1) For which the building contract is placed on or after February 1, 1992; or
- (2) In the absence of a building contract, the keel of which is laid or which is at a similar stage of construction on or after August 1, 1992; or
- (3) The delivery of which is on or after February 1, 1997; or
- (4) For which application for reflagging is made on or after February 1, 1997; or
- (5) Which has undergone a major conversion:
 - (i) For which the contract is placed on or after February 1, 1992; or
 - (ii) In the absence of a contract, the construction work of which is begun on or after August 1, 1992; or
 - (iii) Which is completed on or after February 1, 1997.



Cite: 46 CFR 174. 174.360 Calculations.

Each ship to which this subpart applies must comply with the minimum standard of subdivision and damage stability applicable to that ship under IMO Res. MSC.216 (82), (incorporated by reference, see § 174.007). Compliance with the applicable requirements must be demonstrated by calculations and reflected in information on loading restrictions, such as a maximum height of the center of gravity (KG) or minimum metacentric height (GM) curve, that is part of the stability information required by § 170.110 of this chapter.

9.2.3 Offshore Supply Vessels

See Section **8.1.9** of this Supplement for stability requirements to **Offshore Supply Vessels**.

10 U.S. INTERPRETATIONS TO SOLAS

10.1 Interpretations to SOLAS II-1 Construction – Subdivision and Stability, Machinery and Electrical Installations

10.1.1 Stability

Cite: SOLAS II-1/Reg. 5.1 Intact stability

Intact stability for cargo and passenger vessels is to comply with the applicable parts of Subchapter S. It has been determined that IMO Resolution MSC.267 (85) "International Code on Intact Stability, 2008" (2008 IS Code) is equivalent to the intact stability requirements of Subchapter S. Where the intact stability requirements contained in IMO Res. MSC.267 (85) are used, the Regulations contained in Subparts B, Lifting, and E, Towing, of Subchapter S are also to be satisfied, where applicable. All recommendations that appear in the 2008 IS Code on Intact Stability are required and considered mandatory.

Cite: SOLAS II-1/Reg. 4 Damage stability

Relative to damage stability, please note that all dry cargo vessels over 80 meters in length that change flag to US shall be considered to be new vessels for compliance with the probabilistic damage stability regulations in SOLAS 1974 as amended, Chapter II-1, regardless of the actual build date.

10.1.2 Electrical Installations

Cite: SOLAS II-1/Reg. 45 Precautions against shock, fire and other hazards

All electrical installations in hazardous locations are to comply with the general requirements of IEC 60092-502: 1999 "Electrical installations in ships -tankers" and must be supplemented by the interpretations and additional requirements of IEC 60092-502: 1999 issued by the U.S. Coast Guard in April 2009. The mentioned requirements are listed on the Coast Guard's Alternate compliance website as "USCG Supplemental Requirements for use of "IEC 60092-502:1999 for application of SOLAS regulation II-1/45.11 to U.S. flag vessels".

10.2 Interpretations to SOLAS II-2 Construction – Fire Protection, Fire Detection and Fire Extinction

10.2.1 General Interpretations to SOLAS II-2 (all vessel types)

Cite: SOLAS II-2/3.1 Definitions – Accommodation Spaces

"A pantry containing no cooking appliances" is one which contains only low heat warming equipment, has steel furnishings and is not used as a storeroom for cleaning gear, linen supplies or any other combustible material. A dining room containing such appliances shall not be regarded as a pantry.

10.2.2 General Interpretations to SOLAS II-2 (all vessel types) - Fixed Gas Fire Extinguishing Systems

Cite: SOLAS II-2/10.4 & FSS Code Chapter 5 Fixed gas fire-extinguishing systems

Fixed gas fire extinguishing systems must be USCG type approved equipment.

Cite: SOLAS II-2/10.4 & FSS Code Chapter 5.2.2 – Fixed gas fire-Extinguishing systems – Carbon dioxide systems

A fixed carbon dioxide system must comply with the manufacturer's approved Design, Installation, Operation and Maintenance Manual that meets Chapter II-2, Regulation 10.4 of SOLAS 2000 Amendments and the below supplemental requirements (ref. 46 CFR 34.15, 76.15, 95.15).

The use of low pressure systems, that is, those in which the carbon dioxide is stored in liquid form at a low temperature, must be approved by the Commandant.

Quantity, Pipe Sizes and Discharge Rate

In dry cargo spaces, the number of pounds [kilograms] of carbon dioxide required for each space shall be equal to the gross volume of the space in cubic feet [cubic meters] divided by 30 [1.873]. The gross volume includes trunks extending from the space; however, tonnage openings may be considered sealed. Branch lines to various cargo holds and 'twin decks shall be uniformly distributed with $\frac{3}{4}$ inch or larger pipe sizes.

For CO₂ systems installed for enclosed ventilation systems of rotating electrical propulsion equipment, the number of kilograms of carbon dioxide required for the initial charge shall be equal to the gross volume of the system divided by 0.624 for systems having a volume of less than 57 cubic meters, and divided by 0.749 for systems having a volume of 57 cubic meters or more. For CO₂ systems installed for enclosed ventilation systems of rotating equipment, in addition to the above there shall be sufficient carbon dioxide available to permit delayed discharges of such quantity as to maintain at least a 25% concentration until the equipment can be stopped. If the initial discharge is such as to achieve this concentration until the equipment is stopped, no delayed discharge need be provided.

For machinery spaces, tanks, pump rooms, paint lockers and similar spaces, any fixed gas fire extinguishing system used to protect these spaces must comply with the requirements of SOLAS Chapter II-2, Regulation 10.4.1.1.1.

For spaces specially suited for vehicles, any fixed gas fire extinguishing system used to protect these spaces must comply with the requirements of SOLAS Chapter II-2, Regulation 20.6.1.1

Controls

If the same cylinders are used to protect more than one space, a manifold with normally closed stop valves shall be used to direct the carbon dioxide into the proper space. If the cylinders are used to protect only one space, a normally closed stop valve shall be installed between the cylinders and the space.

Distribution piping to dry cargo spaces shall be controlled from not more than two stations. One of the stations controlling the system for the main machinery space shall be located as convenient as practicable to one of the main escapes from the space. All control stations and the individual valves and controls shall be distinctly marked to indicate the compartments or parts of the vessel to which they lead.

Systems for protection of machinery spaces, pump rooms, paint lockers and similar spaces shall be actuated at each station by one control operating the valve to the space and a separate control releasing at least the required amount of carbon dioxide. These two controls shall be located in a box or other enclosure clearly identified for the particular space.

Where provisions are made for the simultaneous release of a given amount of carbon dioxide by operation of a remote control, provisions shall also be made for manual control at the cylinders. Where gas pressure from pilot cylinders is used as a means for releasing the remaining cylinders, not less than two pilot cylinders shall be used for systems consisting of more than two cylinders. Each of the pilot cylinders shall be capable of manual control at the cylinder, but the remaining cylinders need not be capable of individual manual control.

Systems for machinery spaces, pump rooms and similar type spaces, which are of more than 300 pounds [130 kilograms] of carbon dioxide, shall be fitted with an approved delayed discharge so arranged that an approved audible alarm will be automatically sounded for at least 20 seconds before the carbon dioxide is released into the space. Such systems of not more than 300 pounds [130 kilograms] of carbon dioxide shall also have a similar delayed discharge, except for spaces which have a suitable horizontal escape. The alarm shall depend on no source of power other than the carbon dioxide. In systems where an alarm is required, the alarm shall be conspicuously and centrally located.

Adjacent to all carbon dioxide extinguishing alarms there shall be conspicuously marked: "WHEN ALARM SOUNDS VACATE AT ONCE. CARBON DIOXIDE BEING RELEASED."

All distribution valves and controls shall be approved equipment. All controls shall be suitably protected. On systems in which the CO₂ cylinders are not within the protected space the instructions shall also include a schematic diagram of the system and instructions detailing alternate methods of discharging the system should the manual release or stop valve fail to operate. Each control valve to a branch line shall be marked to indicate the space served.

If the space or enclosure containing the CO₂ supply or controls is to be locked, a key to the space or enclosure shall be in a break-glass type box conspicuously located adjacent to the opening.

Piping

The piping, valves and fittings shall have a bursting pressure of not less than 41 N/mm² (6000 psi). All piping, valves and fittings of ferrous materials shall be protected inside and outside against corrosion unless specifically approved otherwise.

Installation test requirements are as follows:

Upon completion of the piping installation, and before the cylinders are connected, a pressure test in accordance with the manufacturer's Design, Installation, Operation, and Maintenance Manual shall be conducted. Only CO₂ or other inert gas shall be used for this test.

Carbon Dioxide Storage

All cylinders used for storing carbon dioxide must be fabricated, tested, and marked in accordance with 46 CFR 147.60 and 46 CFR 147.65 (US D.O.T approved).

Enclosure Openings

In all spaces protected by a carbon dioxide system, except cargo spaces, stopping of the ventilating fans is to be automatically actuated upon operation of the carbon dioxide system. This will not be required where the carbon dioxide system is a secondary system in addition to another approved primary system protecting the space.

Pressure Relief

Where necessary, relatively tight compartments such as refrigeration spaces, paint lockers, etc., shall be provided with suitable means for relieving excessive pressure accumulating within the compartment when the carbon dioxide is injected.

Markings

CO₂ fire smothering apparatus shall be marked "CO₂ FIRE APPARATUS" in not less than 50 mm (2 in) red letters.

Lockout Valves

A lockout valve must be provided on any carbon dioxide extinguishing system protecting a space over 6,000 cubic feet in volume.

The lockout valve must be a manually operated valve located in the discharge manifold prior to the stop valve or selector valves. When in the closed position, the lockout valve must provide complete isolation of the system from the protected space or spaces, making it impossible for carbon dioxide to discharge in the event of equipment failure during maintenance.

The lockout valve design or locking mechanism must make it oblivious whether the valve is open or closed.

A valve is considered a lockout valve if it has a hasp or other means of attachment to which, or through which, a lock can be affixed, or it has a locking mechanism built into it.

The master or person-in-charge must ensure that the valve is locked open at all times, except while maintenance is being performed on the extinguishing system, when the valve must be locked in the closed position.

Lockout valves added to existing systems must be approved by the Commandant as part of the installed system.

Odorizing Units

Each carbon dioxide extinguishing system installed or altered after July 9, 2013, must have an approved odorizing unit to produce the scent of wintergreen, the detection of which will serve as an indication that

carbon dioxide gas is present in a protected area and any other area into which the carbon dioxide may migrate. "Altered" means modified or refurbished beyond the maintenance required by the manufacturer's design, installation, operation and maintenance manual.

Cite: SOLAS II-2/10.4 & FSS Code Ch. 5.2.5 Equivalent gas fire extinguishing systems

Pressure containers required for the storage of fire-extinguishing medium, other than steam, shall in general be located outside the protected spaces in accordance with SOLAS II-2/10.4.3. Alternative arrangements with gas cylinders located inside the protected space may be approved on a case-by-case basis (ref. Coast Guard Research and Development Report CG-D-02-07).

10.2.3 General Interpretations to SOLAS II-2 (all vessel types) - Fixed Foam Fire Extinguishing Systems

Cite: SOLAS II-2/10.4 & FSS Code Ch. 6 Fixed foam fire-extinguishing systems

The foam system, including the foam concentrate, tank discharge nozzles, discharge monitors, proportioning device and other control components must be USCG Type Approved. (Ref: 34.17, 76.17, 95.17 and 108.473).

At least 2 foam stations shall be installed outside the machinery space entrance with approved combination nozzle, applicator, and self-cleaning strainer such that any part of the machinery space may be reached with at least 2 streams of foam/water. This is in addition to the fire hydrants required for the fire main system.

10.2.4 General Interpretations to SOLAS II-2 (all vessel types) - Fixed Pressure Water-Spraying Systems

Cite: SOLAS II-2/10.4.1.1.3, II-2/10.5 & FSS Code Chapter 7 Fixed pressure water-spraying fire-extinguishing systems in machinery spaces

Water mist systems are to be USCG Type Approved. Design and installation must be in accordance with the USCG Type Approved manual. "Equivalent" machinery space water mist installations must comply with IMO MSC/Circ. 1165.

A fixed pressure water-spraying, fire extinguishing system is not acceptable by the USCG except for lamp lockers, paint lockers and pump rooms. Where installed in these spaces, it shall comply with Chapter 7 of the FSS Code, and the following (ref. 46 CFR 34.25):

Capacity and Arrangement

The spacing of the spray nozzles shall be on the basis of the spray pattern provided by the lowest pressure at any spray nozzle in the system. In no instance shall a system be designed for any spray nozzle to be operated at a pressure less than that for which it was approved.

The maximum permissible height of the spray nozzle above the protected area shall not exceed that specified in its approval. Whenever there are obstructions to coverage by the spray patterns, additional spray nozzles shall be installed to provide full coverage. If a fire pump is used to supply water to the water spray system it is to be sized to provide the quantity of water required for operation of the water spray system while simultaneously supplying the required water to the fire main system.

Controls

Complete, but simple instructions for the operation of the system shall be located in a conspicuous place at or near the controls.

Piping

All piping, valves and fittings shall meet the applicable requirements of the relevant section of the DNV GL Rules for Classification of Ships as modified by this supplement.

Distribution piping shall be of materials resistant to corrosion, except that steel or iron pipe may be used if inside corrosion resistant coatings which will not flake off and clog the nozzles are applied. Materials

readily rendered ineffective by heat of a fire shall not be used. All piping, valves, and fittings shall be securely supported, and where necessary, protected against injury. Drains, strainers and dirt traps shall be fitted where necessary to prevent the accumulation of dirt or moisture. Threaded joints shall be metal to metal, with no thread compound used. Distribution piping shall be used for no other purpose. All piping shall be thoroughly cleaned and flushed before installation of the water spray nozzles. Spray nozzles shall be USCG approved.

Markings

Water spray system apparatus (the control cabinets or spaces containing valves or manifolds) shall be marked: "WATER SPRAY SYSTEM," as appropriate, in not less than 2-inch (50 mm) red letters.

10.2.5 General Interpretations to SOLAS II-2 (all vessel types) - Fixed Pressure Water-Spraying Systems

Cite: SOLAS II-2/10.6, II-2/10.7 & FSS Code Chapter 8 Automatic sprinkler, fire detection and fire alarm systems

Automatic sprinkler systems are also to comply with National Fire Protection Association (NFPA) Standard 13-1996. Where SOLAS Reg. II-2/10.6 and NFPA Std. 13 have similar requirements, the higher standard is to be satisfied. The following supplemental requirements apply (ref. 46 CFR 34.30, 76.25 and 95.30):

The sprinkler heads, alarms, dry pipe valves, and actuating mechanisms shall be listed or approved by a recognized independent testing lab.

All wiring and electrical circuits and equipment shall meet the applicable requirements of the relevant sections of the DNV GL Rules for Classification of Ships and this supplement. All piping, valves, fittings, pressure tanks, etc. must meet the applicable requirements of the relevant sections of the DNV GL Rules for Classification of Ships as modified by this supplement.

The fire detecting and manual alarm, automatic sprinkler, and smoke detecting alarm bells in the engine room shall be identified by at least 25 mm (1 in) red lettering "FIRE ALARM", "SPRINKER ALARM", or "SMOKE DETECTING ALARM" as appropriate. Where such alarms on the bridge or in the fire control station do not form a part of an easily identifiable alarm cabinet, the bells shall be suitably identified as above. The control cabinets or spaces containing valves or manifolds shall be distinctly marked in conspicuous red letters at least 50 mm (2 in) high "AUTOMATIC SPRINKLING SYSTEM."

10.2.6 General Interpretations to SOLAS II-2 (all vessel types) - Fixed Deck Foam Systems

Cite: SOLAS II-2/10.8 & FSS Code Chapter 14 Fixed deck foam systems

The foam system, including the foam concentrate, tank discharge nozzles, discharge monitors, proportioning device and other control components must be USCG Type Approved and must comply with the manufacturer's approved Design, Installation, Operation and Maintenance Manual that meets Chapter II-2, Regulation 10.4 of SOLAS and the following supplemental requirements (ref. 46 CFR 34.20):

Controls

Complete, but simple instructions for the operation of the system shall be located in a conspicuous place at or near the controls. The deck foam system must be capable of being actuated, including introduction of foam to the foam main, within three minutes of notification of a fire.

Piping

All piping, valves, and fittings of ferrous materials shall be protected inside and outside against corrosion unless specifically approved otherwise. All piping, valves, and fittings shall be securely supported, and where necessary, protected against injury. Drains and dirt traps shall be fitted where necessary to prevent the accumulation of dirt or moisture. Piping shall not be used for any other purpose than firefighting, drills and testing.

Discharge Outlets

At least one mounted foam appliance shall be provided for each required foam station.

Markings

Foam apparatus, the control cabinets or spaces containing valves or manifolds for the various fire extinguishing systems shall be distinctly marked in conspicuous red letters at least 50 mm (2 in) high "FOAM FIRE APPARATUS".

Foam Concentrates

Only foam concentrates listed in the USCG type approval shall be used.

10.2.7 General Interpretations to SOLAS II-2 (all vessel types) – FRP Gratings and Means of Escape

Cite: SOLAS II-2/Reg. 11 FRP gratings on open deck

For vessels fitted with fixed deck firefighting systems, e.g. foam or powder systems: FRP gratings in platforms and access ways for firefighting equipment shall be class L1. (Ref. NVIC 9-97, current version).

10.2.8 General Interpretations to SOLAS II-2 (all vessel types) Helidecks

Cite: SOLAS II-2/18.3.2 Aluminum helidecks

NVIC 9-97 (current version) describes the conditions under which aluminum helidecks will be accepted on board US flagged vessels.

10.2.9 Interpretations to SOLAS II-2 for Passenger Vessels

The below interpretations are the USCG MSCs Plan Review Guidelines (PRG) for passenger vessels. The complete text of the PRGs is online at <http://homeport.uscg.mil>.

Cite: SOLAS II-2/3.1 Categorization of pantries on passenger ships

Pantries that are located within accommodation areas and/or serve adjacent isolated accommodation spaces should be given a category 9 designation and considered isolated pantries. These types of pantries should not contain any cooking appliances, built-in (walk-in) reefer units, or office-type furnishings. Portable refrigeration units are acceptable in a category 9 space. In general, pantries containing any of the following items shall be given a category 13 designation:

- cooking appliances (not galley ranges);
- built-in (walk-in) reefer units;
- office furnishings (i.e., desk, chair, filing cabinets).

Pantries annexed to galleys (i.e., open directly into a galley) require a category 12 designation. (PRG SOLAS-42 dated 2010-06-16).

Cite: SOLAS II-2/Reg. 9.2.2.4.2.2 Two-deck spaces on passenger ships

Deck openings that are less than 30% open, relative to the surface area of the lower space (i.e. the ceiling of the lower space), should be protected. The transmission of heat, smoke, and flame through the deck opening should be addressed. The expectation is that protection measures will limit heat, smoke, and flame transmission through the opening when a fire occurs at any point in the lower space. Additionally passengers and crew in both the lower and upper spaces should have time to safely evacuate the space in the event of a fire in the lower space. Therefore, immediate notification should be provided to the upper space when a fire occurs in the lower space. (PRG SOLAS-13 dated 2010-06-16).

Cite: SOLAS II-2/Reg. 9.2.2.3.2.2 Technical spaces behind linings on passenger ships

Access panels/doors should only provide access to the equipment being maintained and should have restricted accessibility through the use of door locks. With the panel/door open, any reachable horizontal surface (such as the deck) that could be used for storage should be blocked with a permanent barrier. Otherwise, the area should be protected with sprinklers and detectors. Doors extending the full height of the lining should not be used. Instead, panels that require mechanical disassembly should be used. In general, if the opening is such that a person can walk into the area behind the lining, this area should be treated as a separate space. (PRG SOLAS-30 dated 2010-06-16).

Cite: SOLAS II-2/Reg. 9.2.2.3.2.2 30 Percent open for common spaces on passenger ships

With respect to the 30% open determination for common spaces; the Coast Guard expects that windows, louvers, and ceiling area will not be considered as contributing to the 30% open requirement. (PRG SOLAS-44 dated 2010-06-16).

Cite: SOLAS II-2/Reg. 9.2.2.3.2.2 Space categorization on passenger ships

The Coast Guard expects a space's outfitting and fire load to be commensurate with the space category and intended use. Coast Guard inspectors will apply the most conservative space categorization determination when evaluating a space's use. This determination will be based on outfitting, usage, and accessibility. (PRG SOLAS-45 dated 2010-06-16).

Cite: SOLAS II-2/Reg. 9.2.2.3.2.2(1) Engine control rooms on passenger ships

To be considered inside the machinery space (and therefore treated as part of the category 12 space) the ECR must be located entirely within the bounds of the machinery space. Additionally, at least 30% of the division between the ECR and adjacent machinery room must be open to allow crew inside the ECR to become immediately aware of emergencies. Otherwise, the ECR should be treated as a category 1 space. (PRG SOLAS-32 dated 2010-06-16).

Cite: SOLAS II-2/Reg. 9.2.2.3.2.2(5) Retractable roofs (magrodomes) on passenger ships

An area beneath a retractable roof should be categorized and protected as an enclosed space, commensurate with its size and use. These spaces are typically considered cat. 8 or cat. 9 depending on furnishings. Category 8 definition is greatly preferred as practice has shown that it is difficult to restrict the furnishings in such spaces. Under no circumstances will a Magrodome covered space be considered a cat. 5. In general, detection and suppression is required under all areas of permanent overhang (including stages and garages for the roof). Additionally, sprinkler coverage or equivalent arrangements should be provided for areas directly beneath the sliding roof. (PRG SOLAS-28 dated 2010-06-16).

Cite: SOLAS II-2/Reg. 9.2.2.3.2.2(5) Overhanging decks on passenger ships

In general, any partially enclosed area that is covered with an overhanging deck in excess of 10 meters is considered an enclosed space requiring fire protection appropriate for the fire load and use (including sprinklers and detection). Similar areas covered for less than 10 meters are still considered type 5 areas, provided that all of the high risk areas (i.e., galley ranges) beneath the overhang are adequately separated from the surrounding areas. (PRG SOLAS-29 dated 2010-06-16).

Cite: SOLAS II-2/Reg. 9.2.2.3.2.2(8) Integrity of multiple deck spaces on passenger ships

For spaces spanning multiple decks, deck and bulkhead integrity should be maintained at each deck level. Thus, the more restrictive of the bulkhead and deck integrity tables should be used to determine the bulkhead rating for all vertical boundaries above the first level of the multiple deck space (the multiple deck space should be treated as the space below when using the deck tables). (PRG SOLAS-46 dated 2010-06-16).

Cite: SOLAS II-2/Reg. 9.2.2.3.2(9) Public bathrooms in stairs on passenger ships

Public bathrooms in stairs that are provided with reduced (B-class) boundaries between the bathroom and stair should be protected with automatic sprinklers if the continuous B-class boundary is broken by removal of the door. (PRG SOLAS-38 dated 2010-06-16).

Cite: SOLAS II-2/Reg. 9.2.2.3.2(11) Refrigerators on passenger ships

USCG expects detection and suppression to be installed within the type-11 refrigerator boundaries. If the type-11 refrigerated space is fully enclosed within a galley boundary then the additional door requirements normally required for galley boundaries are not expected. Otherwise, the type-11 boundary may enclose multiple refrigerated chambers with the exception of areas that will be normally manned or used for non-refrigerated storage. In which case, the non-refrigerated space should be categorized as a type-13. In cases where groups of spaces are enclosed within one category 11 boundary and an area falls into the above non-refrigerated category, the category 11 designation may be maintained so long as A class boundaries are provided between the area in question and any refrigerated chamber and adequate escape is available for manned spaces (workshops, food prep areas, etc.). The drawing in PRG SOLAS-37 gives generic examples of acceptable arrangements. (PRG SOLAS-37 dated 2010-06-16).

Cite: SOLAS II-2/Reg. 9.2.2.3.2(12) Categorization of pantries on passenger ships

"Galley ranges" on open decks beneath overhanging decks are treated as galleys and should be provided with category 12 designation, appropriate detection, suppression, and structural fire protection. Fire boundaries surrounding the galley shall be in accordance with tables B, 9.1 and 9.2. However, if the galley range is an enclosed oven (oven with 5 sides and one door) that has sides that are cool to the touch while the oven is in operation and the overhang is less than 10 meters, the category 12 designation is not necessary. Furthermore, for similar enclosed ovens (such as pizza ovens) that are not cool to the touch while in operation, the category 12 designation may be relaxed if the risk of ignition via heat conduction from the oven is sufficiently mitigated (such as barriers around the oven to prevent stowage of combustibles adjacent to the oven). (PRG SOLAS-39 dated 2010-06-16).

Cite: SOLAS II-2/Reg. 9.2.2.3.2(13) Pool machinery spaces on passenger ships

As far as practicable, spaces where oxidizing chemicals are used or stowed shall be in accordance with II-2/9.2.2.3.2 (13). These spaces should also be protected with automatic fire suppression and detection as appropriate. (PRG SOLAS-24 dated 2010-06-09).

Cite: SOLAS II-2/Reg. 9.7.5.1 Galley range & grease duct structure on passenger ships

USCG considers galley ranges to include open and enclosed ovens from which grease can be expected to enter the exhaust. Such appliances are typified, but not limited to grills, common oven ranges, cook tops, fryers, pizza ovens, and conveyor ovens. In general, because the type of food preparation can vary, most ovens fall into this category. Galley ranges located in any enclosed space and beneath any overhang require ducting protection in accordance with 9.7.5.1 when the ducting passes through an accommodation space, service space, or control station. (PRG SOLAS-07 dated 2010-06-16).

Cite: SOLAS II-2/Reg. 9.7.5.1.3 Suppression on galley ducts on passenger ships

Fixed extinguishing systems should be sized to provide protection for the entire volume of ducting between the dampers required by 9.7.5.1.2. (PRG SOLAS-11 dated 2010-06-16).

Cite: SOLAS II-2/Reg. 9.7.5.1.4 CO2 bottle storage on passenger ships

Single CO2 bottles used in galley duct extinguishing and beverage distribution systems should not be stowed in accommodation areas, and should be arranged so that rapid loss of the CO2 charge will not pose a threat to persons nearby. As far as practicable, CO2 bottle stowage shall be in accordance with II-2/10.4.3. (PRG SOLAS-03 dated 2010-06-16).

Cite: SOLAS II-2/Reg. 13.3.2.3 Access to stairway enclosures on passenger ships

Not all public spaces should be allowed direct access to stairs. Only large public spaces such as halls, dining rooms, and lounges should be permitted as they present other issues such as the need to rapidly egress a large number of people. This need is balanced with the risk of introducing smoke and fire to a stairway. Shops, smaller lounges, reading rooms, beauty parlors, gyms, reception areas, and smoking rooms for example, should not have direct access to stairs because the risk of introducing smoke into the stair is higher compared to the need to evacuate the small number of people. In these cases, alternative escape routes (category 3 or 4) should be provided. Additionally, while the back stage of a theater can be considered common with the theater (and therefore a public space), it is generally not accessible to passengers and not outfitted as a public space. Therefore, these and similar areas should not open directly into a stair. (PRG SOLAS-26 dated 2010-06-22).

Cite: SOLAS II-2/Reg. 13.3.2.4.5 Means of escape on passenger ships

Stairways that are a part of the emergency evacuation plan, serve more than 90 persons and have a minimum width calculated per Chapter 13, Section 2 of the FSS Code, must be aligned fore and aft. Stairs that do not meet these requirements must undergo an engineering analysis in accordance with the requirements of SOLAS II-2/17 to determine the appropriate correction to the factors used in the evacuation analysis contained in MSC.1/Circ.1238, Appendix 1, sections 1.3 and 1.4. Additionally, the effective width, for evacuation calculations, must only include areas along the tread width where the angle of inclination does not exceed 45 degrees. (PRG SOLAS-01 dated 2010-06-11).

Cite: SOLAS II-2/Reg. 13.4.1 Aluminum/GRP plate use on passenger ships

Aluminum or GRP floor plates, grids, or walkways are not acceptable for use in escape routes. (PRG SOLAS-33 dated 2010-06-16).

10.3 Interpretations to SOLAS III Life-Saving Appliances and Arrangements

There are no specific US interpretations to SOLAS Ch. III. See the following chapters of this Supplement for additional US requirements to lifesaving appliances:

- Ch. 2.1.2 Tank Vessels
- Ch. 2.1.4 Passenger Vessels
- Ch. 2.1.5 Cargo and Miscellaneous Vessels
- Ch. 2.11 Offshore Supply Vessels

10.4 Interpretations to SOLAS IV Radio Communications

Cite: SOLAS IV/7.1.6 Radio communications – Application

The required EPIRB must be marked with the vessel's name.

10.5 Interpretations to SOLAS V Safety of Navigation

Cite: SOLAS V/22 Navigation bridge visibility

In addition to the SOLAS implementation schedule, this regulation applies to all cargo and passenger vessels of 100 m or more in length and contracted for on or after September 7, 1990.

11 U.S. INTERPRETATIONS TO TONNAGE AND LOAD LINE

11.1 Tonnage Measurements

Supplemental requirements that are set forth in the current version of Marine Safety Center Technical Notes 01-98, "Tonnage Administrative Policy", and 01-99, "Tonnage Technical Policy" (current version), shall be complied with. Additional information on U.S. interpretations to the Load Line Convention can be found in "The Load Line Technical Manual" on the USCG website:
<http://www.uscg.mil/hq/cg5/cg5212/lltechmanual.asp>.

11.2 Load Line

The following U.S. Interpretation for ICLL, Reg. 10 is to be adhered to:

- 1) Information to be supplied to the master means a loading and stability manual developed in accordance with MSC/Circ.920 "Model Loading and Stability Manuals".
- 2) To be considered as approved stability information, the vessel shall comply with the requirements and recommendations of the International Code on Intact Stability, 2008.

12 U.S. INTERPRETATIONS TO MARPOL 73/78

The following requirements and interpretations are in addition to the requirements contained in the MARPOL Annexes.

Note: USCG has issued additional final rules regarding ballast water management. Reference should be made to **46 CFR 162 and 33 CFR 151 Subpart D**, for additional requirements including: approval of treatment systems, applicability, standards, testing, etc. These final rules are applicable to all U.S. and foreign flagged vessels that are equipped with ballast tanks and operate in the waters of the United States.

12.1 MARPOL Annex I, Prevention of Pollution by Oil

12.1.1 33 CFR 151 Vessels Carrying Oil, Noxious Liquid Substances, Garbage, Municipal or Commercial Waste, and Ballast Water

Cite: 33 CFR 151.27 Shipboard oil pollution emergency plan

For the issue of a Certificate of Inspection, the Shipboard Oil Pollution Emergency Plan (Reg. 26) outlined in IMO Res. MEPC.86 (44) can only be approved by the U.S. Coast Guard (G – MOR).

12.1.2 33 CFR 155 Oil or Hazardous Material Pollution Prevention Regulations for Vessels

Cite: 33 CFR 155.205 Discharge removal equipment for vessels 400 feet or greater in length

Oil carrying tank vessels with a length that is at least 400 ft. must carry discharge removal equipment for on-deck spills up to 12 bbl. The equipment must include: sorbents, non-sparking hand scoops, containers for the recovered spillage, emulsifiers for deck cleaning, protective clothing, one non-sparking portable pump with hoses, and scupper plugs.

Cite: 33 CFR 155.210 Discharge removal equipment for vessels less than 400 feet in length

Oil carrying tank vessels with a length that is less than 400 ft. must carry discharge removal equipment for on-deck spills up to 7 bbl. The equipment must include: sorbents, non-sparking hand scoops, containers for the recovered spillage, emulsifiers for deck cleaning, protective clothing, one non-sparking portable pump with hoses, and scupper plugs.

Cite: 33 CFR 155.225 Internal cargo transfer capability

Unless the vessel's cargo piping system can transfer cargo among all tanks within the cargo block, the vessel must be equipped with hoses and reducers which can enable the transfer of cargo from any tank to any other tank.

Cite: 33 CFR 155.230 Emergency towing capability for oil barges

Offshore barges must carry an emergency tow wire or a tow line that is rigged and ready for use, which has the same characteristics as the primary tow wire or tow line.

Cite: 33 CFR 155.310 Containment of oil and hazardous material cargo discharge

Under hose connections there must be a fixed container or enclosed deck area with a mechanical means of closing the drain for that containment which has a capacity:

- 1/2 bbl. for lines no more than 2"
- 1 bbl. for lines more than 2" up to 4"

- bbl. for lines no less than 4" up to 6"
- bbl. for lines no less than 6" up to 12"
- bbl. for lines 12" or more

Cite: 33 CFR 155.320 Fuel oil and bulk lubricating oil discharge containment

Under fill connections and vents there must be a fixed container or enclosed deck area with a mechanical means of closing the drain for that containment which has a capacity:

- 1/2 bbl. for vessels 300 g.t. or more but less than 1600 g.t.
- 1 bbl. for vessels 1600 g.t. or more

Cite: 33 CFR 155.380 Oily-water separating equipment, bilge alarm and bilge monitor approval standards

Oily-water separating equipment and oil content meters for bilge alarms are to be USCG approved equipment.

Cite: 33 CFR 155.450 Placard

Each machinery space must have a sign indicating that the discharge of oil is prohibited.

Cite: 33 CFR 155.780 Emergency shutdown

Tank vessel must have an emergency means of stopping transfers within a vessel.

Cite: 33 CFR 155.790 Deck lighting

A self-propelled vessel with a capacity of 250 or more barrels of oil or hazardous material that is conducting transfer operations between sunset and sunrise must have deck lighting that adequately illuminates:

- (1) Each transfer operations work area and each transfer connection point in use on the vessel; and
- (2) Each transfer operations work area and each transfer connection point in use on each barge, if any, moored to the vessel to or from which oil or hazardous material is being transferred;

(b) Where the illumination is apparently inadequate the OCMI or COTP may require verification by instrument of the levels of illumination. On a horizontal plane 3 feet above the deck the illumination must measure at least:

- (1) 5.0 foot candles at transfer connection points; and
- (2) 1.0 foot candle in transfer operations work areas.

(c) Lighting must be located or shielded so as not to mislead or otherwise interfere with navigation on the adjacent waterways.

Cite: 33 CFR 155.800 Transfer hoses

Transfer hoses must have burst pressure of at least 600 psi and four times the MAWP, which must be at least 150 psi. Hose flanges must meet ANSI B16.5 or B16.24. The hoses must be marked with the MAWP, type of service, date of manufacture and the date of the last pressure test. The date of manufacture and the date of the last pressure test may be recorded in lieu of being marked on the hoses.

Cite: 33 CFR 155.1010 Response plans – Purposes

Applies to tank vessels without regard to size. (Reg 37 applies to tank vessels greater than 150 g.t. and all vessels greater than 400 g.t.) Applies to discharges of oil. (Reg 37 applies to all discharges of oil.)

Requires formal agreements for spill notification and cleanup. (Reg 37 requires only shipboard procedures and a shoreside contact.) Requires a geographic specific appendix for U.S. ports. (Reg 37 requires a worldwide list.)

12.1.3 33 CFR 157 Rules for the Protection of the Marine Environment Relating to Tank Vessels Carrying Oil in Bulk

Cite: 33 CFR 157.03(n) Definitions – Oil

Oil is not limited to petroleum and includes animal fats and other "oils." (MARPOL regulates animal fats and vegetable oils under Annex II.)

Cite: 33 CFR 157.10b Segregated ballast tanks, dedicated clean ballast tanks, and special ballast arrangements for tank vessels transporting outer continental shelf oil

Tank vessels servicing the OCS are permitted to carry ballast water in cargo tanks. (MARPOL makes no special allowances for these sorts of vessels.)

§ 157.10b Segregated ballast tanks, dedicated clean ballast tanks, and special ballast arrangements for tank vessels transporting Outer Continental Shelf oil.

(a) Each tank vessel that is engaged in the transfer of crude oil from an offshore oil exploitation or production facility on the Outer Continental Shelf of the United States on or after June 1, 1980 must, if segregated ballast tanks or dedicated clean ballast tanks are not required under § 157.09, § 157.10 or § 157.10a, have one of the following:

- (1) Segregated ballast tanks with a total capacity to meet the draft and trim requirements in paragraph (b) of this section.
- (2) Dedicated clean ballast tanks having a total capacity to meet the draft and trim requirements in paragraph (b) of this section and meeting the design and equipment requirements under subpart E of this part.
- (3) Special ballast arrangements acceptable to the Coast Guard.

(f) Each tank vessel under this section may be designed to carry ballast water in cargo tanks, as allowed under § 157.35.

§ 157.35 Ballast added to cargo tanks.

The master of a tank vessel with segregated ballast tanks or dedicated clean ballast tanks under § 157.09, § 157.10, § 157.10a (a) (1), § 157.10a (b), § 157.10a(c), § 157.10b (a), § 157.10c (b) (1), or § 157.10c(c) shall ensure that ballast water is carried in a cargo tank only if:

- (a) The vessel encounters abnormally severe weather conditions;
- (b) More ballast water than can be carried in segregated ballast tanks or dedicated clean ballast tanks is necessary for the safety of the vessel;
- (c) The ballast water is processed and discharged in compliance with § 157.37; and
- (d) On a new vessel under § 157.10 that carries crude oil, the ballast water is only carried in a cargo tank that is crude oil washed in accordance with Subpart D of this part during or after the most recent discharge of crude oil from that tank.

Cite: 33 CFR 157.10d Double hulls on tank vessels

The dates for the requirement of double hull construction are approximately three (3) years earlier than given under MARPOL Annex I/19.

U.S. double hull requirements have no minimum deadweight limit nor exemption to the requirement of double sides.

Specific requirements for the construction of double sides and double bottoms are contained in this regulation. Compliance dates for double hull construction of 46 U.S.C. 3703a(c) are set out in appendix G to 33 CFR Part 157.

Cite: 33 CFR 157.12 Cargo Monitor and control system

The oil discharge monitoring and control system is to be USCG approved equipment. The ODMC system manual is also required to be approved.

Cite: 33 CFR 157.15 Slop tanks in tank vessels

The oily/water detectors installed on slop tanks are to be USCG approved equipment.

Cite: 33 CFR 157.21 Subdivision and stability

For US Flag vessels, MARPOL damage stability requirements are applicable to the following vessels:

- (a) New vessels delivered after 31 December 1977
- (b) New vessels contracted after 31 December 1974, and
- (c) New vessels whose keels were laid (or similar stage of construction) after 30 June 1975

New (defined in 157.03i) applies to vessels as under contract, constructed, or completed between 1975/1976/1979. (MARPOL defines "new" as four (4) years later, prev. Reg. 1(26)).

Interpretation: MARPOL Reg 18.5

Segregated ballast tanks, dedicated clean ballast tanks and crude oil washing. Vessels less than 150 m in length: The U.S. has not adopted the requirements in Appendix 1 to Annex I which addresses segregated ballast for vessels less than 150 m in length. Determination under this regulation must be made by the Commandant, USCG.

Interpretation: MARPOL Reg 19.4

Prevention of oil pollution in the event of collision or stranding. Mid-deck tankers: The U.S. has not ratified that the mid-deck design is equivalent to a double hull.

Interpretation: MARPOL Reg 20

Prevention of oil pollution in the event of collision or stranding. Determinations by the Administration: The Commandant, USCG, makes determinations on behalf of the U.S.

Interpretation: MARPOL Reg 28.1.3

Subdivision and Stability. Stability for vessels under 100 m: The Commandant, USCG, makes determinations concerning the relaxation requirements for vessels less than 100 m if the standards for a vessel 150 m or longer would impair the operational qualities of the ship.

12.2 MARPOL Annex II, Control of Pollution by Noxious Liquid Substances

12.2.1 33 CFR 151 Vessels Carrying Oil, Noxious Liquid Substances, Garbage, Municipal or Commercial Waste, and Ballast Water

Cite: 33 CFR 151.27 Shipboard oil pollution emergency plan for NLS

For issuance of a Certificate of Inspection, the Shipboard Marine Pollution Emergency Plans for Noxious Liquid Substances (NLS) (Reg. 16) outlined in IMO Resolution MEPC.85 (44) can only be approved by the U.S. Coast Guard (G-MOR).

Cite: Regulation 5 -- Discharge of noxious liquid substances

The discharge of Category D residues must be made below the waterline and through a discharge system that meets the same standards as a discharge used for category B or C discharges.

12.3 MARPOL Annex III, Prevention of Pollution by Harmful Substances in Packaged Form

For vessels enrolled in the Alternate Compliance Program, there are no U.S. interpretations or supplemental requirements for this authorization.

12.4 MARPOL Annex IV, Prevention of Pollution by Sewage from Ships

Note: not adopted by U.S.A. comparison of USCG rules to MARPOL

Cite: 33 CFR 159 Marine sanitation devices (MSD)

All vessels must be installed with either an operable MSD which controls the discharged fecal coliform bacteria count to 200 per 100 ml and the suspended solids to 150 mg/l, which is certified by the Commandant, USCG or with an operable MSD which retains the sewage on board.

Statement of voluntary compliance (SOVC)

DNV GL may issue a Statement of Voluntary Compliance (SOVC) with MARPOL Annex IV.

Navigation and Vessel Inspection Circular NVIC 01-09 (current version) provides guidance on voluntary compliance with MARPOL Annex IV. The United States is not party to MARPOL Annex IV; however, vessels registered in the United States visiting nations that are party may need to demonstrate compliance with MARPOL Annex IV regulations on the prevention of pollution by sewage from ships.

12.5 MARPOL Annex V, Prevention of Pollution by Garbage from Ships

12.5.1 33 CFR 151 Vessels Carrying Oil, Noxious Liquid Substances, Garbage, Municipal or Commercial Waste and Ballast Water

Cite: 33 CFR 151.51 Garbage pollution – Applicability

The U.S. applies Annex V to U.S. public vessels after January 1, 1994. MARPOL does not generally apply to public vessels.

Cite: 33 CFR 151.55 Garbage pollution – Record keeping requirements

U.S. ships over 40 ft. must keep records of garbage disposal.

Cite: 33 CFR 151.57 Garbage pollution – Waste management plans

U.S. ships over 40 ft. with galleys must have a waste management plan.

Cite: 33 CFR 151.59 Garbage pollution – Placards

U.S. ships over 26 ft. must have placards describing prohibited waste discharges.



12.6 MARPOL Annex VI, Prevention of Air Pollution from Ships

DNV GL is authorized to issue International Air Pollution Prevention (IAPP) certificates.

The U.S. Coast Guard has created "Guidelines for Ensuring Compliance with MARPOL Annex VI," which are contained in CG-543 Policy Letter 09-01. U.S. vessel compliance must be verified with this policy letter prior to issuing the IAPP.

DNV GL is not authorized to issue Engine International Air Pollution Prevention (EIAPP) certificates on behalf of the U.S. For US flagged vessels, this function is performed by the U.S. Environmental Protection Agency.

For U.S. vessels, NO_x after-treatment devices will need to be approved as part of the EPA engine certification process, if these devices are being used to comply with MARPOL Annex VI.

For U.S. vessels, SO_x Exhaust Gas Cleaning Systems will need to be approved by the U.S. Coast Guard.

For Guidance with IEE, please reference CG-CVC Policy Letter 13-02 "MAPROL ANNED VI INTERNATIONAL ENERGY EFFICIENCY (IEE) CERTIFICATE IMPLEMENTATION GUIDANCE."



13 DIVING

13.1 Diving Support Systems

Diving support systems must meet the following requirements:

(a) Piping for diving installations which is permanently installed on the vessel must meet the requirements of subpart B (Commercial Diving Operations) of 46 CFR part 197.

(b) Piping internal to a pressure vessel for human occupancy (PVHO) must meet the requirements of subpart B of 46 CFR part 197.

Pressure vessels must be designed to ASME PVHO-1. Pressure vessels designed to other design codes must be shown to be equivalent to the ASME code.

14 ACCOMMODATIONS FOR OFFICERS AND CREW

Note: DNV GL can issue a statement of Voluntary Compliance with ILO 92/133 or the Maritime Labour Convention (MLC) if requested and requirements are met.

14.1 Tank Vessels

Cite: 46 CFR 32.40-1 Application

- (a) The provisions of this subpart, except §32.40-60 and §32.40-65, apply to all tankships of 100 gross tons and over constructed on or after June 15, 1987.
- (b) Tankships of less than 100 gross tons and manned tank barges must meet the requirements of §32.40-60.
- (c) Tankships of 100 gross tons and over constructed prior to June 15, 1987, must meet the requirements of §32.40-65.

Cite: 46 CFR 32.40-5 Intent

The accommodations provided for officers and crew on all vessels must be securely constructed, properly lighted, heated, drained, ventilated, equipped, located, arranged and insulated from undue noise, heat and odors.

Cite: 46 CFR 32.40-10 Location of crew spaces

- (a) Crew quarters must not be located farther forward in the vessel than a vertical plane located at 5 percent of the vessel's length abaft the forward side of the stem at the designed summer load water line. However, for vessels in other than ocean or coastwise service, this distance need not exceed 8.5 meters (28 feet). For the purposes of this paragraph, the vessel's length must be as defined in §43.15-1 of subchapter E (Load Lines) of this chapter. Unless approved by the Commandant, no section of the deck head of the crew spaces may be below the deepest load line.
- (b) There must be no direct communication, except through solid, close fitted doors or hatches between crew spaces and chain lockers, or machinery spaces.

Cite: 46 CFR 32.40-15 Construction

All crew spaces are to be constructed and arranged in a manner suitable to the purpose for which they are intended and so that they can be kept in a clean, workable and sanitary condition.

Cite: 46 CFR 32.40-20 Sleeping accommodations

- (a) Where practicable, each licensed officer shall be provided with a separate stateroom.
- (b) Sleeping accommodations for the crew must be divided into rooms, no one of which may berth more than 4 persons.
- (c) Each room must be of such size that there is at least 2.78 square meters (30 square feet) of deck area and a volume of at least 5.8 cubic meters (210 cubic feet) for each person accommodated. The clear head room must not be less than 190 centimeters (75 inches). In measuring sleeping accommodations any furnishings contained therein for the use of the occupants are not to be deducted from the total volume or from the deck area.
- (d) Each person shall have a separate berth and not more than one berth may be placed above another. The berth must be composed of materials not likely to corrode. The overall size of a berth must not be less than 68 centimeters (27 inches) wide by 190 centimeters (75 inches) long, except by special permission of the Commandant. Where two tiers of berths are fitted, the bottom of the lower berth must

not be less than 30 centimeters (12 inches) above the deck. The berths must not be obstructed by pipes, ventilating ducts, or other installations.

(e) A locker must be provided for each person accommodated in a room.

Cite: 46 CFR 32.40-25 Washrooms and toilet rooms

(a) At least 1 toilet, 1 washbasin, and 1 shower or bathtub must be provided for each 8 members or portion thereof in the crew who do not occupy sleeping accommodations to which private or semiprivate facilities are attached.

(b) The toilet rooms and washrooms must be located convenient to the sleeping quarters of the crew to which they are allotted but must not open directly into such quarters except when they are provided as private or semi-private facilities.

(c) All washbasins, showers, and bathtubs must be equipped with adequate plumbing, including hot and cold running water. All toilets must be installed with adequate plumbing for flushing.

(d) At least 1 washbasin must be fitted in each toilet room, except where private or semi-private facilities are provided and washbasins are installed in the sleeping rooms.

(e) Where more than 1 toilet is located in a space or compartment, each toilet must be separated by partitions.

Cite: 46 CFR 32.40-30 Messrooms

(a) Messrooms must be located as near to the galley as is practicable except where the messroom is equipped with a steam table.

(b) Each messroom must seat the number of persons expected to eat in the messroom at one time.

Cite: 46 CFR 32.40-35 Hospital space

(a) Each vessel which in the ordinary course of its trade makes voyages of more than 3 days duration between ports and which carries a crew of 12 or more, must be provided with a hospital space. This space must be situated with due regard to the comfort of the sick so that they may receive proper attention in all weathers.

(b) The hospital must be suitably separated from other spaces and must be used for the care of the sick and for no other purpose.

(c) The hospital must be fitted with berths in the ratio of 1 berth to every 12 members of the crew or portion thereof who are not berthed in single occupancy rooms, but the number of berths need not exceed 6.

(d) The hospital must have a toilet, washbasin, and bathtub or shower conveniently situated. Other necessary suitable equipment such as a clothes locker, a table, and a seat must be provided.

Cite: 46 CFR 32.40-40 Other spaces

Each vessel must have—

(a) Sufficient facilities where the crew may wash and dry their own clothes, including at least 1 sink supplied with hot and cold fresh water;

(b) Recreation spaces; and

(c) A space or spaces of adequate size available on an open deck to which the crew has access when off duty.

Cite: 46 CFR 32.40-45 Lighting

Each berth must have a light.

Cite: 46 CFR 32.40-50 Heating and cooling

- (a) All manned spaces must be adequately heated and cooled in a manner suitable to the purpose of the space.
- (b) The heating and cooling system for accommodations must be capable of maintaining a temperature of 21 °C (70 °F) under normal operating conditions without curtailing ventilation.
- (c) Radiators and other heating apparatus must be so placed and shielded, where necessary, to avoid risk of fire, danger or discomfort to the occupants. Pipes leading to radiators or heating apparatus must be insulated where those pipes create a hazard to persons occupying the space.

Cite: 46 CFR 32.40-55 Insect screens

Provisions shall be made to protect the crew quarters against the admission of insects.

Cite: 46 CFR 32.40-60 Crew accommodations on tankships of less than 100 gross tons and manned tank barges

- (a) The crew accommodations on all tankships of less than 100 gross tons and all manned tank barges must have sufficient size and equipment, and be adequately constructed to provide for the protection of the crew in manner practicable for the size, facilities, and service of the tank vessel.
- (b) The crew accommodations must be consistent with the principles underlying the requirements for crew accommodations of tankships of 100 gross tons or more.

Cite: 46 CFR 32.40-65 Crew accommodations on tankships constructed before June 15, 1987

All tankships of 100 gross tons and over constructed before June 15, 1987, may retain previously accepted or approved installations and arrangements so long as they are maintained in good condition to the satisfaction of the Officer in Charge, Marine Inspection.

14.2 Passenger Vessels

14.2.1 46 CFR 72.20 Accommodations for Officers and Crew

Cite: 46 CFR 72.20-1 Application

The provisions of this part, except §72.20-90, apply to all vessels contracted for after November 18, 1952. Vessels contracted for before November 19, 1952, must meet the requirements of §72.20-90.

Cite: 46 CFR 72.20-5 Intent

Accommodations provided for officers and crew on all vessels shall be securely constructed, properly lighted, heated, drained, ventilated, equipped, located, arranged, and insulated from undue noise, heat, and odors.

Cite: 46 CFR 72.20-10 Location of crew spaces

- (a) Crew quarters must not be located farther forward in the vessel than a vertical plane located at 5 percent of the vessel's length abaft the forward side of the stem at the designed summer load water line. However, for vessels in other than ocean or coastwise service, this distance need not exceed 8.5 meters (28 feet). For the purpose of this paragraph, the vessel's length must be as defined in §43.15-1 of subchapter E (Load Lines) of this chapter. Unless approved by the Commandant, no section of the deck head of the crew spaces may be below the deepest load line.
- (b) There must be no direct communication, except through solid, close fitted doors or hatches between crew spaces and chain lockers, or machinery spaces.



Cite: 46 CFR 72.20-15 Construction

All crew spaces are to be constructed and arranged in a manner suitable to the purpose for which they are intended and so that they can be kept in a clean, workable, and sanitary condition.

Cite: 46 CFR 72.20-20 Sleeping accommodations

- (a) Where practicable, each licensed officer shall be provided with a separate stateroom.
- (b) Sleeping accommodations for the crew must be divided into rooms, no one of which shall berth more than 4 persons.
- (c) Each room shall be of such size that there is at least 2.78 square meters (30 square feet) of deck area and a volume of at least 5.8 cubic meters (210 cubic feet) for each person accommodated. The clear head room shall be not less than 190 centimeters (75 inches). In measuring sleeping accommodations any furnishings contained therein for the use of the occupants are not to be deducted from the total volume or from the deck area.
- (d) Each person shall have a separate berth and not more than one berth may be placed above another. The berth must be composed of materials not likely to corrode. The overall size of a berth must not be less than 68 centimeters (27 inches) wide by 190 centimeters (75 inches) long, except by special permission of the Commandant. Where two tiers of berths are fitted, the bottom of the lower berth must not be less than 30 centimeters (12 inches) above the deck. The berths must not be obstructed by pipes, ventilating ducts, or other installations.
- (e) A locker must be provided for each person accommodated in a room.

Cite: 46 CFR 72.20-25 Washrooms and toilet rooms

- (a) There must be at least 1 toilet, 1 washbasin, and 1 shower or bathtub for each 8 members or portion thereof in the crew who do not occupy sleeping accommodations to which private or semi-private facilities are attached.
- (b) The toilet rooms and washrooms shall be located convenient to the sleeping quarters of the crew to which they are allotted but must not open directly into such quarters except when they are provided as private or semi-private facilities.
- (c) All washbasins, showers, and bathtubs must be equipped with adequate plumbing, including hot and cold running water. All toilets must be installed with adequate plumbing for flushing.
- (d) At least 1 washbasin must be fitted in each toilet room, except where private or semi-private facilities are provided and washbasins are installed in the sleeping rooms.
- (e) Where more than 1 toilet is located in a space or compartment, each toilet must be separated by partitions.

Cite: 46 CFR 72.20-30 Messrooms

- (a) Messrooms must be located as near to the galley as practicable except where the messroom is equipped with a steam table.
- (b) Each messroom must seat the number of persons expected to eat in the messroom at one time.

Cite: 46 CFR 72.20-35 Hospital space

- (a) Each vessel which in the ordinary course of its trade makes voyages of more than 3 days duration between ports and which carries a crew of 12 or more, must be provided with a hospital space. This space must be situated with due regard to the comfort of the sick so that they may receive proper attention in all weathers.
- (b) The hospital must be suitably separated from other spaces and must be used for the care of the sick and for no other purpose.

(c) The hospital must be fitted with berths in the ratio of 1 berth to every 12 members of the crew, or portion thereof, who are not berthed in single occupancy rooms, but the number of berths need not exceed 6.

(d) The hospital must have a toilet, washbasin, and bathtub or shower conveniently situated. Other necessary suitable equipment such as a clothes locker, a table, and a seat must be provided.

Cite: 46 CFR 72.20-40 Other spaces

Each vessel must have:

- (a) Sufficient facilities where the crew may wash and dry their own clothes, including at least 1 sink supplied with hot and cold fresh water;
- (b) Recreation spaces; and
- (c) A space or spaces of adequate size on an open deck to which the crew has access when off duty.

Cite: 46 CFR 72.20-45 Lighting

Each berth must have a light.

Cite: 46 CFR 72.20-50 Heating and cooling

(a) All manned spaces must be adequately heated and cooled in a manner suitable to the purpose of the space.

(b) The heating and cooling system for accommodations must be capable of maintaining a temperature of 21 °C (70 °F) under normal operating conditions without curtailing ventilation.

(c) Radiators and other heating apparatus must be so placed and shielded, where necessary, to avoid risk of fire, danger or discomfort to the occupants. Pipes leading to radiators or heating apparatus must be insulated where those pipes create a hazard to persons occupying the space.

Cite: 46 CFR 72.20-55 Insect screens

Provisions must be made to protect the crew quarters against the admission of insects.

Cite: 46 CFR 72.20-90 Vessels contracted for prior to November 19, 1952

For vessels contracted prior to 1952 see 46 CFR 72.20-90 for accommodation requirements.

14.3 Cargo and Miscellaneous Vessels

14.3.1 46 CFR 92.20 Accommodations for Officers and Crew

Cite: 46 CFR 92.20-1 Application

(a) The provisions of this subpart apply to all vessels of 100 gross tons and over contracted for on or after November 19, 1952. Vessels of 100 gross tons and over contracted for prior to November 19, 1952 must meet the requirements of §92.20-90.

(b) Vessels of less than 100 gross tons must meet the applicable requirements of this subpart insofar as is reasonable and practicable.

Cite: 46 CFR 92.20-5 Intent

It is the intent of this subpart that the accommodations provided for officers and crew on all vessels must be securely constructed, properly lighted, heated, drained, ventilated, equipped, located, arranged, and insulated from undue noise, heat, and odors.

Cite: 46 CFR 92.20-10 Location of crew spaces

(a) Crew quarters must not be located farther forward in the vessel than a vertical plane located at 5 percent of the vessel's length abaft the forward side of the stem at the designed summer load water line. However, for vessels in other than ocean or coastwise service, this distance need not exceed 8.5 meters (28 feet). For the purposes of this paragraph, the vessel's length must be as defined in §43.15-1 of subchapter E (Load Lines) of this chapter. Unless approved by the Commandant, no section of the deck head of the crew spaces may be below the deepest load line.

(b) There must be no direct communication, except through solid, close fitted doors, or hatches between crew spaces and chain lockers, or machinery spaces.

Cite: 46 CFR 92.20-15 Construction

All crew spaces are to be constructed and arranged in a manner suitable to the purpose for which they are intended and so that they can be kept in a clean, workable, and sanitary condition.

Cite: 46 CFR 92.20-20 Sleeping accommodations

(a) Where practicable, each licensed officer must be provided with a separate stateroom.

(b) Sleeping accommodations for the crew must be divided into rooms, no one of which shall berth more than 4 persons.

(c) Each room must be of such size that there is at least 2.78 square meters (30 square feet) of deck area and a volume of at least 5.8 cubic meters (210 cubic feet) for each person accommodated. The clear head room must be not less than 190 centimeters (75 inches). In measuring sleeping accommodations, any furnishings contained therein for the use of the occupants are not to be deducted from the total volume or from the deck area.

(d) Each person shall have a separate berth and not more than one berth may be placed above another. The berth must be composed of materials not likely to corrode. The overall size of a berth must not be less than 68 centimeters (27 inches) wide by 190 centimeters (75 inches) long, except by special permission of the Commandant. Where 2 tiers of berths are fitted, the bottom of the lower berth must not be less than 30 centimeters (12 inches) above the deck. The berths must not be obstructed by pipes, ventilating ducts, or other installations.

(e) A locker must be provided for each person accommodated in a room.

Cite: 46 CFR 92.20-25 Washrooms and toilet rooms

(a) There must be provided at least 1 toilet, 1 washbasin, and 1 shower or bathtub for each 8 members or portion thereof in the crew who do not occupy rooms to which private or semi-private facilities are attached.

(b) The toilet rooms and washrooms must be located convenient to the sleeping quarters of the crew to which they are allotted but must not open directly into such quarters except when they are provided as private or semi-private facilities.

(c) All washbasins, showers, and bathtubs shall be equipped with adequate plumbing, including hot and cold running water. All toilets must be installed with adequate plumbing for flushing.

(d) At least 1 washbasin must be fitted in each toilet room, except where private or semi-private facilities are provided and washbasins are installed in the sleeping rooms.

(e) Where more than 1 toilet is located in a space or compartment, each toilet must be separated by partitions.

Cite: 46 CFR 92.20-30 Messrooms

(a) Messrooms must be located as near to the galley as is practicable except where the messroom is equipped with a steam table.

(b) Each messroom must seat the number of persons expected to eat in the messroom at one time.

Cite: 46 CFR 92.20-35 Hospital space

(a) Each vessel which in the ordinary course of its trade makes voyages of more than 3 days duration between ports and which carries a crew of 12 or more, must be provided with a hospital space. This space must be situated with due regard to the comfort of the sick so that they may receive proper attention in all weathers.

(b) The hospital must be suitably separated from other spaces and must be used for the care of the sick and for no other purpose.

(c) The hospital must be fitted with berths in the ratio of 1 berth to every 12 members of the crew or portion thereof who are not berthed in single occupancy rooms, but the number of berths need not exceed 6.

(d) The hospital must have a toilet, washbasin, and bathtub or shower conveniently situated. Other necessary suitable equipment such as a clothes locker, a table, and a seat shall be provided.

(e) On vessels in which the crew is berthed in single occupancy rooms, a hospital space will not be required, provided that one room is designated and fitted for use as a treatment or isolation room. This room must meet the following standards:

(1) The room must be available for immediate medical use; and

(2) A washbasin with hot and cold running water must be installed either in or immediately adjacent to the space and other required sanitary facilities must be conveniently located.

Cite: 46 CFR 92.20-40 Other spaces

Each vessel must have:

(a) Sufficient facilities where the crew may wash and dry their own clothes, including at least 1 sink supplied with hot and cold fresh water;

(b) Recreation spaces; and

(c) A space or spaces of adequate size on an open deck to which the crew has access when off duty.

Cite: 46 CFR 92.20-45 Lighting

Each berth must have a light.

Cite: 46 CFR 92.20-50 Heating and cooling

(a) All manned spaces must be adequately heated and cooled in a manner suitable to the purpose of the space.

(b) The heating and cooling system for accommodations must be capable of maintaining a temperature of 21 °C (70 °F) under normal operating conditions without curtailing ventilation.

(c) Radiators and other heating apparatus must be so placed and shielded, where necessary, to avoid risk of fire, danger, or discomfort to the occupants. Pipes leading to radiators or heating apparatus must be insulated where those pipes create a hazard to persons occupying the space.

Cite: 46 CFR 92.20-55 Insect screens

Provisions must be made to protect the crew quarters against the admission of insects.

Cite: 46 CFR 92.20-90 Vessels contracted for prior to November 19, 1952

For vessels contracted prior to 1952 see 46 CFR 92.20-90 for accommodation requirements.

15 NAVIGATION

15.1 33 CFR 164 Navigation Safety Regulations

Cite: 33 CFR 164.35(g) Navigational equipment

1. Application

(a) The provisions of this section apply to all self-propelled vessels over 1600 G.T. when operating in the navigable waters of the United States, except the St. Lawrence Seaway.

2. Maneuvering Information

(a) Maneuvering characteristics must be posted prominently on a fact sheet in the wheel house. The requirements for posting maneuvering information are found in 33 CFR 164.35. The maneuvering characteristics are to be representative of normal load, normal ballast conditions, calm weather (wind 10 kts or less), no current, deep water (at least twice the vessel's draft), and clean hull. At the bottom of the fact sheet the following statement shall be provided: "WARNING" The response of the (name of vessel) may be different from that listed above if any of the following conditions, upon which the maneuvering information is based, are varied:

1. Calm weather – wind 10 knots or less, calm sea;
2. No current;
3. Water depth twice the vessel's draft or greater;
4. Clean hull; and
5. Intermediate drafts or unusual trim.

(b) The posted characteristics shall consist of the following maneuvers:

- Turning Circle Diagram to both port and starboard.
- Time, distance, advance, transfer to alter course 90 degrees with maximum power settings for either full or half speeds, or full and slow speeds.
- Vessels which have essentially the same turning characteristics to both port, and starboard may substitute a turning circle in one direction only, with a note stating the other direction to be essentially the same.
- Time and distance to stop the vessel from either full or half speeds while maintaining initial heading, and minimum rudder application.
- Table of Shaft RPM for a representative range of speeds should be provided for a vessel with a fixed pitch propeller.
- Table of Control Settings for a representative range of speeds for a vessel with a controllable pitch propeller.
- Table of Effective Speeds for auxiliary maneuvering devices such as bow thrusters. This table should show the range of speeds for which the unit can be used effectively.

(c) Navigation and Vessel Inspection Circular (NVIC) 7-89 (current version) calls attention to IMO Resolution A.601(15) "Provision and Display of Maneuvering Information Onboard Ships", adopted 19 November 1987, and MSC/Circ. 389, "Interim Guidelines for Estimating Maneuvering Performance in Ship Design," adopted 10 January 1985. These provide guidance to the owner and operator concerning maneuvering performance estimation and a standardized format for presentation of ship maneuvering information to operating personnel, including pilots.

Cite: 33 CFR 164.33(2) (i) & 33 CFR 164.33(3) (ii) Charts and publications

1. Application

(a) The provisions of this section apply to all self-propelled vessels over 1600 G.T. when operating in the navigable waters of the United States, except the St. Lawrence Seaway.

2. Requirements

(a) In addition to the requirements of SOLAS, a vessel must have a current copy of the "U.S. Coast Pilot", and "Tidal Current Tables", published by the National Oceanographic Service. Further detail is provided in 33 CFR 164.33.



Cite: 33 CFR 164.41 Electronic position fixing devices

See Federal Register Vol. 59, No. 56, dated March 23, 1994, page 13757 for additional guidance.

1. Application

(a) The provisions of this section apply to all self-propelled vessels over 1600 G.T. and calling at a port in the United States, including Alaska south of Cape Prince of Wales. Each vessel operated, owned, or bareboat chartered by the United States, State, or Political Subdivision, by a foreign nation, and not engaged in commerce is exempt from this requirement. Requirements for electronic position fixing devices are found in 33 CFR 164.41.

2. Devices

(b) A Satellite Navigation Receiver with automatic acquisition of satellite signals, and position updates derived from satellite information.

(c) A system considered to meet the intent for availability, accuracy, and coverage for the U.S. Confluence Zone (CCZ) contained in U.S. "Federal Radio Navigation Plan" (Report No. DOD-No. 4650.4-D or No. DOT-TSC-RSPA-80-16I)

Cite: 33 CFR 164.46 Automatic identification system (AIS)

(1) Application

(a) In addition to the requirements of SOLAS and DNV GL rules, the provisions of this section apply to Self-propelled vessels of 65 feet or more in length, other than passenger and fishing vessel.

(2) Requirements

(a) An operational, type approved and properly installed AIS shall be installed.

16 U.S. INTERPRETATIONS AND GUIDANCE RELATED TO THE IBC CODE

16.1 IBC Code Chapters

Unless otherwise noted below, DNV GL is permitted to interpret the expressions “*left to the satisfaction of the Administration,*” or similar expressions given in the Code.

Chapter 1 - General

- 1.1.6 USCG will handle matters relating to carriage conditions of cargoes not listed in the IBC Code.
- 1.3.16 Approved closed cup test uses the Tagliabu tester.
- 1.4 Generally, USCG acts as the administration for findings of equivalency.
- 1.5 Under this section, Administration means the USCG.

Chapter 2 - Ship survival capability and location of cargo tanks

- 2.2.2 Intact stability shall meet 46 CFR Subchapter S for gas carriers, as given in § 172.165.
- 2.2.3 The method for determining free surface effect is contained in the *International Code on Intact Stability, 2008*.
- 2.3.3 The valve shall be to DNV GL rules.
- 2.8.2 No dispensation for smaller ships will be allowed.
- 2.9.2.3 Residual stability shall not be less than as allowed in 2.9.3.

Chapter 3 - Ship arrangements

- 3.4.4 Smaller dimensions are not permitted unless authorized by the USCG. Acceptable openings must permit entry with breathing apparatus.
- 3.7.2 Bow or stern loading and unloading lines shall not be used for the transfer of products required to be in type 1 ships. Bow or stern loading and unloading lines shall not be used for the transfer of cargoes emitting toxic vapors unless specifically approved by USCG
- 3.7.3.5 Alternative arrangements must be authorized by the USCG.
- 3.7.4 USCG must authorize relaxations.

Chapter 4 - Cargo containment

- 4.1.3 IACS unified requirements, as implemented in DNV GL Rules, apply for tank testing.
- 4.1.4 ASME Code Section VIII, Division I and II, applies for pressure vessel design.

Chapter 5 - Cargo transfer

- 5.1.1 Piping standards are listed in 46 CFR 56.60, tables 56.60 - 1(A), 1(B) and 2(A).
- 5.1.3 Flanges, valves and fittings should meet applicable standards of the ASME Code.
- 5.2.1 Relaxations should be authorized by the USCG.
- 5.2.2 Exceptional cases should be authorized by the USCG.
- 5.2.3 See 5.1.1.
- 5.2.4 See 5.1.1.
- 5.2.5 See 5.1.1.

5.4 Relaxations should be authorized by the USCG.

Chapter 6 - Materials of construction

6.1 Materials must meet IACS Unified Requirements.

Chapter 7 - Cargo temperature control

7.1.1 IACS Unified Requirements apply.

Chapter 8 - Cargo tank vent systems

8.3.5 High velocity vents must be approved in accordance with 46 CFR 162.017 - 6.

8.3.6 Flame arrestors installed on tanks should meet ASTM F - 1273.

Chapter 10 - Electrical installations

10.1.2.1 Only intrinsic safe-category a ("ia"), pressurized ("p"), or flameproof ("d") equipment is allowed.

10.1.5

- a. Hazardous location identification and types of equipment and wiring shall be in accordance with chapter 10 of the IBC Code.
- b. Flammable atmosphere information contained in chapter 17 of the IBC Code shall be used.
- c. Items requiring certification per chapter 10 of the IBC Code shall be in accordance with either IEC 79 series or UL standards (ref. to 46 CFR 111.105 for specific standards).

Chapter 11 - Fire protection and fire extinction

11.2.2 Tankers carrying a restricted number of cargoes should not receive relaxations from the general requirements.

11.3.2 Note that dry chemical extinguishing agents are not acceptable to the USCG for IBC Code cargo.

11.3.7 Reduced monitor capacities for ships less than 4,000 DWT should be referred to USCG.

Chapter 13 - Instrumentation

13.2.3 Exemptions from toxic-vapor detection are only to be authorized by USCG.

Chapter 14 - Personnel protection

14.1.2 Interpretation of the expression "adequate segregation" is left to DNV GL, subject to USCG oversight.

Chapter 15 - Special requirements

15.2.3 With regard to this provision, the USCG retains authority as Administration. This authority is not delegated to any recognized organizations.

15.6.3 Only USCG authorizes entry into tanks which have contained MFAK compounds.

15.7 USCG only authorizes carriage of molten phosphorous.

15.8.11 The U.S. will not consider requests for use of materials listed in this paragraph.

15.8.22.2 The refrigeration requirements may not be waived.

- 15.8.25.2 Cargo handling plans are left to DNV GL, subject to USCG oversight.
- 15.8.26.3 Cargo tank filling limits are left to DNV GL, subject to USCG oversight.
- 15.8.29 The waterspray to operate automatically in a fire involving the cargo containment system, to have at least two manual actuators, and to have an application rate of 10.5 l/m²/min.
- 15.12.1.4 High velocity vents must be approved in accordance with 46 CFR 162.017 - 6.
- 15.14.3 No waivers on refrigeration system will be granted for restricted operation.
- 15.19.7 DNV GL acts as the administration.

Chapter 16 - Operational requirements

- 16.2.2 USCG will review all cargoes which are mixtures.
- 16.5.1 Samples must be stored in the cargo area.

Chapter 20 - Transportation of liquid chemical wastes


Transportation of liquid chemical wastes, although not generally permitted, requires USCG authorization in concert with the US EPA.

16.2 Guidance related to 46 CFR Subchapter O – Bulk Chemical Cargoes

16.2.1 Bulk Liquid Chemicals – Specific Cargo Restrictions

There are a small number of cargoes with additional U.S. requirements that exceed the International Code for Construction and Equipment of Dangerous Chemicals in Bulk.

- a. The following high vapor pressure cargoes (vapor pressure > 100 kPa at 37.8° C) may be carried if they are listed on the IMO COF and the vessel carries onboard a statement from the flag administration or classification society that the requirements of 46 CFR 153.370, 153.371 and 153.438 are met. If the tanks carrying these cargoes are not refrigerated, the tanks must be designed for no less than the relief valve settings shown (these are approximate cargo vapor pressures at 46° C or 115° F):
1. Ammonium sulfide solution (46 % or less) (vapor pressure at 46° C for the particular mixture)
 2. Diethyl Ether (57 kPa gauge, 8.3 psig, 0.57 bar gauge)
 3. Dimethylamine, aqueous (greater than 55 % but less than 65 %) (vapor pressure at 46° C for the particular mixture)
 4. Ethylamine solution (72 % or less) (vapor pressure at 46° C for the particular mixture)
 5. Isoprene (57 kPa gauge, 8.3 psig, 0.57 bar gauge)
 6. Isopropylamine (58 kPa gauge, 8.4 psig, 0.58 bar gauge)
 7. Methyl Formate (66 kPa gauge, 9.6 psig, 0.66 bar gauge)
 8. Propylene Oxide (49 kPa gauge, 7.1 psig, 0.49 bar gauge)
 9. Sodium Hydrosulfide Ammonium Sulfide Solution (vapor pressure at 46° C for the particular mixture)
 10. Vinyl Ethyl Ether (42 kPa gauge, 6.1 psig, 0.42 bar gauge)
 11. Vinylidene Chloride (64 kPa gauge, 9.3 psig, 0.64 bar gauge)
- b. Alkylene oxides (propylene oxide; ethylene oxide/propylene oxide mixtures (maximum of 30 % ethylene oxide); and 1,2-butylene oxide) may be carried if they are:

- 
1. Listed on the IMO COF; and
 2. The vessel carries on board a statement from the classification society or flag state that the cargo piping is separated as specified by paragraph 4.7.17 of the IMO BCH Code (paragraph 15.8.25.3 of the IBC Code) and that the vessel meets 46 CFR 153.530(b), (d) and (p)(1).

16.2.2 46 CFR 154 Safety Standards for Self-Propelled Vessels Carrying Bulk Liquefied Gases

Cite: 46 CFR 154.175 Nitrogen

Except for deck tanks and their piping systems, cargo containment systems and piping systems carrying nitrogen must be specially approved by the Commandant (G-MSO).

Cite: 46 CFR 154 Table 4 "Summary of Minimum Requirements"

Chlorine or a cargo not included in Rules for classification: Ships — DNVGL-RU-SHIP-Pt.5, Ch.7, Section 19, can only be carried by prior approval of the USCG.

17 U.S. INTERPRETATIONS AND GUIDANCE RELATED TO THE IGC CODE

17.1 IGC Code Chapters

Unless otherwise noted below, DNV GL is permitted to interpret the expressions “*left to the satisfaction of the Administration*” or similar terms given in the Code.

Chapter 1 - General

- 1.1.6 USCG acts only as a port Administration for this requirement.
- 1.4 USCG acts as Administration for this section.
- 1.5 USCG acts as Administration for this section.

Chapter 2 - Ship survival capacity and location of cargo tanks

- 2.2.2 In addition to other intact stability requirements, design calculation must show that 50 mm of positive metacentric height can be maintained by each vessel when it is being loaded and unloaded in accordance with 46 CFR 172.165. The design calculations may consider the effects of the addition of water ballast.
- 2.2.3 The method for determining free surface effect is contained in the International Code on Intact Stability, 2008.
- 2.9.1.3 Residual stability should not be less than the requirement in 2.9.2.1.

Chapter 3 - Ship arrangements

- 3.1.1 Machinery spaces forward of the cargo area are not normally permitted.
- 3.3.1.1 Relaxation of the pump or compressor room location requirement is not permitted.
- 3.5.3.2 Relaxation of the access dimensions is not permitted.
- 3.8.1.1 Bow or stern loading and unloading lines which are led past accommodation spaces, service spaces or control stations should not be used for the transfer of products requiring type 1G ships. Bow or stern loading and unloading lines should not be used for transfer of toxic products unless specifically approved by USCG.
- 3.8.4 Relaxation of this section’s requirements is not permitted.

Chapter 4 - Cargo containment

- 4.1 Cargo containment systems not previously accepted by the USCG will require USCG approval. A list of cargo containment systems currently accepted by the USCG may be obtained from the Commandant (CG-ENG-5).
- 4.2.2.3 See 4.1.
- 4.2.4.2 Recognized standards are DNV GL rules. (*Rules for classification: Ships – DNVGL-RU-SHIP-Pt.5, Ch.7*)
- 4.2.4.4 Type C tanks may only be allocated to type B.
- 4.2.5.4 Internal insulation tanks shall not have a design vapor pressure greater than 0.7 bar.
- 4.2.6.4 Higher vapor pressures in port are not allowed.
- 4.2.7 Provisions to cover lower temperature prevention are covered in Chapter 13.
- 4.3.2.1 Equivalent calculation procedures must be submitted to USCG.
- 4.3.4.3 Simplified loading spectra shall not be used.
- 4.3.4.5 No special consideration shall be given for restricted service.

- 4.4.1 Integral tanks are to meet DNV GL rule requirements. *(Rules for classification: Ships — DNVGL-RU-SHIP-Pt.5, Ch.7, Section 4)*
- 4.4.2.5 The DNV GL *Nauticus* programs shall be used for structural analysis, and the DNV GL rule requirements for recognized standards. *(Rules for classification: Ships — DNVGL-RU-SHIP-Pt.5, Ch.7, Section 23)*
- 4.4.4.1 DNV GL rules will be used for the recognized standard. *(Rules for classification: Ships — DNVGL-RU-SHIP-Pt.5, Ch.7, Section 20)*
- 4.4.4.2 DNV GL rules will be used for the recognized standard. *(Rules for classification: Ships — DNVGL-RU-SHIP-Pt.5, Ch.7, Section 20)*
- 4.4.5.5 Model tests will normally be required.
- 4.4.6 ASME Boiler and Pressure Vessel Code will be used as the acceptable standard, except as required otherwise.
- 4.4.7.2.1 The DNV GL program *Nauticus* will be used for structural analysis. *(DNV Rules Sec. 5 J)*
- 4.4.7.2.3 DNV GL rules are the recognized standards. *(DNV Rules Sec. 5 J 203)*
- 4.4.7.3 See 4.1.
- 4.5.1.1 DNV GL rules are recognized standards. *(Rules for classification: Ships — DNVGL-RU-SHIP-Pt.5, Ch.7, Section 24)*
- 4.5.1.3 Acceptable stresses are those which agree with DNV GL rules. *(Rules for classification: Ships — DNVGL-RU-SHIP-Pt.5, Ch.7, Section 20)*
- 4.5.1.4 The value of "A" shall be 4.0 for all materials.
- 4.5.1.7.2 Special consideration of improved tensile and yield properties must be demonstrated to the USCG.
- 4.5.1.10 Unspecified materials must be reviewed by USCG.
- 4.5.2.1 C Corrosion allowances will be required for tanks that are not surrounded by inert gas or dry air or for corrosive cargoes. The USCG will provide the values for these allowances upon request.
- 4.7.3 Semi-membrane tanks shall have a full secondary barrier.
- 4.7.7 Either a pressure/vacuum test or a visual test shall be specified.
- 4.8.1 For vessels that intend to trade to Alaska, lower ambient temperatures are required, as given in 46 CFR 154.176.
- 4.8.4.4 In general, hull heating systems are not acceptable.
- 4.9.1 Recognized standards are DNV GL rules, but vessels trading to the US should have crack arresting steels specified by USCG.
- 4.9.8 Quality control of insulation is delegated, subject to USCG oversight.
- 4.10.1.2.1 Alternative edge penetrations are generally not permitted.
- 4.10.1.2.2 The ASME Code is the acceptable standard, other standards require USCG approval.
- 4.10.2 USCG should be contacted regarding workmanship. In general tolerances should be half of the ASME Code.
- 4.10.5.2 Sampling tests shall be according to DNV GL rules. *(Rules for classification: Ships — DNVGL-RU-SHIP-Pt.5, Ch.7, Section 4, 5.3)*
- 4.10.6 Testing of integral tanks shall be according to DNV GL rules. *(Rules for classification: Ships — DNVGL-RU-SHIP-Pt.5, Ch.7, Section 24, 1.3)*
- 4.10.8.1 Recognized standards are the DNV rules. *(DNV Rules Sec.5 N 400)*
- 4.10.8.2 Recognized standards are the DNV rules. *(DNV Rules Sec.5 N 402)*
- 4.10.8.3 DNV GL tank testing rules are satisfactory to USCG. *(DNV Rules Sec.5 N 403)*

- 4.10.9 ASME Code is the standard acceptable.
- 4.10.10.3.4 Hydro pneumatic testing is not acceptable.
- 4.10.10.3.5 Higher stresses are not acceptable.
- 4.10.12 See note concerning 4.7.7.
- 4.10.13 Tanks constructed to the ASME Code do not need stress level confirmation.
- 4.11.1 Soaking should be according to the ASME Code.
- 4.11.2 Stress relief shall comply with the ASME Code.
- 4.11.2.14 Mechanical stress relief methods must be approved beforehand by USCG.

Chapter 5 - Process pressure vessels and liquid, vapor, and pressure piping systems

- 5.1.2 Process pressure vessels shall meet the ASME Code.
- 5.2.2.1 The piping standard shall be as required by 46 CFR Chapter I, Subchapter F.
- 5.2.4.4 No lower design pressure may be accepted.
- 5.2.4.5 Flanges must comply with ASME B16.5.
- 5.2.5 Stress analysis is delegated to DNV GL, subject to oversight by USCG.
- 5.3.2.1 No higher or lower temperature may be specified.
- 5.3.2.2 Same as 5.3.2.1.
- 5.3.2.2.2 In general, pressure tests need not be performed at the design temperature.
- 5.3.2.2.5 Performance of tests may not be waived.
- 5.4.2.3 Screwed couplings are also to comply with 46 CFR 56.30 - 20, as applicable.
- 5.4.3.2 Flanges must comply with ASME B16.5.
- 5.4.4 Alternative piping arrangements require USCG approval.
- 5.4.6.2 Thermal stress relieving may not be waived.
- 5.4.6.3.1 Radiography may not be reduced.
- 5.5.1 No relaxations are permitted.
- 5.5.2 Alternative fluids must be liquids that have a flashpoint greater than 125 °F.

Chapter 6 - Materials of construction

- 6.1.3 Recognized standards are DNV GL rules. (*Sec. 2 with due reference to Part 2*)
- 6.1.4.1 A Charpy V-Notch test is required.
- 6.1.4.2 Other tests may not be substituted for the Charpy V-Notch test.
- 6.1.5 Material properties must meet DNV GL rules. . (*Rules for classification: Ships — DNVGL-RU-SHIP-Pt.5, Ch.7, Section 6 with due reference to Part 2*)
- 6.1.7 Alternative chemical properties are not acceptable.
- Table 6.1 (Footnotes) No special approval is permitted.
- Table 6.2 (Footnotes) No special agreement or approval is permitted.
- Table 6.3 (Footnotes) No special approval is permitted.
- Table 6.4 (Footnotes) No special approval is permitted.
- 6.3.1 Testing may not be omitted.
- 6.3.2 Welding consumables shall meet DNV GL rules for type A tanks. DNV GL approval of welding consumables may be applied for type B tanks. However, for type B tanks,

welding consumables may be stipulated by the USCG as part of the USCG concept review for type B tanks. ASME Code requirements will be applied for type C tank welding consumables. Welding tests may not be waived.

- 6.3.3.1 Radiography is required.
- 6.3.3.2.2 Transverse bend tests are at the discretion of DNV GL.
- 6.3.3.2.4 Requirements for these tests are left to the discretion of DNV GL.
- 6.3.4.2 No special agreement is permitted.
- 6.3.4.3 Recognized standards for this section will be individually reviewed.
- 6.3.5 Test requirements should be in accordance with 6.3.4.
- 6.3.6.1 A reduction in test for secondary barrier is not acceptable. Production tests for contiguous hull structure are required to meet 46 CFR 154.182
- 6.3.6.2.2 USCG will consider alternatives to the energy requirements on a case by case basis.
- 6.3.6.3 USCG will consider alternatives to the energy requirements on a case by case basis.
- 6.3.6.4 Integral and membrane tests must be inspected according to USCG approved standards from the manufacturer.
- 6.3.7.1.2 Tank examination will be as approved by USCG for the tank designed.
- 6.3.7.1.3 DNV GL rules shall be the recognized standards, except that for membrane tanks the USCG accepted manufacturer's procedures shall be used.
- 6.3.7.3 See note for 6.3.7.1.3.

Chapter 7 - Cargo pressure/temperature control

- 7.1 Refrigeration systems shall meet 46 CFR 154.702. Stand-by unit is required. Unless a refrigeration system is installed, cargoes with a vapor pressure exceeding the MARVS at 46 degrees Celsius are not authorized in US Waters.
- 7.1.1 Design of cargo pressure and temperature control must contain cargo for 21 days, and cargo venting cannot be used to control tank pressure while in US ports.
- 7.1.2 Special design ambient temperatures apply for Alaskan waters, as given in 46 CFR 154.176.

Chapter 8 - Cargo tank vent systems

- 8.2.2 Pressure/vacuum relief is delegated to DNV GL, subject to USCG oversight.
- 8.2.5 DNV GL is an acceptable authority.
- 8.2.7 Changing of relief valve settings will be overseen by an agent of DNV GL.
- 8.2.10 No relaxation of this requirement is accepted for ships less than 90 m.
- 8.4.2.3 Other vacuum relief systems must be accepted by USCG.
- 8.5.2 Approval for $F = 0.5$ is delegated to DNV GL, subject to USCG oversight

Chapter 9 - Environmental control

- 9.5.2 A check valve is an acceptable means.

Chapter 10 - Electrical installations

All electrical installations in hazardous locations are to comply with the general requirements of IEC 60092-502: 1999 "Electrical installations in ships -tankers" and must be supplemented by the interpretations and additional requirements of IEC 60092-502: 1999 issued by the U.S. Coast Guard in

April 2009. The mentioned requirements are listed on the Coast Guard's Alternate compliance website as "USCG Supplemental Requirements for use of "IEC 60092-502:1999 for application of SOLAS regulation II-1/45.11 to U.S. flag vessels".

Chapter 11 - Fire protection and fire extinction

- 11.3.4 When the fire pumps are used to supply the water spray system, the fire main must still be able to operate at full capacity.
- 11.4.3 DNV GL is delegated to accept standards for ships with capacity less than 1,000 m³.
- 11.4.4 Suitable alternatives will be considered by USCG.
- 11.4.6 The coverage area maintained by hand hose lines for portions of the main deck which are inaccessible to personnel must not exceed one-half of the projected hose at its rated discharge or 10 m (32.8 ft), whichever is lesser.
- 11.5.2 Relaxations are not permitted for ships carrying a restricted number of cargoes.

Chapter 12 – Mechanical ventilation in the cargo area

- 12.1.5 If rooms are considered to be gas dangerous, the space should be of negative pressure type provided by a means of mechanical ventilation. Relative negative pressure by supply of positive pressure ventilation to surrounding areas is not acceptable.

Chapter 13 - Instrumentation (gauging, gas detection)

- 13.1.4 Testing intervals are delegated to DNV GL, subject to USCG oversight. Vessels in U.S. ports should be able to demonstrate that the instruments function, and in the case of gas detection that they are properly calibrated.
- 13.2.4 Gauge glasses need USCG approval, but are generally not acceptable.
- 13.3.1 Sensors required for automatic closing of the shut-off valve for overflow controls as specified by 13.2.1, must be independent of each other, however, the sensors may send signals to the same actuator. USCG should be contacted in the case that it is the port authority.
- 13.5.4 Temperature sensors should be at the bottom of the tank and near the top of the tank, below the maximum filling level.
- 13.6.1 Gas detection is delegated to DNV GL, subject to USCG oversight.
- 13.6.11 Other limits are not acceptable.
- 13.6.13 Portable gas detectors should meet the thresholds specified by OSHA.

Chapter 14 - Personnel protection

- 14.2 Safety equipment compliant with 46 CFR 154.1400 must be provided
- 14.2.4 The provisions of this paragraph are not acceptable.
- 14.3.1 Stretchers and other required equipment must be provided in accordance with 46 CFR 154.1420
- 14.4.5 This requirement is delegated to DNV GL, subject to USCG oversight.

Chapter 15 - Filling limits for cargo tanks

- 15.1.3 Higher filling limits are permitted.
- 15.2 The approval of this list is delegated without restriction.

Chapter 16 - Use of cargo as fuel

- 16.5.2 This requirement is delegated to DNV GL, subject to USCG oversight.
- 16.5.6 This requirement is delegated to DNV GL, subject to USCG oversight.
- 16.6 This requirement is delegated to DNV GL, subject to USCG oversight.

Chapter 17 - Special requirements

- 17.1 Carbon dioxide is not permitted to be carried as cargo in U.S. waters.
- 17.14 Chlorine may not be carried in U.S. waters.
- 17.18 Methyl acetylene propadiene mixtures (MAPP gas) shall be carried only in one of the two compositions specified in the applicable Gas Code.
- 17.18.3 Other compositions require USCG approval.
- 17.19 Nitrogen cargo carriage requires special USCG approval
17.20 Propylene oxide may be authorized for carriage subject to the following special restrictions:
 - Classification society certification that the required cargo piping separation has been achieved must be on board the vessel and available to the Coast Guard boarding personnel.

The following requirements apply to the carriage of ethylene oxide/propylene oxide mixtures (containing a maximum of 30% ethylene oxide):

 - When this cargo is carried without refrigeration the cargo tank relief valve setting shall not be less than 120 kPa gauge (17 psig).
- 17.20.3.1 Only steel or stainless steel are acceptable.
- 17.20.13.2 The approval of handling plans is delegated to DNV GL.
- 17.20.14 The approval of filling limits is delegated to DNV GL.
- 17.21 Operational requirements for the carriage of Vinyl Chloride:
 - Fixed or portable instruments shall be used to continuously monitor for vinyl chloride vapor leaks during vinyl chloride transfer operations. The method of monitoring and measurement shall have accuracy (with a confidence level of 95 percent) of not less than $\pm 50\%$ from 0.25 through 0.5 ppm, $\pm 35\%$ from over 0.5 ppm through 1.0 ppm, and $\pm 25\%$ over 1.0 ppm;
 - Cargo transfer operation is discontinued or corrective action is initiated by the person in charge to minimize exposure to personnel whenever a vinyl chloride vapor concentration in excess of 1 ppm is detected. If the vinyl chloride vapor concentration exceeds 5 ppm for over 15 minutes, action to reduce the leak can be continued only if the respiratory protection requirements of 29 CFR 1910.1017 are met by all personnel in the area of the leak;
 - Those portions of cargo lines which will be open to the atmosphere after piping is disconnected are free of vinyl chloride liquid and the vinyl chloride vapor concentration in the area of the cargo piping disconnect points is not greater than 5 ppm;
 - Any restricted gauge fitted on a tank containing vinyl chloride is locked or sealed so that it cannot be used and a restricted gauge is not used as a check required closed gauge, nor as a means of sampling;
 - The words "CANCER-SUSPECT AGENT" are added to the warning signs required by 46 CFR 154.1830, and signs bearing the legend: "CANCERSUSPECT AGENT IN THIS AREA, PROTECTIVE EQUIPMENT REQUIRED, AUTHORIZED PERSONNEL ONLY" are posted whenever hazardous operations, such as tank cleaning, are in progress;

- A vessel undergoing cargo transfer operations be designated a “regulated area” having access limited to authorized persons and requiring a daily roster of authorized persons who may board, and;
- Employees engaged in hazardous operations, such as tank cleaning, be required to wear and use respiratory protection in accordance with the provisions of 29 CFR 1910.1017 and protective garments, provided clean and dry for each use, to prevent skin contact with liquid vinyl chloride.

17.2 Guidance related to 46 Subchapter O – Bulk Dangerous Cargoes

Ships carrying liquefied gases

1. Allowable stress levels for independent tank types B and C

The stress factors for use in designing independent Type B tanks are shown in Table 2. Stress factors A and B also apply when designing Type C tanks. Certification of this item should be indicated in the Certificate of Fitness. (For a vessel to be accepted as Type II PG, the minimum design MARVS of 686 kPa (7 kp/cm²) must be based on these stress factors).

Stress Factors	Nickel Steel and Carbon Manganese Steel Values	Austenitic Steel Values	Aluminum Alloy Values
A	4.0	4.0	4.0
B	2.0	1.6	1.5
C	3.0	3.0	3.0
D	1.5	1.5	1.5

Table 2: Values of Stress Factors

2. Crack arresting steels

The following grades of steel, or their equivalents, must be used along the length of the cargo area in the following locations as required by Section 46 CFR 154.70:

- Deck stringer: Grade E
- Sheer strake: Grade E
- Turn of the bilge: Grade D or E

Certification of this item may be made in the Certificate of Fitness or on a separate certificate issued by the classification society or administration.

3. Design ambient temperatures

Lower ambient temperatures for calculation of hull steel (see 446 CFR 154.174, 154.176, 154.466):

For Continental U.S. and Hawaii:

- Air (at 5 knots): 18 degrees C (0 degrees F)
- Seawater: 0 degrees C (32 degrees F)

For Alaska:

- Air (at 5 knots): 29 degrees C (- 20 degrees F)
- Seawater: 2 degrees C (28 degrees F)

Certification of this item should be indicated on the Certificate of Fitness. (For gas ships with independent tanks Type C, it is sufficient to use the design ambient temperatures from the IMO Gas Carrier Code and International Gas Carrier Code).



4. Cargo pressure/Temperature control

Except for the carriage of methane, the cargo containment system must be designed to maintain the cargo indefinitely without venting to the atmosphere at the upper design ambient temperature of 45 degrees C for air and 32 degrees C for seawater. For methane, the cargo containment system must be designed to maintain the cargo without venting to the atmosphere for a minimum period of 21 days while a vessel is in port and under ambient conditions of 45 degrees C for air and 32 degrees C for seawater. Certification of this item may be handled in the same manner as for item 2.

Ships carrying compressed natural gas

Please note Rules for classification: Ships — DNVGL-RU-SHIP-Pt. 5, Ch. 8, “Compressed Natural Gas Tankers” has not been accepted by the USCG.



18 RECORD OF REVISIONS

Chapter	Change



About DNV GL

Driven by our purpose of safeguarding life, property and the environment, DNV GL enables organizations to advance the safety and sustainability of their business. We provide classification and technical assurance along with software and independent expert advisory services to the maritime, oil and gas, and energy industries. We also provide certification services to customers across a wide range of industries. Operating in more than 100 countries, our 16,000 professionals are dedicated to helping our customers make the world safer, smarter and greener.