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Coast Guard

Gas Carrier Inspector Course (MS-513)

STUDENT GUIDE

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Gas Carrier Inspector Course

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QUESTIONS ABOUT THIS TEXT SHOULD BE
ADDRESSED TO THE LGC NCOE INSTRUCTOR

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Lesson 1: LGC NCOE Overview

Introduction

National Centers of Expertise were promulgated in the 2008 Marine Safety Enhancement Plan to increase marine inspection and investigation competencies within the Coast Guard.

In 2009, the Liquefied Gas Carrier National Center of Expertise (one of six such centers) was established to raise the Coast Guard's competency, capabilities, and consistency in the field of Liquefied Gas Ship safety, security, environmental protection requirements and Port State Control Examinations. The LGC NCOE is a detached unit of the Traveling Inspection Staff (CG-5P-TI) and is collocated with MSU Port Arthur.

Lesson Objectives

This presentation will be a brief review of the Liquefied Gas Carrier NCOE's:

- Roles and Responsibilities
- Staff make up
- Staff training & designations
- Operational support we can provide
- Training support we can provide
- Support we provide to CGHQ
- Current projects
- Link to our website

Staff

The LGC NCOE's staff consists of:

- Detachment Chief (O5): (409) 723-6507
- National Technical Advisor (O4): (409) 723-6559
- Senior Marine Inspector/Training Manager (GS-13): (409) 723-6584
- Marine Inspector – Gas for Fuel SME (GS-12): (409) 723-6508
- Marine Inspector – Facilities SME (O3): (409) 723-6519
- Marine Inspector – Bunkering SME (O3): (409) 723-6507

Staff Training & Designations

LGC NCOE staff member expertise starts with the foundational Coast Guard certifications as Port State Control Examiner (PSCE) and Foreign Gas Carrier Examiner (FGCE). Before a member can represent the NCOE as an expert, there are a robust set of baseline requirements that must be fulfilled. An equally rigorous set of annual recency requirements have to be met. This training and professional development, along with almost daily focused attention on and interaction with the liquefied gas shipping and fuel industry, gives the NCOE its expertise.

Staff Training & Designations (cont'd)

Baseline requirements:

- Completion of the Port State Control course.
- Attainment of the PSCE and FGCE certifications/competencies.
- Participate in an introductory Industry familiarization program for a minimum of **30** days.
- Completion of the Gas Carrier Inspector Course.
- Completion of the CG's Instructor Development Course or a FORCECOM "approved" commercial Train-the-Trainer course.
- To become a National PQS Verifying Officer (NVO), staff must also complete at least 10 liquefied gas carrier exams at the NCOE and be recommended by at least two existing NCOE NVO's.
- To become an MMS audit team member, staff members must also complete a RABQSA or IRCA certified Quality Management System Lead Auditor Course.
- Prior to assignment as an instructor for resident training, non-resident (exportable) training or structured on-the-job training, staff members must also obtain the Instructor (PERJC) competency.

Annual requirements:

- Participate in a minimum of 10 Liquefied Gas Carrier Exams (not all same ship type).
- Participate as a member on at least 1 FGCE certification board.
- Participate in a minimum of 5 days of gas carrier industry related training.
- Perform at least 5 days of maritime/professional development related professional development training (non gas carrier industry related).
- Attend at least 1 gas carrier industry related conference or seminar.
- Read at least 2 liquefied gas related industry books/documents.
- For members holding the PER-JC competency. Conduct at least three hours of formal instruction.

National PQS Verifying Officer (NVO): This designation comes from the Chief, Traveling Inspector (CG-5P-TI) and authorizes LGC NCOE staff members to verify and sign FGCE PQS at all Coast Guard field units.

Instructor (PER-JC): This is an official certification/competency within the Coast Guard. LGC NCOE staff members attain it after completing a formal process that ensures that they have the skills to effectively develop and deliver training to apprentice FGCEs.

Staff Training & Designations (cont'd)

Assessor/Auditor: This is an informal designation in the Coast Guard but requires private certification following formal training. This is a skill used by LGC NCOE staff to participate in and lead MMS audits, oversight company internal audits, and to carry out Inspector Proficiency Assessments.

Operational Support

The LGC NCOE provides assistance to Coast Guard field units worldwide and the assistance can take many different forms:

Q&A: Call if you have any questions regarding liquefied gas shipping, related policy, standards, etc. The LGC NCOE maintains liquefied gas ship examination procedures and other "how-to" information, including best practices for the field to use. A Subject Matter Expert (SME) list is provided on Page 1-1 of this lesson as well as the LGC NCOE website.

Ship Inspection: LGC NCOE staff can support field units with foreign liquefied gas carrier COC exams, domestic LNG/LPG barge inspections, domestic liquefied gas carrier inspections, and on any conversion/new construction project utilizing LNG as a fuel. LGC NCOE members remain qualified and current in all gas shipping related competencies and are available on short notice to deploy and participate as a team member or lead an examination. LGC NCOE staff also have quick access to a CG-wide roster of FGCE's and can help arrange for support from a neighboring unit as well. This support is very prevalent in both the busiest gas shipping ports and for units that rarely have the need to conduct a gas ship examination. This role has expanded with the use of LNG as a marine fuel.

PQS Qualification Board member: For neighboring units, this support is often in person. Distance does not obviate this capability though. LGC NCOE members have telephonically participated in numerous PQS qualification boards throughout the U.S.

Marine Casualties: LGC NCOE staff is available, telephonically or on-scene, as a technical advisor for casualty investigations involving liquefied gas carriers.

Outreach: The LGC NCOE uses the following methods to facilitate communication of enforcement guidance and policy updates to the field and to ensure its consistent application:

- **Field Notices** are topic-specific providing real-time guidance and alerts to the field. These improve consistency until more detailed National guidance can be delivered and are sent immediately to all FGCE's, Sector/MSU Prevention leadership, and District/Area/HQ representatives.

Operational Support (cont'd)

- **Website/CGPortal site**: The LGC NCOE website is located at www.uscg.mil/hq/cg5/LGCNCOE/. It contains contact information, liquefied gas carrier policy and guidance, LNG as a fuel policy and guidance, safety alerts, field notices, and training information. Any information that is not releasable to the public is maintained on the CG Portal site:

  (https://cgportal2.uscg.mil/units/LGC NCOE/SitePages/Home.aspx)

- **Newsletter** includes enforcement reminders, technical guidance, contact information, etc. These identify current events, best practices, negative trends (and steps to reverse) and are electronically distributed to the same audience as Field Notices, also including industry stakeholders.
- **Coast Guard Maritime Commons:** The LGC NCOE regularly submits content to be posted on the Coast Guard blog. The blog can be found at: http://mariners.coastguard.dodlive.mil/

Training Support

The LGC NCOE interacts along the entire training & workforce development continuum for Foreign Gas Carrier Examiners. From qualification (PQS development, OJT, one-on-one targeted training, resident training) to advanced training (industry training and the Liquefied Gas Carrier Ship Rider Program).

The LGC NCOE also monitors long term field-level workload shifts. This information is used to help CG-CVC forecast needed capability growth so that field units have an adequate cadre of qualified examiners on hand before the workload increases materialize. Some of the ways the LGC NCOE supports FGCE training & workforce development can be found below.

Liquefied Gas Carrier Accelerated Program (LGCAP): The LGCAP is designed to bring 6 members at a time to the LGC NCOE for 3-4 weeks to receive specialized & targeted classroom training and OJT. Members work with LGC NCOE National Verifying Officers to gain knowledge and experience on both LPG and LNG vessels. They also have the opportunity to complete the indoctrination portion of the PQS at a liquefied gas facility. Most members are able to complete 100% of their FGCE PQS by the end of the 3rd week. The 4th week is reserved for those members that have successfully completed their PQS and would like to complete a check ride and certification board before returning to their unit. Check rides and certification boards have to be prearranged with the supporting unit and the LGC NCOE.

Industry Training: The LGC NCOE supports Coast Guard members selected for liquefied gas industry training by identifying compatible host companies, suggesting work projects, and monitoring progress.

Training Support (cont'd)

Deployable OJT(D-OJT): This type of training is for individuals or groups at a unit that require attention in a particular facet of the PQS. It includes review of policy/procedure/standards in the office under the instruction of a LGC NCOE member with associated ship visits/inspections focused on the information reviewed in the office. LGC NCOE members can travel to visit a unit (provided there is adequate LNG/LPG ship traffic) or a member(s) can visit the NCOE.

Resident "C" School Training: The LGC NCOE assists CVC-2 with the management of the Gas Carrier Inspector Course (MS-513). This course is provided twice a year by the Calhoon MEBA Engineering School at their facility in Easton, MD. CG members that are assigned and actively pursuing the FGCE competency are targeted for attendance to the course. In addition to assisting with the management of the course, LGC NCOE staff members provide instruction on the scope and recommended procedures for conducting a liquefied gas carrier certificate of compliance examination.

Liquefied Gas Carrier Ship Rider Program: The LGC NCOE manages the Coast Guard's Liquefied Gas Carrier Ship Rider Program. The NCOE coordinates with interested candidates to identify and schedule ship ride opportunities. In some cases, companies can accommodate two individuals. In those cases, the LGC NCOE tries to send a staff member with an apprentice FGCE to conduct structured OJT throughout the ship ride. This helps to facilitate a very effective learning environment.

Policy & Standards Support

NCOE staff members are technical experts that provide consultation, advice, and review of new Coast Guard policies and safety standards related to liquefied gas carriers and LNG as fuel. In other cases, the LGC NCOE will recommend new policy or revisions to existing guidance.

The LGC NCOE initiates outreach with liquefied gas shipping industry stakeholders before laws are enacted or policy is implemented. Industry concerns and questions are compiled and communicated to respective DCO program offices. The LGC NCOE staff provides this feedback and technical support to regulators and policy drafters and help gauge interim industry compliance.

How to Request Support

The LGC NCOE exists foremost to support the field. Any of the staff can be contacted for a request, particularly for inspections related questions. The NCOE's website also has a question/comment form that can be used. The NCOE's Training Manager is the best source for training requests and the National Technical Advisor is best source for operational support.

Alternatively, the general office email account (LGCNCOE@uscg.mil) may be utilized. Questions and comments generated from the website are delivered here.

Current & Upcoming Projects

Below summarizes some of the projects that the LGC NCOE either directly manages or is an active participant in:

- FGCE PQS annual revision
- Foreign Gas Carrier Examiner (FGCE) Tactics, Techniques and Procedures (TTP) review and revision
- Development of work instructions and associated job aids for LNG as fuel inspections
- PQS development for inspections of vessels utilizing LNG as fuel
- Reflag of LNG/LPG carriers
- Liquefied Gas Carrier Ship Rider Program
- Harvey Gulf OSV new construction projects with Sector Mobile
- TOTE Marlin class LNG fuelled containership new construction projects with Sector San Diego
- LNG bunkering job aid
- CG-OES policies on LNG bunkering and ships using LNG as fuel
- ISO Technical Subcommittee on LNG as fuel
- Industry advisory committees (TSAC and CTAC) evaluating use of LNG as fuel
- Reliance's Very Large Ethane Carriers (VLEC)
- Savage Marine's ammonia barge
- EVERGAS multi-gas carriers
- NCOE's annual LNG for Fuel Workshop
- SIGTTO's Senior Executive Forum
- Pan American Regional Forum (PARF)

Lesson 2: Subchapter "O" Plan Review

Introduction

Prior to conducting an examination of a liquefied gas carrier, the vessel must undergo a plan review process to ensure the vessel's eligibility to obtain a Certificate of Compliance. This plan review process is conducted by the Marine Safety Center and is commonly referred to as the Subchapter O Plan Review process.

During this process, verification is conducted to ensure that all items required by 46 CFR 154.22 have been submitted, reviewed and approved by the classification society. It primarily focuses on **four design areas** where the requirements of 46 CFR 154 **exceed** the requirements contained in the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code).

Lesson Objectives

At the end of this lesson you will be able to:

- **LIST** the four design areas where 46 CFR 154 exceeds the requirements outlined in the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code).
- **DETERMINE** which U.S. waters a vessel may operate based on its ambient design temperature criteria and secondary barrier requirements.
- **STATE** the three (03) allowable methods to maintain cargo tank pressure and temperature in order to comply with the "no venting to the atmosphere" requirement.
- **DETERMINE** if a vessel is authorized to use **M**aximum **A**llowable **R**elief **V**alve **S**ettings **(MARVS)** based on its vessel particulars & type of installed cargo tank(s) as outlined in CG-ENG Policy Letter 04-12.
- **STATE** how to confirm MSC's completion of the Subchapter O Plan Review process.

References

- Code of Federal Regulations (CFR), Title 46, Part 154
- International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (1993 Edition)
- Marine Safety Manual (MSM), Volume II, Section F, Chapter 4
- Marine Safety Center Procedure C1-43
- CG-ENG Policy Letter No. 04-12 dated 08-Aug-2012
- LGCNCOE Field Notice 01-2012

Enhanced Steel Grades

An operator who desires an endorsed Certificate of Compliance for the carriage of liquefied gases must ensure that the hull is constructed in accordance with the requirements contained within 46 CFR 154. As part of the plan review process, the Marine Safety Center verifies that the vessel's classification society has certified that the vessel has been constructed in accordance with 46 CFR 154.170 as required by 46 CFR 154.22.

For crack arresting purposes, enhanced grades of steel must be used along the cargo area. Grade E steel is required to be used along the deck stringer and sheer strake, and either Grade D or Grade E steel is required to be used along the turn of the bilge.

Ambient Design Temperatures

Prior to the construction of a liquefied gas carrier, the owner of the new vessel must determine what cargo the vessel will carry and the geographic area that the vessel desires to operate in. These two factors are important in determining which ambient design criteria will be applied to the vessel during the design phase. For foreign liquefied gas carriers that desire an endorsed Certificate of Compliance, the ambient design criteria used must comply with 46 CFR 154.459.

During the Subchapter O Plan Review process, the Marine Safety Center reviews the conditions of carriage section of the vessel's Certificate of Fitness for the minimum design temperature used for the cargo tanks. This information is then compared to 46 CFR 154.459, Table 3 to determine if a secondary barrier is required.

If a secondary barrier is required to be used, the ambient design temperature values are checked to see if they are equal to, or below -18°C for air and 0°C for water. This design criterion will allow for the carriage of liquefied gases in U.S. waters with the exception of Alaskan waters. For the carriage of liquefied gases in U.S. waters, including Alaska, design criteria of -29°C for air and -2°C for water must be used. If the ambient design temperatures are not within these standards, the vessel must meet the requirements of 46 CFR 154.178 for hull heating systems. If documentation is not provided certifying the ambient design temperatures used, then the vessel will only be authorized for the carriage of those cargoes that do not require a secondary barrier.

If a secondary barrier is not required to be used, ambient design temperature values of 5°C for air and 0°C for water are used. This criterion is acceptable for all waters.

A job aid is provided on the following page that may help clarify this part of the SOE process.

WHERE A VESSEL MAY OPERATE IN U.S. WATERS

BASED ON AMBIENT DESIGN TEMPERATURE CRITERIA AND SECONDARY BARRIER REQUIREMENTS

1. **FIRST,** locate the minimum design temperature and tank type used for the vessel's cargo tanks on the Certificate of Fitness.

2. **THEN**, compare this information to Table 3 in 46 CFR 154.459 (below) to determine if a secondary barrier is required.

Table 3 in 46 CFR 154.459:

Tank type	Cargo temperature (T) at atmospheric pressure		
	T≥−10 °C (14 °F)	T<-10 °C (14 °F)≥55 °C (−67 °F)	T<−55 °C (−67 °F)
Integral	No secondary barrier required	Tank type not usually allowed[1]	Tank type not allowed.
Membrane	.....do	Complete secondary barrier[1]	Complete secondary barrier.
Semi-membrane	.....do	.....do	.....do
Independent:			
Type A	.....do	.....do	.....do
Type B	.....do	Partial secondary barrier[1]	Partial secondary barrier.
Type C	.....do	No secondary barrier required	No secondary barrier required.

[1]The hull may be a secondary barrier.

3. **THEN,** using the chart on page 2-4, **find** the secondary barrier requirement and the applicable ambient design temperature in order to determine where in the U.S. carriage of liquefied gas is authorized.

IF	AND	THEN
A secondary barrier is required	The ambient design temperature value for 5 knot air is = or < than -18°C	Carriage of liquefied gases is allowed in U.S. waters **EXCEPT** for Alaskan waters.
A secondary barrier is required	The ambient design temperature value for still seawater is 0°C	Carriage of liquefied gases is allowed in U.S. waters **EXCEPT** for Alaskan waters.
A secondary barrier is required	The ambient design temperature value for 5 knot air is -29°C	Carriage of liquefied gases is allowed in all U.S. waters.
A secondary barrier is required	The ambient design temperature value for still seawater is -2°C	Carriage of liquefied gases is allowed in all U.S. waters.
A secondary barrier is required	Ambient design temperature values **ARE NOT** met	Vessels must meet the requirements of 46CFR154.178 for a full heating system.
A secondary barrier **is not** required	The ambient design temperature value for 5 knot air is 5°C	Carriage of liquefied gases is allowed in all U.S. waters.
A secondary barrier **is not** required	The ambient design temperature value for still seawater is 0°C	Carriage of liquefied gases is allowed in all U.S. waters.
If vessel is unable to provide documentation certifying the ambient design temperatures used		Vessel is only authorized for the carriage of those cargoes requiring no secondary barrier.

Cargo Tank Temperature & Pressure Control

Each vessel that carries liquefied gases in the U.S. must have the capability to control cargo temperature and pressure without venting cargo vapors to the atmosphere. This capability is verified by the vessel's classification society and this certification is reviewed by the Marine Safety Center as part of the Subchapter O Plan Review process in accordance with 46 CFR 154.22(a)(9)(i)(B).

For vessels carrying LPG, the requirements contained in 46 CFR 154.701 apply. An LPG vessel may be fitted with safety relief valves set at a pressure equal to or greater than the vapor pressure of the cargo at 45°C but not greater than the MARVS; or the vessel may be fitted with a refrigerated system meeting the requirements of 46 CFR 154.702. If fitted with a refrigeration system, incompatible cargoes must remain separated.

For vessels carrying LNG, the requirements contained in 46 CFR 154.703 apply. Unless a cargo tank carrying LNG can withstand the pressure build up due to boil off gas for 21 days, the pressure in the cargo tank must be maintained below the set pressure of the safety relief valve for at least 21 days by one of the following means:

- A refrigeration system meeting the requirements of 46 CFR 154.702;
- A catalytic furnace (i.e., GCU or gas combustion unit); or
- The capability to use the boil off gas as fuel

Maximum Allowable Relief Valve Settings (MARVS)

Liquefied gas carriers requesting a certificate of compliance that are outfitted with independent Type B and independent Type C tanks shall have their MARVS calculated using the stress factors specified in 46 CFR 154. The stress factors identified in 46 CFR 154 are more conservative than those specified in the IGC code. The result of the more conservative stress factors is a requirement to use *lower* MARVS when operating in U.S. waters.

To view the different stress factors used in determining MARVS, a comparison can be made between 46 CFR 154 Table 2 and IGC 4.5.1.4.

On 08 August 2012, CG-ENG-5 issued CG-ENG Policy Letter No. 04-12, *Alternate Pressure Relief Valve Settings on Vessels Carrying Liquefied Gases in Bulk in Independent Type B and Type C Tanks*. In this policy letter, the Commandant has determined that an equivalent level of safety exists for vessels that were built to the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (1993 Edition) and that those vessel's may use the higher MARVS. Guidance can also be found in LGCNCOE Field Notice 01-2012. Both references can be found in the "REF" tab of this guide.

Subchapter O Endorsement

Upon completion of the Subchapter O Plan Review Process, the Marine Safety Center will "upload" a Subchapter O Endorsement into the documentation section of the vessel's MISLE file. After the initial upload of this endorsement, the Marine Safety Center will identify the status as "In Process". The presence of this document in the vessel's MISLE file informs the OCMI that the plan review process has been completed and that the vessel is eligible to hold a certificate of compliance pending an examination.

This document can be reissued and does not need to be updated as long as the vessel's list of authorized cargoes and cargo containment system characteristics remain unchanged.

The Subchapter O Endorsement will contain information concerning the applicable IMO International Gas Code, onboard cargo containment system, MARVS, authorized cargoes and special restrictions.

Key Points

The four design areas of 46 CFR 154 that exceed the requirements of the IGC Code which are part of the Subchapter O Plan Review Process are:

1. Enhanced Steel Grades
2. Ambient Design Temperatures
3. Cargo Tank Temperature & Pressure Control
4. Reduced MARVS on Independent Type B & Independent Type C Tanks

The presence of the Subchapter O Endorsement in MISLE is verification that the Subchapter O Plan review process is complete.

Exercise 2.1: Subchapter "O" Plan Review

Exercise

Using your Student Guide, TTP and the associated references, answer the following three questions.

Question 1

What are the **four areas** of 46 CFR 154 that exceed the requirements in the 1993 International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code)?

1.

2.

3.

4.

Question 2

If a vessel has a secondary barrier, and the design temperature used was 0°C for still seawater, would this vessel be authorized to carry liquefied gases in **all** U.S. waters?

Yes / No

Question 3

You have received a request from a liquefied gas carrier operator who is requesting permission to use MARVS in U.S. waters that are specified in the 1993 IGC Code in lieu of the MARVS specified in 46 CFR 154.

The operator states that the vessel has a Type C independent tank, keel laid date of 01-Oct-1992, and that it is built in accordance with the 1993 IGC Code.

Is this vessel authorized to use MARVS specified in the 1993 IGC Code while in U.S. waters?

Yes / No

Why / Why Not?

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Lesson 3: Certificate of Compliance Exam on a Liquefied Gas Carrier

Introduction

Title 46 U.S.C. 3711 requires foreign vessels carrying cargoes regulated in 46 CFR Subchapter O to have onboard a Certificate of Compliance (COC) authorizing the carriage of those cargoes in U.S. waters. The COC is endorsed, with the Subchapter O Endorsement (SOE) in the case of liquefied gas carriers, following a satisfactory examination conducted by the OCMI.

A foreign liquefied gas carrier is required to have an International Maritime Organization (IMO) Certificate of Fitness (COF) onboard. The COF is issued by the vessel's Flag State Administration, usually through the Classification Society, and attests to compliance with the applicable IMO Gas Code. The Coast Guard also accepts the IMO Certificate of Fitness as evidence of compliance with 46 CFR 154, with the exception of the four design areas that were previously discussed in lesson 2.

This lesson will outline the general scope and procedures for verifying compliance with the applicable Codes and Regulations on a foreign gas carrier examination and COC.

Lesson Objectives

At the end of this lesson you will be able to:

- **OUTLINE** the scope and recommended procedures for the 13 Major Accomplishments associated with an examination of a liquefied gas carrier during a Port State Control Certificate of Compliance exam.
- **STATE** examples of substandard conditions that may be grounds for denial of entry, expulsion and/or detention of a liquefied gas carrier.

During this lesson we will be reviewing/discussing the required Tasks and Steps associated with each of the Major Accomplishments of a COC exam.

Note: The Tasks and Steps in this Lesson align with the current FGCE PQS.

After we review each Major Accomplishment, you will get a chance to practice what you have learned.

Working as a group/team, you will be given multiple scenarios (specifically tailored for each COC Major Accomplishment), basic details of a liquefied gas carrier, cargo information, sample vessel documents & manuals, blank forms and necessary references. Using this information and your student notes, you will *(depending on the particular scenario)*:

- **REVIEW** a sample Certificate of Compliance Form (CG-3585) completed in accordance with CG policy and procedures.
- **DETERMINE** if a marine chemist is required to certify the compressor/pump room "Safe for Entry" in accordance with CG policy and Safety Alert (191819ZMar10).

- **DETERMINE** what cargo specific characteristics and safety concerns should be addressed during the Pre-Exam Safety Meeting in accordance with CG policy and the MSM.
- **REVIEW** an International Certificate of Fitness for accuracy in accordance with CG policy and procedures, U.S. Laws/Regulations and International Standards.
- **REVIEW** a SOE for accuracy in accordance with CG policy and procedures and U.S. Laws/Regulations.
- **REVIEW** a Certificate of Inhibition for accuracy in accordance with CG policy and procedures, U.S. Laws/Regulations and International Standards.
- **REVIEW** a NLS IOPP Certificate for accuracy in accordance with CG policy and procedures, U.S. Laws/Regulations and International Standards
- **REVIEW** SCTW Certificates for required training in accordance with CG policy and procedures, U.S. Laws/Regulations and International Standards.
- **DETERMINE** if a discrepancy/deficiency exists, the appropriate regulatory cite and acceptable corrective actions (if any) your boarding team will take in accordance with CG policy and procedures, U.S. Laws/Regulations and International Standards.
- **DETERMINE** what required/specific equipment should be onboard in accordance with U.S. Laws/Regulations and International Standards.
- **IDENTIFY** specific items that are required to be verified when examining different shipboard systems in accordance with CG policy and procedures, U.S. Laws/Regulations and International Standards.
- **DETERMINE** if a particular discrepancy/condition may be grounds for denial of entry, expulsion and/or detention in accordance with CG policy and procedures.

At the end of this lesson, there will be a Final Performance Assessment that will be similar in structure to the practical exercises. You will also be completing the assessment as a group/team.

Lesson 3: Certificate of Compliance Exam on a Liquefied Gas Carrier

References

- Code of Federal Regulations (CFR), Title 46, Part 154
- The International Convention for the Safety of Life at Sea (SOLAS), Consolidated Edition 2009
- International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978 (MARPOL 73/78) (Annex II) (Consolidated Edition 2011)
- International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code) [1993 Edition]
- International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code) [2016 Edition]
- Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (GC Code)
- Life Saving Appliances (LSA) Code, 2010 Edition
- International Code for Fire Safety Systems (FSS), 2007 Edition
- Marine Safety Manual (MSM), Volume I, Administration and Management
- Marine Safety Manual (MSM), Volume II, Material Inspection
- International Medical Guide for Ships
- Medical First Aid Guide for Use in Accidents Involving Dangerous Goods (MFAG)
- MSC.1/Circ.1318, Guidelines for the Maintenance and Inspection of Fixed Carbon Dioxide Fire-Extinguishing Systems
- Safety Alert – Cargo Compressor Room Entries During Port State Control Exams and Law Enforcement Boardings of Liquefied Petroleum Gas (LPG) Carriers, 191819z Mar 10, COMDT COGARD Washington DC //CG-543//
- International Chamber of Shipping Tanker Safety Guide (Liquefied Gas)
- Foreign Gas Carrier Examiner (FGCE) Tactics, Techniques, and Procedures (TTP), April 2016

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Lesson 3: Certificate of Compliance Exam on a Liquefied Gas Carrier

Pre-Exam Activities

Prepare the Certificate of Compliance (COC) CG-3585

During the Port State Control Course, you learned about the requirement to issue a Certificate of Compliance (CG-3585) to foreign Tank Vessels that operate in U.S. waters. This requirement also applies to Liquefied Gas Carriers. Prior to attending a liquefied gas carrier to conduct an exam, it will be necessary to prepare a COC if the vessel is scheduled for an "initial" or "renewal" exam.

Please see Chapter 2, Section A of your FGCE TTP for details of preparing a COC.

Conduct a Safety Meeting

You have already learned some of the hazards associated with the carriage of liquefied gases in bulk. Personnel working around liquefied gases need to be aware of the specific hazards and outfit themselves accordingly. Prior to conducting an examination on a Liquefied Gas Carrier, the lead Foreign Gas Carrier Examiner (FGCE) should conduct a pre-exam safety meeting with the examination team.

Please see Chapter 2, Section B of your FGCE TTP for details of conducting a safety meeting.

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Documents, Publications & Logs/Manuals Exam

International Pollution Prevention Certificate for the Carriage of Noxious Liquid Substances in Bulk (IPP NLS)

In some instances, an LPG carrier may be authorized to carry gases that are also considered to be Noxious Liquid Substances (NLS) cargoes. These cargoes are identified with an asterisk (*) in the table located in chapter 19 of the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code, 1993 edition) and Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (GC Code). When these cargoes are authorized, the vessel will be issued an International Pollution Prevention Certificate for the Carriage of Noxious Liquid Substances in Bulk (IPP NLS) in accordance with Regulation 5 of MARPOL Annex II.

Please see Chapter 3, Section A of your FGCE TTP for details of examining an IPP NLS certificate.

International Certificate of Fitness (COF)

An International Certificate of Fitness (COF) will be issued to Gas Carriers as evidence of compliance with the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code, 1993 edition). The certificate will be issued under the authority of IMO Resolution MSC.5(48) as amended by Resolution MSC.17(58) for vessels with a keel laid date of 01 July 1986 and later.

A table of gas code applicability can be found in Chapter 2, Section C of your FGCE TTP.

Please see Chapter 3 Section B of your FGCE TTP for details of examining an International Certificate of Fitness.

Certificate of Fitness (COF)

A Certificate of Fitness (COF) will be issued to Gas Carriers as evidence of compliance with the Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (GC Code). The certificate will be issued under the authority of IMO Resolution A.328(IX) or IMO Resolution A.329(IX) depending on keel laid date, contract date or delivery date.

A table of gas code applicability can be found in Chapter 2, Section C of your FGCE TTP.

Please see Chapter 3, Section C&D of your FGCE TTP for details of examining a Certificate of Fitness.

Lesson 3: Certificate of Compliance Exam on a Liquefied Gas Carrier

Standards of Training, Certification & Watchkeeping for Seafarers (STCW)

During the Port State Control Course you received instruction covering the Standards of Training, Certification & Watchkeeping for Seafarers (STCW) and it's applicability to mariners. There are additional requirements for mariners serving on Liquefied Gas Carriers. The specific requirements are identified in STCW V/1-2.

Please see Chapter 3, Section G of your FGCE TTP for details of examining mariner's liquefied gas training and credentials.

Subchapter O Endorsement (SOE)

As previously discussed in the Subchapter O Plan (SOE) Review Process lesson, the Marine Safety Center will generate a Subchapter O Endorsement at the completion of the plan review process. The SOE is part of the Certificate of Compliance for Gas Carriers and is required by 46 CFR 154.1802(a)(1).

Please see Chapter 3, Section H of your FGCE TTP for details of examining a Subchapter O Endorsement.

Certificate of Inhibition

Certain chemical cargoes may contain a substance to prevent or slow down the deterioration of the cargo. This substance is referred to as an inhibitor. When an inhibitor has been added to a cargo, the manufacturer is required to issue the vessel a certificate. This certificate is required by IGC (1993 edition) Reg 17.8, GC Reg 17.10 & 46 CFR 154.1818.

Please see Chapter 3, Section I of your FGCE TTP for details of examining a Certificate of Inhibition.

Cargo Record Book

When a LPG carrier is authorized to carry Noxious Liquid Substances (NLS) it must comply with requirements outlined in MARPOL Annex II. Every ship to which MARPOL Annex II is applicable, must have a Cargo Record Book in accordance with Regulation 15.

The Cargo Record Book must be readily available for inspection and kept onboard the ship.

Please see Chapter 4, Section A of your FGCE TTP for details of examining a cargo record book.

Procedures & Arrangements Manual (P&A)

Every ship certified to carry a category X, Y or Z Noxious Liquid Substance (NLS) shall have onboard a Procedures & Arrangements (P&A) Manual in accordance with Regulation 14 of MARPOL Annex II.

The purpose of this manual is to identify the physical arrangements and operational procedures for the handling of these cargoes.

Please see Chapter 4, Section B of your FGCE TTP for details of examining a Procedures & Arrangements Manual.

Shipboard Marine Pollution Emergency Plan (SMPEP) for Noxious Liquid Substances

Every ship of 150 gross tons and above certified to carry Noxious Liquid Substances (NLS) shall have onboard a Shipboard Marine Pollution Emergency Plan (SMPEP) for Noxious Liquid Substances in accordance with Regulation 17 of MARPOL Annex II. The purpose of the plan is to outline procedures to be taken by personnel onboard to reduce or control the discharge of noxious liquid substances following an incident.

Please see Chapter 4, Section C of your FGCE TTP for details of examining a Shipboard Marine Pollution Emergency Plan for Noxious Liquid Substances.

Cargo Operations Manual

Liquefied Gas Carriers are required to have onboard information that will assist those individuals responsible for the safe carriage of the cargo(es) being carried. This information is required by IGC (1993 edition) Reg 18.1.1, GC Reg 18.1 & 46 CFR 154.1810.

Typically the information is contained in a manual; however newer vessels may be keeping this information in a computer data base.

Please see Chapter 4, Section D of your FGCE TTP for details of examining a cargo operations manual.

Loading and Stability Information Book

The master of a Liquefied Gas Carrier shall be supplied with a Loading and Stability Information Book. This book is required in accordance with IGC (1993 edition) Reg 2.2.5, GC Reg 2.2.3 & 46 CFR 154.1809.

Please see Chapter 4, Section E of your FGCE TTP for details of examining a loading and stability information book.

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Exercise 3.2: Documents, Publications & Manuals Exam

Scenario

You are onboard the LPGC GELU LIQUIDUS during a renewal Certificate of Compliance (COC) examination. You and the rest of the examination team are conducting the Documents, Publications & Manuals exam portion of the examination.

At the completion of the Documents, Publications & Manuals Exam, the examination team leader will provide a brief on the team's findings.

Question 1

As an examination team, given an International Certificate of Fitness, identify and document all discrepancies.

Question 2

As an examination team, given a Subchapter O Endorsement, identify and document all discrepancies.

Question 3

As an examination team, given a Certificate of Inhibition, identify and document all discrepancies.

Question 4

As an examination team, given an International Pollution Prevention Certificate for the Carriage of NLS, identify and document all discrepancies.

Question 5

As an examination team, given certificates of competency & certificates of completed training, verify that officers onboard the vessel meet the minimum requirements for training & qualification. Identify and document all discrepancies.

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THE FLAG ADMINISTRATION

Date of issue: 2015-12-17
Certificate No: 0000001

CONTINUOUS SYNOPSIS RECORD

Issued under the provisions of the INTERNATIONAL CONVENTION FOR THE SAFETY OF LIFE AT SEA, 1974, as modified by the Protocol of 1988 relating thereto

under the authority of the Government of

DOCUMENT NUMBER 01 FOR THE SHIP WITH IMO NUMBER 1234567

by **The Classification Society**

This certificate is applies from 2015-12-17

Particulars of Ship

Name of Ship:	**"Gelu Liquidus"**
Distinctive Number or Letters:	**LGCNCOE**
Port of Registry	**HOMEPORT**
Name of current registered owner	**Gas Carriers INC** **2016 NCOE LN** **Port Arthur, TX**
Gross Tonnage:	**23,952**
Name of Company (International Safety Management): Registered address(es):	**Gas Carriers INC** **2016 NCOE LN** **Port Arthur, TX**
Administration/Government/Recognized Organization which issued Safety Management Certificate:	**THE CLASSIFICATION SOCIETY**

Date of Build

Date of building contract:	**1998-01-22**
Date on which keel was laid or ship was at a similar stage of construction:	**1998-06-23**
Date of delivery:	**1999-03-15**
Date on which work for a conversion or an alteration or modification of a major character was commenced (where applicable):	**-**

Issued at **Easton, MD**

Name of authorized person: **THE SURVEYOR**

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Ship Particulars

GELU LIQUIDUS

Official No.:	11111	IMO	1234567
Gas Carrier Type	LPG/NH3 Type 2 G		
Keel Laid Date	23-Jun-98		
Delivery Date	31-Mar-99		
Owners	Gas Carriers INC	LGCNCOE@uscg.mil	
Operators	Gas Carriers INC	LGCNCOE@uscg.mil	
Class	The Classification Society		

International Gross Tonnage	23,952
International Net Tonnage	7,799

LOA	179 m	Light Ship	4,495 mt
LBP	172 m	Draft Summer	11.13 m
Breadth	27.4 m	Displacement	13,800 mt
Depth Moulded	18.2 m		

Cargo Tanks

		Cargo Tank Capacity	
Minimum Temp	-50°C		
Max Pressure	0.25 (Sea)	Tank No. 1	11,528 m^3
	0.45 (Harbor)	Tank No. 2	15,536 m^3
Minimum Pressure	-0.05 barg	Tank No. 3	11,638 m^3
Max Cargo Density	970 kg/m^3 partial	**Total**	**38,702 m^3**
	700 kg/m^3 98%		
Max Permitted Filling Level	98% by volume		

Deck Tanks (Type C)

		Volume @ 100%/20 ° C	
Minimum Temperature	-50°C		
Max Pressure	18 barg	Tank No. 1	293 m^3
Max Cargo Density	700 kg/m^3	Tank No. 2	146 m^3
Max Permitted Filling Level	98% by voume	**Total**	**439 m^3**

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International Certificate of
Fitness for the Carriage of Liquefied Gases in Bulk

Issued under the provisions of the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IMO Resolution A.328(IX))

The Flag Administration

By The classification society

Particulars of the ship

Name of the ship:	GELU LIQUIDUS
Distinctive number or letters:	LGCNCOE
Port of Registry:	Easton, MD USA
Cargo Capacity (m^3):	38,702 m^3
Ship Type (Code paragraph 2.1.2)[1]:	2G
IMO Number:	1234567
Date on which the Keel was laid or on which the ship was at a similar stage of construction (in case of a converted ship) date on which Conversion to a gas carrier was commenced	23JUN1998

The ship also complies fully with the following amendments to the Code:
All applicable Amendments

The ship is exempted from compliance with the following provisions of the Code:
Not applicable

THIS IS TO CERTIFIY:

1 .1 That the ship has been surveyed in accordance with the provisions of section 1.5 of the Code;
.2 That the survey showed that the structure, equipment, fittings, arrangements and materials of the ship and the conditions thereof are in all respects satisfactory and the ship complies with the relevant provisions of the Code.

2 That the following design criteria have been used:

.1 Ambient air temperature: 5°C [2]

.2 Ambient water temperature: 0°C [2]

.3

Tank number and Type	Stress Factors[3]				Materials[3]	MARVS
	A	B	C	D		
Independent Tanks Type "A" Tanks 1-3					Cargo tank design complies With paragraph 4.5.1.3 of the Code.	0.25 barg (Sea) 0.45 barg (Harbor)
Independent Type "C" Deck Tank (100m^3)	3	2			KL 33-55-T-3SR	18 barg
Independent Type C Deck Tank (325m^3)	3	2			KL 33-55-T-3SR	18 barg
Cargo Piping	2.7	1.8			Austenitic Steel Type 316L	10 barg 25 barg* (*Downstream of booster pump)

N.B.: Tank numbers referred to in this list are identified on attachment 2, signed and dated tank plan.

.4 Mechanical properties of the cargo tank material were determined at -50°C[4]

3

PRODUCTS	Conditions of Carriage (tank numbers, minimum temp, maximum pressure, tank loading conditions
Ammonia, Anhydrous Butadiene[1] Butane Dimethylamine Ethyl Chloride Isoprene[1,2] Pentanes[2] (all isomers) Propane Vinyl Chloride	**Independent Type "A" Cargo Tanks 1-3** Minimum Temperature: -50°C Maximum Specific Gravity: 0.69 Maximum pressure: 0.25 barg (sea) 0.45 barg (harbor) Partial loading vinyl chloride or ethyl chloride with max specific gravity 0.97
Ammonia, Anhydrous Butadiene[1] Butane Dimethylamine Ethyl Chloride Propane Propylene Vinyl Chloride	**Independent Type "C" Deck Tank (100m^3)** Minimum Temperature: -50°C Maximum specific gravity: 0.567 (98%) Maximum pressure: 18 barg Partial loading of not less than 31% is permitted
Ammonia, Anhydrous Butadiene[1] Butane Dimethylamine Ethyl Chloride Propane Propylene Vinyl Chloride	**Independent Type "C" Deck Tank (325m^3)** Minimum Temperature: -50°C Maximum specific gravity: 0.447 (98%) Maximum pressure: 18 barg Partial loading of not less than 39% is permitted

[1] Products shall be carried inhibited only
[2] Formal carriage permission must (in relation to maritime pollution) be given in the vessel's NLS certificate

4 That in accordance with sections 1.4/2.8.2* the provisions of the Code are modified in respect of the ship in the following manner:
Not applicable

5 That the ship must be loaded:
*.1 in accordance with the loading conditions provided in the appropriate loading Manual, stamped and dated 01MAR11 and signed by a responsible officer of the Administration, or of an organization recognized by the Administration;

*.2 ~~in accordance with the loading limitations appended to this Certificate.~~

Where it is required to load the ship other than in accordance with the above instruction, then the necessary calculations to justify the proposed loading conditions should be communicated to the certifying Administration who may authorize in writing the adoption of the proposed loading condition.**

This certificate is valid until 30JUN2018 subject to the surveys in accordance with 1.5 of the Code. “Completion date of the survey on which this certificate is based: 15JUN2013

Issued at Dallas, MD on 01JUL2013

The undersigned declares that he/she is duly authorized by the said government to issue this certificate.

Signing Authority

Notes on completion of Certificate:

1. Ship type: Any entry under this column must be related to all relevant recommendations, e.g. an entry “type 2G” should mean type 2G in all respects prescribed to the Code.

2. Paragraphs 2.1 and 2.2: The ambient temperatures accepted or required by the Administration for the purposes of 4.8.1 of the Code to be inserted.

3. Paragraph 2.3: Stress factors and materials as accepted or required by the Administration for the purposes of 4.5.1.4 and 4.5.1.6 of the Code to be inserted.

4. Paragraph 2.4: Temperature accepted by the Administration for the purposes of 4.5.1.7 to be inserted.

5. Paragraph 3: Only products listed in chapter 19 of the Code or which have been evaluated by the Administration in accordance with paragraph 1.1.6 of the Code, or their compatible mixtures having physical proportions within the limitations of tank design, should be listed. In respect of the latter “new” products, any special requirements provisionally prescribed should be noted.

Endorsement for annual and intermediate surveys

THIS IS TO CERTIFY that at a mandatory annual survey required by 1.5.2.1.4 of the International Code of the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk, the ship was found to comply with the relevant provisions of the Code.

1st annual survey: Place: Cuskerville, TX Date:01SEP2014

Signature:___Complete_____

2nd annual survey: Place: Gandolfo Island, VA Date:01AUG2015

Signature:___Complete_____

3rd annual/intermediate* survey: Place: Date:

Signature:_____

4th annual survey: Place: Date:

Signature:_____

Note: An intermediate survey may take the place of a mandatory annual survey where the relevant provisions of 1.5.2.1.3 and 1.5.2.1.4 are complied with.

Endorsements for intermediate surveys

THIS IS TO CERTIFY that at a mandatory annual survey required by 1.5.6.8.3 of the International Code of the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk, the ship was found to comply with the relevant provisions of the Code.

Place: Date:

Signature:_____

Place: Date:

Signature:_____

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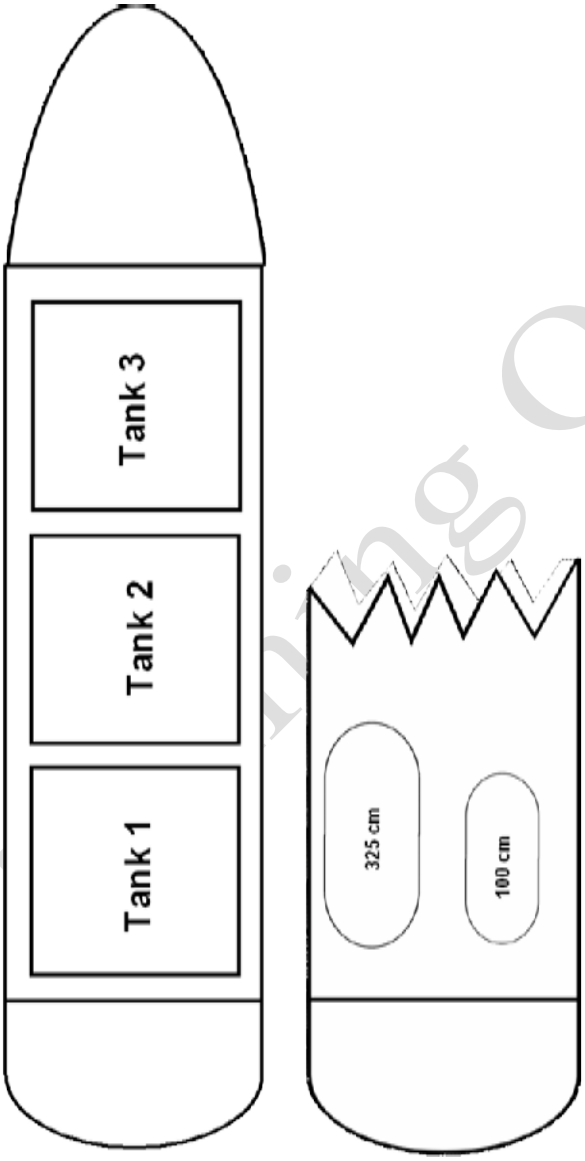
* delete as appropriate

Tank Plan



CERTIFICATE OF COMPLIANCE ENDORSEMENT
(SUBCHAPTER O ENDORSEMENT)
for

GELU LIQUIDUS, O.N. 1234567

1. VALIDITY

This Subchapter O Endorsement is valid only when attached to the vessel's valid Certificate of Compliance and only when accompanied by a valid IMO International Gas Code (Resolution MSC.5(48)) Certificate of Fitness.

2. CERTIFICATION

a. The subject vessel's current IMO International Gas Code (Resolution MSC.5(48)) Certificate of Fitness is the basis for this Subchapter O Endorsement. A valid copy of the certificate is required on board the vessel at all times to maintain the validity of the Certificate of Compliance and Subchapter O Endorsement. If the certificate has been updated, a copy of the updated certificate shall be presented to the cognizant Coast Guard Officer in Charge, Marine Inspection (OCMI) at the vessel's next U.S. port of call.

b. The requirements to notify the Marine Safety Center are detailed in paragraph 8 below. If any changes to the cargo containment system, list of authorized cargoes on the IMO Certificate of Fitness, or deficiencies exist with the cargo containment system, notify the Marine Safety Center immediately at the postal address, e-mail address, or fax below:

Commanding Officer (MSC-3)
U.S. Coast Guard Marine Safety Center
2703 Martin Luther King Jr Ave SE
Washington, D.C. 20593-7430
Or
E-mail to: msc@uscg.mil

c. Only the cargoes listed in the paragraph 4 below entitled "Cargoes Authorized" may be carried in U.S. waters. Adjustment to this list may be made only by forwarding an updated IMO Certificate of Fitness that reflects the desired cargoes to the Marine Safety Center.

d. Evidence must be available on board the vessel that the periodic surveys required by section 1.5.2 of the International Gas Code have been completed.

3. CARGO CONTAINMENT SYSTEM

The cargo containment system is acceptable subject to the following restrictions:

a. Maximum allowable relief valve settings (MARVS):

Main Tanks: #1-3, Independent Type A:
0.25 bar gauge (25 kPa gauge, 3.63 psig) at sea
0.45 bar gauge (45 kPa gauge, 6.53 psig) in harbor

Deck Tanks: Independent Type C: 18 bar gauge (1800 kPa gauge, 261 psig)

b. Minimum temperature: -50 ºC (-58 ºF)

c. Certification from the classification society must be onboard the vessel attesting to the set pressure of the cargo tank relief valves and the date verified.

4. CARGOES AUTHORIZED

Unless specifically prohibited by a paragraph of this endorsement entitled "Special Restrictions," the cargoes listed below are authorized for carriage in U.S. waters. These cargoes must be carried in accordance with any additional restrictions contained in this Endorsement.

a. Ammonia, anhydrous
b. Butadiene
c. Butane
d. Butylenes
e. Dimethylamine
f. Ethyl chloride
g. Isoprene
h. Pentanes (all isomers)
i. Propane
j. Vinyl chloride

5. CARGOES NOT LISTED

Cargoes for which a Subchapter O Endorsement is required are indicated in Table 1 of 46 CFR 153 and in Table 4 of 46 CFR 154. Cargoes for which a Subchapter O Endorsement is not required are listed in Table 2 of 46 CFR 153. Cargoes not authorized by this Subchapter O Endorsement nor listed in Table 2 of 46 CFR 153 must be specifically authorized by the Marine Safety Center (MSC-3) before carriage is permitted in U.S. waters.

6. GENERAL CARRIAGE REQUIREMENTS

The carriage of all cargoes listed in the vessel's IMO Certificate shall be in accordance with the requirements of the International Gas Code, Resolution MSC.5(48) as amended, the Certificate of Fitness, and all Coast Guard requirements.

7. CARGO COMPATIBILITY

Incompatible cargoes shall be stowed in accordance with paragraph 18.2 of the International Gas Code. Title 46, Code of Federal Regulations, Part 150, Subpart A-Compatibility of Cargoes, shall be consulted to determine cargo compatibility.

8. REPORTS TO THE MARINE SAFETY CENTER (MSC-3)

a. Any alterations, damage, or system failure of the cargo containment system of the vessel must be promptly reported to the Marine Safety Center (MSC-3) prior to the next U.S. port of call. A report describing any damages or system failures must also specify any corrective action taken. Examples of reportable occurrences include, but are not limited to, involvement in a significant marine casualty that affects the vessel’s hull or cargo containment system, cargo piping, tank damage or leaks, failure of fire protection equipment, failure of leak detection equipment, failure

of the nitrogen inerting system including cargo inter-barrier nitrogen pressure regulators, failure of cargo handling equipment, and/or failure of the main propulsion equipment for LNG carriers.

b. Remit an updated IMO Certificate of Fitness to make any changes to the list of cargoes reflected in paragraph 4 above titled "Cargoes Authorized." The vessel must obtain an updated Subchapter O Endorsement from the Marine Safety Center prior to carriage of any new cargoes.

9. SUBCHAPTER O ENDORSEMENT INVALIDATION

The Subchapter O Endorsement (SOE) will become invalid under the following conditions:

a. The subject vessel's IMO Certificate of Fitness is invalidated as a result of a marine casualty affecting the vessel's cargo containment system; or

b. The subject vessel cannot show proof of a valid IMO Certificate of Fitness prior to calling or returning to a U.S. port; or

c. A Coast Guard representative considers the vessel unsuitable for carriage of the authorized cargoes and invalidates the SOE and/or the Certificate of Compliance (COC). Examples of unsuitable conditions include, but are not limited to involvement in a significant marine casualty that affects the vessel's hull or cargo containment system, cargo piping, tank damage or leaks, failure of fire protection equipment, failure of leak detection equipment, failure of the nitrogen inerting system including cargo inter-barrier nitrogen pressure regulators, and failure of cargo handling equipment.

10. REISSUANCE OF SOE AND COC

Upon normal expiration of the Certificate of Compliance, contact the Officer in Charge Marine Inspection (OCMI) at the nearest U.S. Coast Guard Marine Inspection or Marine Safety Office to arrange for a vessel examination. To avoid any vessel delays when an examination is required, at least seven days advance notice must be provided to the OCMI. If the SOE becomes invalid due to the conditions in paragraph 9.a or 9.b above, contact the Marine Safety Center (MSC-3) well in advance of any planned port arrival. If the conditions in paragraph 9.c apply, contact the Marine Safety Center (MSC-3) otherwise the OCMI has the authority to invalidate the Certificate of Compliance.

11. CERTIFICATION OF INHIBITION

For those cargoes stabilized to prevent decomposition or inhibited against self-reaction, the certification required by paragraph 17.8 of the International Gas Code must be available for presentation to Coast Guard personnel prior to loading.

12. SPECIAL RESTRICTIONS

The person in charge of the transfer of vinyl chloride shall ensure that:

(1) 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 an accuracy (with a confidence level of 95 percent) of not less than ± 50 % from 0.25 through 0.5 ppm, ± 35% from over 0.5 ppm through 1.0 ppm, and ± 25% over 1.0 ppm;

(2) 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;

(3) 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;

(4) 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 on the required closed gauge, nor as a means of sampling;

(5) The words “CANCER-SUSPECT AGENT'” are added to the warning signs required by 46 CFR 154.1830, and signs bearing the legend: “CANCER-SUSPECT AGENT IN THIS AREA, PROTECTIVE EQUIPMENT REQUIRED, AUTHORIZED PERSONNEL ONLY” are posted whenever hazardous operations, such as tank cleaning, are in progress;

(6) 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;

(7) 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.

Issuing Officer

30 SEP 2016
Issue Date

30 SEP 2018
Expiration Date

To the Captain of **GELU LIQUIDUS**

GMT:

Location: EASTON, MD

INHIBITED CARGO CERTIFICATE Nr.

Ship	GELU LIQUIDUS
Cargo tanks nos.	1,2,3
Prior to the loading, the tanks contained: and were therefore in good condition for the mentioned cargo	Butadiene 1,3 vapours
Product loaded	Butadiene 1,3
Date of loading	01MAR16
Name of Inhibitor	TERTIAIR BUTYL CATECHOL(T.B.C.)
Date on which the inhibitor was added	02MAR16
Concentration of inhibitor in cargo	**99 ppm**
Duration of the voyage	< 1 month
Inhibitor Oxygen dependent	Not oxygen dependent
Temperature limitation qualifying the inhibitor's effective lifetime	Never to exceed 30°C
Action to be taken if the duration of the voyage exceeds the expected life of the inhibitor	**ADD INHIBITOR IF INHIBITOR CONTENT IS BELOW SPECIFICATION**

This certificate is based on received certificates of delivering units.

Signed by **Master / Chief Officer for receipt**	
Signature: Master (+stamp)	Signature: Surveyor
Name: Master	Name/Stamp of surveyor: Surveyor
Date: 02 MAR 16	Date: 02 MAR 16

In accordance with IMO/ IBC Code resolution MSC.4(48) / IGC Code resolution MSC.5(48) / edition 1993

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INTERNATIONAL POLLUTION PREVENTION CERTIFICATE
FOR THE CARRIAGE OF NOXIOUS LIQUID SUBSTANCES IN BULK

Issued under the provisions of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto, and as amended (hereinafter referred to as "the Convention") under the authority of the Government of:

The Flag Administration

(full designation of the country)

By **The classification society**

(full designation of the competent person or organization authorized under the provisions of the Convention)

Particulars of ship

Name of ship	GELU LIQUIDUS
Distinctive number or letter	LGC NCOE
IMO Number	1234567
Port of registry	Easton, MD USA
Gross tonnage	23,952

THIS IS TO CERTIFY:

1 That the ship has been surveyed in accordance with regulation 8 of Annex II of the Convention

2 That the survey showed that the structure, equipment, systems, fitting, arrangements and material of the ship and the condition thereof are in all respects satisfactory and that the ship complies with the applicable requirements of Annex II of the Convention.

3 That the ship has been provided with a Procedures and Arrangements Manual as required by regulation 14 of Annex II of the Convention, and that the arrangements and equipment of the ship prescribed in the Manual are in all respects satisfactory.

4 That the ship complies with the requirements of Annex II to MARPOL for the carriage in bulk of the following noxious liquid substances, provided that all relevant provisions of Annex II are observed.

Noxious Liquid Substance	Conditions of Carriage (tank numbers etc.)	Pollution category
Isoprene	Carriage in tank 1,2 & 3	Y
Pentanes (all isomers)	Carriage in tank 1,2 & 3	Y

This certificate is valid until: 31MAR2019
subject to surverys in accordance with regulation 8 of Annex II of the Convention.

Completion date of the survey on which this certificate is based:

Issued at: Port Arthur, TX

Date of Issue: 01APR2014

Signing Authority

(authorized official issuing the certificate)

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CERTIFICATE ISSUED UNDER THE PROVISIONS OF THE INTERNATIONAL CONVENTION ON STANDARDS OF TRAINING, CERTIFICATION AND WATCHKEEPING FOR SEAFARERS, 1978, AS AMENDED

The Government of FOREIGN COUNTRY certifies that THE MASTER has been found duly qualified in accordance with the provisions of regulation II/2 of the above Convention, as amended, and has been found competent to perform the following functions, at the levels specified, subject to any limitations indicated until 01 Jan 21 or until the date of expiry of any extension of the validity of this certificate as may be shown overleaf:

FUNCTION	LEVEL	LIMITATIONS APPLYING (IF ANY)
Navigation	Management	None
Cargo handling and stowage	Management	Not valid for service on oil tankers

The lawful holder this certificate may serve in the following capacity or capacities specified in the applicable safe manning requirements of the Administrations:

CAPACITY	LIMITATIONS APPLYING (IF ANY)
>3000 gt	Must wear corrective lenses

Certificate No. 123456 issued on 01Jan16

(*Official Seal)*

…….
Signature of duly authorized official

……..
Name of duly authorized official

The original of this certificate must be kept available in accordance with regulation 1/2, paragraph 11, of the convention while its holder is serving on a ship.

Date of birth of the holder of the certificate 01Jan52

Signature of the holder of the certificate …….

Photograph of the holder of the certificate

CERTIFICATE ISSUED UNDER THE PROVISIONS OF THE INTERNATIONAL CONVENTION ON STANDARDS OF TRAINING, CERTIFICATION AND WATCHKEEPING FOR SEAFARERS, 1978, AS AMENDED

The Government of FOREIGN COUNTRY certifies that THE CHIEF ENGINEER has been found duly qualified in accordance with the provisions of regulation III/2 of the above Convention, as amended, and has been found competent to perform the following functions, at the levels specified, subject to any limitations indicated until 01 Jan 20 or until the date of expiry of any extension of the validity of this certificate as may be shown overleaf:

FUNCTION	LEVEL	LIMITATIONS APPLYING (IF ANY)
Marine Engineering	Management	Not valid on ship which use steam boilers

The lawful holder this certificate may serve in the following capacity or capacities specified in the applicable safe manning requirements of the Administrations:

CAPACITY	LIMITATIONS APPLYING (IF ANY)
>3000 kw	None

Certificate No. 123456 issued on 01Jan15

(*Official Seal)*

…….
Signature of duly authorized official

……..
Name of duly authorized official

The original of this certificate must be kept available in accordance with regulation 1/2, paragraph 11, of the convention while its holder is serving on a ship.

Date of birth of the holder of the certificate 01Jan75

Signature of the holder of the certificate …….

Photograph of the holder of the certificate

CERTIFICATE ISSUED UNDER THE PROVISIONS OF THE INTERNATIONAL CONVENTION ON STANDARDS OF TRAINING, CERTIFICATION AND WATCHKEEPING FOR SEAFARERS, 1978, AS AMENDED

The Government of FOREIGN COUNTRY certifies that THE CHIEF MATE has been found duly qualified in accordance with the provisions of regulation II/2 of the above Convention, as amended, and has been found competent to perform the following functions, at the levels specified, subject to any limitations indicated until 01 Jan 19 or until the date of expiry of any extension of the validity of this certificate as may be shown overleaf:

FUNCTION	LEVEL	LIMITATIONS APPLYING (IF ANY)
Navigation	Management	None
Cargo handling and stowage	Management	Not valid for service on oil tankers

The lawful holder this certificate may serve in the following capacity or capacities specified in the applicable safe manning requirements of the Administrations:

CAPACITY	LIMITATIONS APPLYING (IF ANY)
>3000 gt	None

Certificate No. 123456 issued on 01Jan14

(*Official Seal)*

…….
Signature of duly authorized official

……..
Name of duly authorized official

The original of this certificate must be kept available in accordance with regulation 1/2, paragraph 11, of the convention while its holder is serving on a ship.

Date of birth of the holder of the certificate 01Jan71

Signature of the holder of the certificate …….

Photograph of the holder of the certificate

CERTIFICATE ISSUED UNDER THE PROVISIONS OF THE INTERNATIONAL CONVENTION ON STANDARDS OF TRAINING, CERTIFICATION AND WATCHKEEPING FOR SEAFARERS, 1978, AS AMENDED

The Government of FOREIGN COUNTRY certifies that THE SECOND ENGINEER has been found duly qualified in accordance with the provisions of regulation III/2 of the above Convention, as amended, and has been found competent to perform the following functions, at the levels specified, subject to any limitations indicated until 01 Jan 20 or until the date of expiry of any extension of the validity of this certificate as may be shown overleaf:

FUNCTION	LEVEL	LIMITATIONS APPLYING (IF ANY)
Marine Engineering	Management	Not valid on ship which use steam boilers

The lawful holder this certificate may serve in the following capacity or capacities specified in the applicable safe manning requirements of the Administrations:

CAPACITY	LIMITATIONS APPLYING (IF ANY)
>3000 kw	None

Certificate No. 123456 issued on 01Jan15

(*Official Seal)*

…….
Signature of duly authorized official

……..
Name of duly authorized official

The original of this certificate must be kept available in accordance with regulation 1/2, paragraph 11, of the convention while its holder is serving on a ship.

Date of birth of the holder of the certificate 01Jan80

Signature of the holder of the certificate …….

Photograph of the holder of the certificate

CERTIFICATE ISSUED UNDER THE PROVISIONS OF THE INTERNATIONAL CONVENTION ON STANDARDS OF TRAINING, CERTIFICATION AND WATCHKEEPING FOR SEAFARERS, 1978, AS AMENDED

The Government of FOREIGN COUNTRY certifies that THE SECOND MATE has been found duly qualified in accordance with the provisions of regulation II/1 of the above Convention, as amended, and has been found competent to perform the following functions, at the levels specified, subject to any limitations indicated until 01 Jan 20 or until the date of expiry of any extension of the validity of this certificate as may be shown overleaf:

FUNCTION	LEVEL	LIMITATIONS APPLYING (IF ANY)
Navigation	Operational	None
Cargo handling and stowage	Operational	Not valid for service on tankers other than gas tankers

The lawful holder this certificate may serve in the following capacity or capacities specified in the applicable safe manning requirements of the Administrations:

CAPACITY	LIMITATIONS APPLYING (IF ANY)
>3000 gt	None

Certificate No. 123456 issued on 01Jan15

(*Official Seal)*

…….
Signature of duly authorized official

……..
Name of duly authorized official

The original of this certificate must be kept available in accordance with regulation 1/2, paragraph 11, of the convention while its holder is serving on a ship.

Date of birth of the holder of the certificate 01Jan79

Signature of the holder of the certificate …….

Photograph of the holder of the certificate

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STCW TRAINING Co.

presents

Certificate of Training

to

Master

for

Advanced training for liquefied gas tanker cargo operations (STCW V/1-2.4)

Master Trainer *September 14, 2016*

STCW TRAINING Co.

presents

Certificate of Training

to

Chief Engineer

for

Basic training for liquefied gas tanker cargo operations (STCW V/1-2.2)

Master Trainer *September 14, 2016*

STCW TRAINING Co.

presents

Certificate of Training

to

Chief Mate

for

Advanced training for liquefied gas tanker cargo operations (STCW V/1-2.4)

Master Trainer *September 14, 2016*

STCW TRAINING Co.

presents

Certificate of Training

to

2nd Mate

for

Basic training for liquefied gas tanker cargo operations (STCW V/1-2.2)

Master Trainer *September 14, 2016*

Instrumentation Exam

Fixed Gas Detection System

Liquefied Gas Carriers are required to have gas detection equipment in accordance with Reg 13.6 of the IGC (1993 edition) & GC codes. The gas detection equipment monitors the atmosphere of certain locations at intervals not to exceed 30 minutes.

The most common types of gas detection equipment for vessels that carry liquefied gas cargoes are "sampling" systems. The system draws a sample of air from a particular location & then transports it back to the analyzing unit. If the analyzing unit indicates that gas levels have reached 30% of the LFL, an alarm activates. Alarms are located on the navigation bridge, cargo control position & the gas detector readout location.

Please see Chapter 5, Section A of your FGCE TTP for details of examining a fixed gas detection system.

Portable Gas Detection Equipment

Liquefied Gas Carriers are required to have onboard certain portable gas detection equipment in accordance with Reg 13.6 of the IGC (1993 edition) & GC codes that are suitable for the products carried.

One portable oxygen (O_2) meter and at least two sets of portable gas detection equipment. There are two types of combustible gas detectors that detect hydrocarbons: infrared and catalytic.

Please see Chapter 5, Section B of your FGCE TTP for details of examining devices.

Temperature Indicating Devices

Liquefied Gas Carriers are required to have temperature indicating devices in accordance with Reg 13.5 of the IGC (1993 edition) & GC codes to allow shipboard personnel the ability to monitor the temperature of the cargo tanks. The temperature indicating devices are used primarily during cool down and loading operations.

Please see Chapter 5, Section C of your FGCE TTP for details of examining temperature indicating devices.

Pressure Monitoring Devices

Liquefied Gas Carriers are required to have devices that monitor the pressure of the cargo system in accordance with Reg 13.4 of the IGC (1993 edition) & GC codes.

Pressure Monitoring Devices are located within cargo tanks, pump and compressor discharge lines, liquid & vapor crossovers. Pressure switches are also fitted to various systems to protect equipment by utilizing alarms and shutdowns.

Please see Chapter 5, Section D of your FGCE TTP for details of examining pressure monitoring devices.

Overflow Control System

Liquefied Gas Carriers are required to have an overflow control system in accordance with Reg 13.3 of the IGC (1993 edition) & GC codes. The overflow control system is designed to provide a warning to shipboard personnel prior to the cargo tanks becoming full and to initiate a shutdown if subsequent action is not taken.

Please see Chapter 5, Section E of your FGCE TTP for details of examining an overflow control system.

Exercise 3.3: Instrumentation Exam

Scenario

You are onboard the LPGC GELU LIQUIDUS during a renewal Certificate of Compliance (COC) exam. You and the rest of the examination team are conducting the Instrumentation Exam portion of the examination.

At the completion of the Instrumentation Exam, the examination team will provide a brief on the team's findings.

Question 1

As an examination team, given applicable cargo information, determine if sampling points should be located in the upper or lower portion of a space when the carriage of the following cargoes is authorized:

- Ammonia Upper / Lower Relative Density: _____
- Propane Upper / Lower Relative Density: _____
- Butadiene Upper / Lower Relative Density: _____

Question 2

As an examination team, examine the temperature indicating devices on the following cargo tanks. Identify and document all discrepancies.

Cargo Tank 1 - Butadiene		**Cargo Tank 2 - Propane**	
Vapor	2.0°C	Vapor	-22.6°C
Top	-4.1°C	Top	-41.2°C
75%	-4.8°C	75%	-42.0°C
50%	-5.0°C	50%	-42.0°C
Bottom	-5.0°C	Bottom	-38.1°C

Question 3

As an examination team, you are preparing to witness a test of the high pressure alarm. The Chief Mate informs you that in order to conduct the test, he must add pressure to the gauge with a small pressure pump. This increases the pressure at the gauge, activating the high pressure alarm.

Is this a common method for conducting this test? Yes / No

What is another common method on gas carriers for testing the high pressure alarm?

Question 4

As an examination team, during a test of the overflow control system you notice that the high level alarm provides only an audible warning. Is this acceptable?

Yes / No

Why? [Include the appropriate 1993 IGC Code cite in your answer.]

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Health and Safety Equipment Exam

Decontamination Showers & Eye Wash Stations

Decontamination Showers and Eye Wash Stations are required on LPG carriers in accordance with the IGC code (1993 edition). This requirement is dependent on specific cargoes that the vessel is authorized to carry.

When 14.4.3 is listed in column "*i*" (special requirements) of the table in Chapter 19 for a cargo that is authorized for carriage, then the ship must be fitted with Decontamination Showers and Eye Wash Stations.

Please see Chapter 6, Section A of your FGCE TTP for details of examining decontamination showers & eye wash stations.

Respiratory & Eye Protection for Emergency Escape

Respiratory and Eye Protection for emergency escape purposes are required on LPG carriers in accordance with the IGC code (1993 edition). This requirement, like the requirement to have Decontamination Showers and Eye Wash Stations, is also dependent on specific cargoes that the vessel is authorized to carry.

When 14.4.2 is listed in column "*i*" (special requirements) of the table in Chapter 19 for a cargo that is authorized for carriage, then the ship must carry Respiratory and Eye Protection to be used for emergency escape purposes.

Please see Chapter 6, Section B of your FGCE TTP for details of examining respiratory & eye protection for emergency escape purposes.

Personnel Safety Equipment

Liquefied Gas Carriers shall have onboard sufficient Personnel Safety Equipment to protect personnel from hazards in accordance with Chapter 14 of the IGC (1993 edition) & GC codes.

Please see Chapter 6, Section C of your FGCE TTP for details of examining personnel safety equipment.

First Aid Equipment

Liquefied Gas Carriers will be outfitted with additional First Aid Equipment in accordance with Chapter 14 of the IGC (1993 edition) & GC codes, and the Medical First Aid Guide for Use in Accidents Involving Dangerous Goods (MFAG).

Please see Chapter 6, Section D of your FGCE TTP for details of examining first aid equipment.

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Exercise 3.4: Health & Safety Equipment Exam

Scenario

You are onboard the LPGC GELU LIQUIDUS during a renewal Certificate of Compliance (COC) examination. You and the rest of the examination team are conducting the Health & Safety Equipment Exam portion of the examination.

At the completion of the Health & Safety Equipment Exam, the examination team will provide a brief on the team's findings.

Question 1

As an examination team, you are conducting an examination of the Decontamination Showers and Eye Wash Stations within the cargo area. You have ensured that they are suitably marked and that they are located in convenient locations.

What else should be verified during the examination of the Decontamination Showers and Eye Wash Stations?

How do you determine if Decontamination Showers and Eye Wash Stations are required on the vessel that you are examining? [Include the appropriate 1993 IGC Code cite in your answer.]

Question 2

As an examination team, you have determined that the vessel that you are examining is required to have Respiratory & Eye Protection for Emergency Escape purposes. You have verified that each person onboard has been provided with the required equipment. While spot checking equipment, you notice that each set is new and unmarked.

Is there a problem with the Respiratory & Eye Protection for Emergency Escape purposes that has been issued to each crew?

Should there be additional Respiratory & Eye Protection for Emergency Escape purposes located anywhere else on the ship?

Question 3

As an examination team leader, while conducting an examination of the Personnel Safety Equipment, you were asked the following questions from a member of the exam team. To assist your team member with conducting the exam, please provide them with the correct answers.

1. The Personnel Safety Equipment consists of what equipment?

2. How often does the compressed air for safety equipment need to be inspected by an "expert"?

3. In addition to the required amount of firemen's outfits, how many sets of Personnel Safety Equipment are required to be onboard?

Question 4

As an examination team, you are conducting an examination of the First Aid Equipment. You ask the Chief Mate to present the stretcher, suitable for hoisting, for examination.

Two crewmembers present you with a stretcher that has four, two foot long pieces of rope, attached to the stretcher with bowlines.

Is this stretcher, as currently outfitted, suitable for hoisting an injured person vertically from a space below deck?

Why or why not?

Cargo System Exam

Emergency Shutdown System (ESD)

At remote locations onboard the ship, pneumatic valves or electric push buttons are provided to activate the emergency shutdown system that is required by IGC code (1993 edition) Reg 5.6.4 and GC code Reg 5.3.4.

When activated, remotely activated valves will close and cargo pumps and compressors will shut down.

In addition, fusible elements are located at tank domes and cargo manifolds that will activate the emergency shutdown system in the event of a fire.

Please see Chapter 8, Section A of your FGCE TTP for details of examining an emergency shutdown system.

Cargo Tank Pressure Relief Valves

Cargo tanks shall be provided with a pressure relief system appropriate for the design of the cargo containment system in accordance with Reg 8.2 of the IGC (1993 edition) & GC codes.

Please see Chapter 8, Section B of your FGCE TTP for details of examining cargo tank pressure relief valves.

Cargo Piping

Cargo piping includes all product piping, vapor piping and cargo tank vent lines and must comply with the requirements contained in Reg 5.2 of the IGC (1993 edition) & GC codes.

These pipes will have offsets, loops, bends and mechanical expansion joints to protect against the stresses of thermal expansion and from the movement of the ship.

Please see Chapter 8, Section C of your FGCE TTP for details of examining cargo piping.

Cargo System Shutoff Valves

Cargo system shutoff valves are provided on cargo tanks and cargo piping in accordance with IGC code (1993 edition) Reg 5.6 and GC code Reg 5.3.

These valves are ball, globe, gate or butterfly valves and are usually fitted with pneumatic or hydraulic actuators.

Please see Chapter 8, Section D of your FGCE TTP for details of examining cargo system shutoff valves.

Cargo Machinery Room Equipment

The cargo machinery room onboard a Liquefied Gas Carrier is a gas dangerous space located in the cargo area and houses equipment such as cargo compressors, cargo condensers and cargo vaporizers.

The cargo compressors are usually powered by a motor located in an adjacent gas safe space with a shaft passing through the bulkhead by way of a gas tight seal.

When conducting your exam of the cargo machinery room, equipment may or may not be in operation. The primary purpose of this exam is not to test equipment, but to view its overall condition.

Please see Chapter 8, Section E of your FGCE TTP for details of examining cargo machinery room equipment.

Exercise 3.5: Cargo System Exam

Scenario

You are onboard the LPGC GELU LIQUIDUS during a renewal Certificate of Compliance (COC) examination. You and the rest of the examination team are conducting the Cargo System Exam portion of the examination.

At the completion of the Cargo System Exam, the examination team will provide a brief on the team's findings.

Question 1

As an examination team, while witnessing a test of the Emergency Shutdown System (ESD), you measured the time of closure of the liquid piping shut down valves, from the time the system was activated to full closure, as 36 seconds.

The Chief Mate informs you that the shut down system on this vessel is designed with a 10 second delay from the time the system is activated until the time that the valves begin to close, so the actual closure time of the ESD valves is 26 seconds.

Is this system currently in compliance with the code?

Why or why not? [Include the appropriate 1993 IGC Code cite in your answer.]

Question 2

As an examination team, while conducting an examination of the cargo tank relief valves, you notice that one of the relief valves on the Cargo Tank No. 2 is not sealed.

You remember that during the Documents, Publications & Manuals portion of the exam, you viewed documentation attesting to the proper setting of all cargo tank relief valves. Each cargo tank relief valve was identified by serial number, including the relief valve on the Cargo Tank No. 2, which is missing the seal.

What possible action would the examination team take for this situation? [Include the appropriate 1993 IGC Code cite in your answer.]

Exercise 3.5: Cargo System Exam

Question 3

Which of the following incidents/situations discovered during a Cargo System Exam would be grounds for denial of entry to port, expulsion from port or detention IAW MSM Volume II?

If a major control action is not warranted, is the incident/situation deficient?

1. A manually operated stop valve on a liquid line for a Type C independent tank is missing.

2. The relief valve pressure for a pressure relief valve capable of being changed <u>is not</u> displayed.

3. The fusible elements for an emergency shutdown system are painted over.

4. An ESD quick closing shut off valve takes 38 seconds to fully shut when activated.

Cargo Environmental Control Systems Exam

Inert Gas System (IGS)

Unlike a crude oil or product carrier, the cargo tanks on a Liquefied Gas Carrier always contain flammable or toxic vapors when in operation. Inert Gas Systems (IGS) are installed on Liquefied Gas Carriers and are utilized during the gas freeing process. Inert Gas Systems installed onboard Liquefied Gas Carriers are required to comply with Reg 9.5 of the IGC (1993 edition) & GC codes.

Please see Chapter 9, Section A of your FGCE TTP for details of examining an inert gas system.

Nitrogen (N2) Generating System

Most Liquefied Gas Carriers are provided with the capability to generate nitrogen onboard. Since nitrogen is an inert gas, the requirements for a Nitrogen Generator are the same as the Inert Gas System (IGS) and must be in accordance with Reg 9.5 of the IGC (1993 edition) & GC codes.

Please see Chapter 9, Section B of your FGCE TTP for details of examining a nitrogen gas generating system.

Nitrogen (N2) Storage Tanks

In the event that a Liquefied Gas Carrier does not have the capability to generate nitrogen, they will have the capability to store liquid nitrogen onboard. The storage requirements are contained in Chapter 9 of the IGC (1993 edition) & GC codes.

Please see Chapter 9, Section C of your FGCE TTP for details of examining nitrogen storage tanks.

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Lifesaving Equipment Exam

Additional Lifeboat Requirements

Lifeboats utilized onboard Tankers, including Liquefied Gas Carriers, are required to be outfitted with equipment in addition to what is required of lifeboats on other types of ships. This equipment is needed for the protection of personnel, due to the flammability and toxicity characteristics of the cargoes that may be authorized for carriage.

Lifeboats utilized onboard liquefied gas carriers shall be outfitted in accordance with SOLAS Chapter III Regulation 31.1.6 and 31.1.7 which references LSA 4.8 and 4.9 respectively.

Please see Chapter 10, Section A of your FGCE TTP for details of examining the additional lifeboat requirements on a liquefied gas carrier.

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Electrical System Exam

Electrical Installations in the Cargo Machinery Room

The Cargo Machinery Room (compressor room) is a gas dangerous space in the cargo area which is not designed or equipped to ensure that the atmosphere is maintained at all times in a gas safe condition.

Electrical equipment within this space shall be approved for this environment and shall meet the requirements of IGC code (1993 edition) Reg 10.2.4 & GC code Reg 10.2.5.

Please see Chapter 11, Section A of your FGCE TTP for details of examining electrical installations in the cargo machinery room.

Electrical Installations Contained in Gas Dangerous Zones (Open Decks and Spaces other than Cargo Machinery Rooms)

The gas dangerous zone is an area in the cargo area where a gas safe atmosphere cannot be ensured.

Electrical equipment within this zone shall be approved for this environment and shall meet the requirements of IGC Code (1993 edition) Reg 10.2.5 & GC Code Reg10.2.6.

Please see Chapter 11, Section B of your FGCE TTP for details of examining electrical installations contained in gas dangerous zones other than cargo machinery rooms.

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Exercise 3.8: Electrical System Exam

Scenario

You are onboard the LPGC GELU LIQUIDUS during a renewal Certificate of Compliance (COC) examination. You and the rest of the examination team are conducting the Cargo Area Electrical System Exam portion of the examination.

At the completion of the Cargo Area Electrical System Exam, the examination team will provide a brief on the team's findings.

Question 1

The Cargo Machinery Room onboard a Liquefied Gas Carrier is considered to be a _____ space.

a. Gas Dangerous

b. Gas Safe

Question 2

As an examination team, while conducting an examination of the Cargo Machinery Room, it appears that the lighting fixtures are not of the pressurized or flameproof type.

You ask the Chief Mate about the lighting and he informs the examination team that the lighting is not of the pressurized or flameproof type.

He also states that this configuration is "OK", because it is only temporary and the lighting will be fixed as soon as parts arrive and it was convenient to do so.

What action should the team take?

Question 3

As an examination team, while conducting an examination of the Cargo Machinery Motor Room, it appears that the equipment inside of the space is not certified as "safe type" equipment. The space is provided with an airlock.

You ask the Chief Mate about the equipment and he tells you that this configuration is "OK", because it will de-energize upon loss of over pressurization in the space.

You verify that the equipment is designed to de-energize upon loss of over pressurization in the space.

What action should the team take?

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Cargo Area Ventilation System Exam

Cargo Machinery Motor Room Ventilation

The Cargo Machinery Motor Room is a gas safe space and is required to have **positive** ventilation in accordance with Reg 12.1 of the IGC (1993 edition) & GC codes.

Positive ventilation is required in this space to maintain a pressure differential between it and the adjacent gas dangerous space.

Please see Chapter 12, Section A of your FGCE TTP for details of examining cargo machinery motor room ventilation.

Cargo Machinery Room Ventilation

The Cargo Machinery Room is a gas dangerous space and is required to have **negative** ventilation in accordance with Reg 12.1 of the IGC (1993 edition) & GC codes.

Negative ventilation is required in this space to maintain a pressure differential between it and the adjacent gas safe space.

Please see Chapter 12, Section B of your FGCE TTP for details of examining cargo machinery room ventilation.

Air Lock Exam

Air Lock

Air locks are installed in accordance with Reg 3.6 of the IGC (1993 edition) & GC codes and are adjacent to the entrance of the Cargo Machinery Motor Room or other gas safe spaces within the gas dangerous zone.

Airlocks are designed to prevent the loss of overpressure in the cargo machinery motor room or other gas safe spaces when personnel access the space from a gas dangerous zone.

Please see Chapter 7 of your FGCE TTP for details of examining an air lock.

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Exercise 3.9: Cargo Area Ventilation System & Air Lock Exam

Scenario

You are onboard the LPGC GELU LIQUIDUS during a renewal Certificate of Compliance (COC) examination. You and the rest of the examination team are conducting the Cargo Area Ventilation System and Air Lock Exam portion of the examination.

At the completion of the Cargo Area Ventilation System and Air Lock Exam, the examination team will provide a brief on the team's findings.

Question 1

As an examination team, prior to entering the cargo machinery motor room, you ask the Chief Mate to open up both doors on the airlock to examine the alarm system that indicates if more than one door is not in the closed position.

When both doors are opened, you are able to hear the audible alarm but notice that the alarm strobe light above the outer door is not working.

You bring this to the attention of the Chief Mate, and he informs you that having only the audible alarm in operation is adequate, because the vessel only conducts cargo operations during daylight hours and the strobe light cannot be seen anyway.

Since the vessel only conducts cargo operations during daylight hours, is this system currently in compliance with the code? Yes/No

Why or why not? [Include the appropriate 1993 IGC Code cite in your answer.]

Question 2

As an examination team, while conducting an examination of the cargo machinery motor room, it appears that the ventilation system is not operating. You ask the Chief Mate if the ventilation is in operation and he responds that it is not, because he forgot to turn the system on prior to entering the space.

What measure is required to remind personnel to have ventilation, in operation, prior to entering the cargo machinery motor room? [Include the appropriate 1993 IGC Code cite in your answer.]

Would you expect to see positive or negative ventilation, in operation in the cargo machinery motor room? [Include the appropriate 1993 IGC Code cite in your answer.]

Exercise 3.9: Cargo Area Ventilation System & Air Lock Exam

Question 3

As an examination team, while conducting an examination of the cargo machinery room, you notice that the Chief Mate energizes the ventilation system with a switch located inside the space. You ask the Chief Mate why he/she did not energize the ventilation prior to personnel entering the space, and he/she tells you that the only switch to energize the system is located inside of the space.

Is this system currently in compliance with the code?

Why or why not? [Include the appropriate 1993 IGC Code cite in your answer.]

Question 4

As an examination team, while conducting an examination of the cargo machinery room, you notice that ventilation extraction can only be done from the upper portion of the space.

This vessel is authorized to carry Anhydrous Ammonia, Butadiene, and Propane.

Is ventilation extraction from the upper portion of the space acceptable? Yes/No

Why or why not? [Include the appropriate 1993 IGC Code cite in your answer.]

Gas Fuel Supply System Exam

Master Gas Valve

The Master Gas Valve is located in the cargo area and is required to close when situations require the supply of gas from the cargo area to engine room to be stopped. The Master Gas Valve is required in accordance with IGC Code (1993 edition) Reg 16.3.7 and GC Code Reg 16.7.

Please see Chapter 13, Section A of your FGCE TTP for details of examining a master gas valve.

Ventilation Hood/Casing

Ventilation is provided in the ventilation hood or casing as a means to extract natural gas vapors out of the space in the event of a natural gas leak. This ventilation is required in accordance with IGC Code (1993 edition) Reg 16.3.4 and GC Code Reg 16.5.

Please see Chapter 13, Section B of your FGCE TTP for details of examining a ventilation hood and/or casing.

Gas Detection System

Previously in this lesson we discussed the examination of the Fixed Gas Detection System. However, we did not cover the examination of the Gas Detection System that is used to detect natural gas leaks in the Gas Fuel Supply System.

A Gas Detection System is required for the Gas Fuel Supply System in accordance with IGC Code (1993 edition) Regs 16.3.4 & 16.3.10 and GC Code Regs 16.5 & 16.10.

Please see Chapter 13, Section C of your FGCE TTP for details of examining a gas detection system used for the protection of the cargo fuel system.

Gas Utilization Units

Each Gas Fuel Supply System shall be fitted with a Gas Utilization Unit. The Gas Utilization Unit is required in accordance with IGC Code (1993 edition) Reg 16.3.6 and GC Code Reg 16.6.

Please see Chapter 13, Section D of your FGCE TTP for details of examining a gas utilization unit.

Gas Fuel Piping

The gas fuel is provided to the Engine Room from the Cargo Machinery Room through a ventilated pipe or duct system or the less common, double wall piping system. The Gas Fuel Piping System is required in accordance with IGC Code (1993 edition) Reg 16.3 and GC Code Reg 16.2.

Please see Chapter 13, Sections E & F of your FGCE TTP for details of examining gas fuel piping.

Gas Combustion Unit (GCU)

The gas combustion unit (GCU) or thermal oxidizer is an authorized method for controlling cargo tank pressure and temperature. The GCU burns excess Boil-off gas (BOG) that cannot be consumed by the propulsion system.

The GCU fuel gas system is arranged in a similar manner as the propulsion system. The GCU may have valves (i.e., MGV) or sections of ducting/fuel gas piping that are common with a propulsion fuel gas system.

On some gas carriers GCUs have completely independent fuel gas systems.

The GCU should be sized to accommodate the maximum design boil off rate and should be totally independent of the re-liquefaction system or dual fuel/gas burning diesel engines operation.

Please see Chapter 13, Section G of your FGCE TTP for details for examining a GCU.

Exercise 3.10: Gas Fuel Supply System Exam

Scenario

You are onboard the LNGC Methane Transporter during a renewal Certificate of Compliance (COC) examination. You and the rest of the examination team are conducting the Gas Fuel Supply System Exam portion of the examination.

At the completion of the Gas Fuel Supply System Exam, the examination team will provide a brief on the team's findings.

Question 1

As an examination team, while witnessing a test of the fixed gas detection system that monitors the gas fuel supply system, you inform the Chief Engineer that you would like to verify the operation of the alarm and the closing of the master gas valve when gas concentrations reach the levels specified in the code.

The Chief Engineer, utilizing the proper span gas, performs the tests.

You witness the activation of the alarm at 30% LEL and note that the master gas valve did not close automatically.

The Chief Engineer informs you that the system is in compliance with the code, because when the alarm indicates levels at 30% LEL or higher, a crew member is placed in the engine room to monitor the gas concentrations and that crew member will close the master gas valve when the Chief Engineer decides it is appropriate to do so.

Is this system currently in compliance with the code? Yes/No

Why or why not? [Include the appropriate 1993 IGC Code cite in your answer.]

Question 2

In addition to high gas concentrations, what other situation would cause the master gas valve to shut? [Include the appropriate 1993 IGC Code cite in your answer.]

Question 3

What piping arrangement should be verified while examining a Gas Combustion Unit? [Include the appropriate 1993 IGC Code cite in your answer.]

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Fire Fighting System Exam

Fire Main System

Fire Main Systems on Liquefied Gas Carriers are required in accordance with Reg 11.2 of the IGC (1993 edition) & GC codes and SOLAS.

Please see Chapter 14, Section A of your FGCE TTP for details of examining the fire main system on a liquefied gas carrier.

Deck Water Spray System

Liquefied Gas Carriers shall have a Deck Water Spray System for cooling, fire protection and crew protection. The Deck Water Spray System is required in accordance with Reg 11.3 of the IGC (1993 edition) & GC codes.

Please see Chapter 14, Section B of your FGCE TTP for details of examining a deck water spray system.

Fixed Dry Chemical Powder System

Liquefied Gas Carriers that are authorized the carriage of *flammable cargo(es)*, must be fitted with a Fixed Dry Chemical Powder Extinguishing system. The system shall be installed to the satisfaction of the Administration and in accordance with Reg 11.4 of the IGC (1993 edition) & GC codes.

Please see Chapter 14, Section C of your FGCE TTP for details of examining a fixed dry chemical powder fire-extinguishing system.

Fixed Fire Extinguishing System for Cargo Machinery Rooms & Cargo Machinery Motor Rooms

Cargo Machinery Motor Rooms & Cargo Machinery Rooms shall each be provided with a fixed CO_2 Extinguishing System. The system shall be installed to the satisfaction of the Administration and in accordance with Reg 11.5 of the IGC (1993 edition) & GC codes, SOLAS, and the FSS code.

Please see Chapter 14, Sections D &E of your FGCE TTP for details of examining fixed fire extinguishing systems for cargo machinery and cargo machinery motor rooms.

Firemen's Outfits

During the Port State Control Course you received instruction on Firemen's Outfits and required equipment. Liquefied gas carriers are required to have additional Firemen's Outfits onboard over and above those required to be carried on other ship types. Firemen's Outfits are required in accordance with Reg 11.6 of the IGC (1993 edition) & GC codes, SOLAS, and the FSS code.

Please see Chapter 14, Section F of your FGCE TTP for details of examining firemen's outfits on a liquefied gas carrier.

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Exercise 3.11: Fire Fighting System Exam

Scenario

You are onboard the LPGC GELU LIQUIDUS during a renewal Certificate of Compliance (COC) examination. You and the rest of the examination team are conducting the Fire Fighting System Exam portion of the examination.

At the completion of the Fire Fighting System Exam, the examination team will provide a brief on the team's findings.

Question 1

As an examination team leader, you are preparing to witness an operational test of the vessel's deck water spray system.

You assign the members of the examination team to witness the operation of the system from different locations. A couple of the examination team members ask which areas of the cargo area are required to be covered by the deck water spray system.

You provide the following reply to the examination team:
[Include the appropriate 1993 IGC Code cite in your answer.]

Question 2

As an examination team, you have just witnessed the operational test of the deck water spray system. You observed that the system was remotely started from the bridge.

What is the additional requirement for the system if the vessel is authorized to carry Propylene Oxide? [Include the appropriate 1993 IGC Code cite in your answer.]

Question 3

As an examination team, you are preparing to conduct an exam of the fire main system. You have informed the Chief Mate that you would like to have the system "charged" while you do this part of the exam.

The Chief Mate informs you that the engine room is unattended and that someone would have to proceed to the engine room to start the fire pump.

Does the Chief Mate's response sound correct? Yes/No

Why or Why not? [Include the appropriate 1993 IGC Code cite in your answer.]

What pressure is the fire pump required to achieve?

How far apart should fire hydrants be located?

Question 4

Answer either "True" or "False" to the following statements:

A Liquefied Gas Carrier with a cargo capacity greater than 5,000 m^3 is required to have six Firemen's Outfits onboard. (T or F)

1993 IGC Code Cite: _____

All Liquefied Gas Carriers are required to have a Fixed Dry Chemical Powder Fire Extinguishing System. (T or F)

1993 IGC Code Cite: _____

The fire pump on a Liquefied Gas Carrier may also be used to supply the deck water spray system. (T or F)

1993 IGC Code Cite: _____

Deck monitors for the Fixed Dry Chemical Powder Fire Extinguishing System must be capable of protecting the cargo loading and discharge manifolds. (T or F)

1993 IGC Code Cite: _____

Post Exam/Follow-up Activities

Issue the Certificate of Compliance (COC) CG-3585

When you have completed a satisfactory Initial, Annual or Renewal examination, certain documents can be issued. In addition to the USCG Port State Control Report Form A (CG-5437a) and, if applicable, the Form B (CG-5437b), you will also issue a COC.

In the "Pre-Exam Activities" portion of this lesson, we discussed what portions of a COC are prepared and routed for OCMI signature.

Now that the examination is completed, you must fill out the remainder of the COC and issue it to the ship's Master.

Please see Chapter 15, Section A of your FGCE TTP for details of properly filling out a COC for a liquefied gas carrier.

Common Mistakes to Avoid

When preparing a COC, the following blocks **should not be checked**:

- "Category Z Noxious Liquid Substances (NLS) as noted on the vessel's International Pollution Prevention Certificate for the Carriage of Noxious Liquid Substances in Bulk (NLS Certificate)"

Note: The governing document for issuing a COC to a Liquefied Gas Carrier is the Certificate of Fitness, not the IPP NLS certificate. There is no circumstance on a liquefied gas carrier where a cargo will be authorized for carriage on the IPP NLS certificate and not be authorized on the Certificate of Fitness. The block on the COC regarding the carriage of category Z NLS cargoes will only be applicable to product carriers that are issued an IPP NLS certificate authorizing the carriage of category Z NLS cargoes.

- "This vessel meets the double-hull construction requirements as noted on the IOPP certificate and supplements."

Note: This information is applicable only to vessels that carry oil in bulk and will only be found on the supplement to the IOPP certificate, Record of Construction and Equipment for Oil Tankers.

- "The vessel's Vapor Collection System (VCS) meets the requirements of 46 CFR 39".

Note: Even though Liquefied Gas Carriers are designed to manage and transfer vapors, 46 CFR 39 applies to tank vessels that transfer vapors from crude oil, gasoline blends and benzene.

Common Mistakes to Avoid (Continued)

- "This vessel is equipped with an Inert Gas System that complies with the requirements of SOLAS 74 (amended) II-2/4.5.5 and 46 CFR 32".

Note: The IGC and GC codes specifically address a Liquefied Gas Carrier's IGS as not being required to comply with SOLAS. The vapor space of a cargo tank in a Bulk Liquid Tank Vessel are required to be kept in an inert condition and the vapor space in a Liquefied Gas Carrier always contains flammable or toxic vapors.

Please see Chapter 15, Section B of your FGCE TTP for more details.

MISLE Casework

At the completion of the COC Examination, the lead Foreign Gas Carrier Examiner (FGCE) shall ensure that a MISLE activity is created and completed in accordance with the Mission Management System (MMS) Work Instruction: *"MISLE Data Entry Requirements for Foreign Vessel Arrivals, Examinations and Operational Controls"*.

Please also see Chapter 15, Section C of your FGCE TTP for details of completing MISLE casework on a liquefied gas carrier.

Liquefied Gas Carrier
"Substandard Conditions"

Possible Grounds for Detention
MSM Volume II/ D.2.D.10

Examples Are Only Those Topics Covered in the Foreign Gas Carrier Inspector Course

Cargo Systems

1. Transportation of a cargo(es) not listed on the International Certificate of Fitness (COF) or Certificate of Fitness (COF).
2. Transportation of a cargo(es) required to be inhibited without a valid Certificate of Inhibition.
3. Inoperative Gas Detection System.
4. Inoperative pressure alarms installed in cargo tanks.
5. Missing or defective quick closing valves.
6. Missing or defective cargo tank Pressure Relief/Safety Valves.
7. Serious leaks from cargo piping.
8. A bulkhead that is not gastight.
9. An inoperable ventilation system in cargo areas.
10. Defective air locks.
11. Electrical installations not intrinsically safe or do not comply with corresponding code requirements.
12. Missing closing devices for accommodations or service spaces.

Documentation

1. Documents not available.
2. Document missing name of its issuing authority.
3. Disparities between actual condition of vessel and documentation listing.
4. Document lacks an issue date, signature of the duly authorized official issuing the document, or seal or stamp of the issuing authority.

SOLAS

1. Absence, insufficient capacity or serious deterioration of any lifesaving appliances.
2. Absence, insufficient capacity, or serious deterioration of any firefighting appliances or fire protection.
3. Absence, substantial deterioration, or failure of proper operation of cargo deck area fire protection.
4. Absence of non-sparking exhaust ventilation for cargo pump/machinery rooms.
5. Number, composition, or certification of crew not corresponding to safe manning document.

STCW

1. Failure of seafarers to hold a certificate, to have an appropriate certificate, or to have valid dispensation or to provide documentary proof that the seafarer has applied for an endorsement to the flag state administration.
2. Failure to comply with the applicable safe manning requirements of the flag state administration.
3. Failure to provide proof of professional proficiency for the duties assigned to seafarers for the safety of the ship.

****

Possible Grounds for Denial of Entry/ Expulsion
MSM Volume II/D.2.C.1

1. Incompatible cargoes stowed in adjacent tanks.
2. Cargoes being carried that are not authorized by the Certificate of Compliance.
3. Serious cargo leaks from tanks or piping systems.
4. LNG/LPG Gas Detection System inoperative.
5. Vessel carrying cargoes not authorized for carriage by the vessel's IMO Documents.

MSC Guidelines for the Review of Application for Foreign Liquefied Gas Carrier COC Endorsement

Procedure Number: C1-43 Revision Date: March 16, 2012

R. J. LECHNER, CDR, Tank Vessel and Offshore Division

Purpose

To establish the procedures for reviewing and processing Foreign Liquefied Gas Carrier Certificate of Compliance endorsement applications and generating Subchapter O Endorsements (SOEs).

References

a. 46 CFR Subchapter O, Part 154

b. IMO Code for Existing Ships Carrying Liquefied Gases in Bulk, Resolution A.329(IX)

c. IMO Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk, Resolution A.328(IX)

d. IMO International Gas Carrier (IGC) Code, Resolution MSC.5(48) and Resolution MSC.30(61), 1993 Edition

e. Marine Safety Manual (MSM), Volume II, Section D, Chapter 6

Contact Information

If you have any questions or comments concerning this document, please contact the Marine Safety Center (MSC) by email or phone. Please refer to the Procedure Number C1-43.

Email: MSC@uscg.mil
Phone: 202-475-3403
Website: http://homeport.uscg.mil/msc

Responsibilities

Using applicable portions of references (a) through (e), the submitter shall provide sufficient documentation and plans to indicate compliance with the applicable requirements. The submission shall be made electronically to the above email address or, if paper, in triplicate to the MSC's address found on the above website. To facilitate plan review and project management, all plans and information specified in these guidelines should be submitted as one complete package through a single point of contact for the project.

General Guidance

The Marine Safety Center will:

- Determine whether the vessel's flag administration is signatory to SOLAS and MARPOL: (Status of Conventions is available at http://www.imo.org/HOME.html. Click the "Conventions" button, then view the Status of Conventions, Complete List)

- If the vessel's flag administration does NOT issue IMO Certificates, refer to 46 CFR 154.22 (b), reference (a). In this case, plans will be submitted and reviewed individually by respective branches in the standard method:
  - Account for all required parts of the application as per 46 CFR 154.15(b) regarding specific plans and information from 46 CFR, part 54, 56, 91 and 110.

- If vessel's flag administration does issue IMO Certificates:

  - Account for all required parts of the application. See 46 CFR 154.22 (a).
    - The vessel's valid IMO Certificate of Fitness (COF)
    - A description of the vessel
    - Specifications for the cargo containment system
    - A general arrangement plan of the vessel
    - A midship section plan of the vessel
    - Schematic plans of the liquid and vapor cargo piping
    - A firefighting and safety plan
    - If the applicant is requesting an endorsement for the carriage of ethylene oxide, a class society certification that the vessel meets 154.1725(a)(4),(5), and (7)
    - If the vessel is a new gas vessel, or an existing vessel that does not meet 154.12 (b), (c), or (d)
      - A certification from a class society that the vessel –
        - Has enhanced grades of steel meeting 154.170 and
        - Meets 154.701, or 154.703 and
      - The vessel's valid SOLAS Cargo Ship Safety Construction Certificate and Cargo Ship Safety Equipment Certificate.

      Note: For an existing vessel initially was operating under U.S. Flag and then later on changed to another administration's flag, the item (9)(i) need not to be met. However, the vessel needs to meet 46 CFR 154.12 (b), (c) or (d) and 46 CFR 154.24 (b).

- Verify that the vessel has a valid Certificate of Financial Responsibility (COFR) by using the National Pollution Funds Center's e-COFR search https://npfc.uscg.mil/cofr/default.aspx, or on the Certificates tab on the MISLE vessel screen.

- Review certificates and plans, paying attention to validity dates, vessel identification information and content. Ensure that certificates are complete and signed by a representative of the flag state or class society.

- Complete the Initial SOE Checklist, attached to this document and also located at www.homeport.uscg.mil/msc

SOE Administration, General

Before May 2005, the SOE document specifically referenced a vessel's IMO Certificate of Fitness (COF) by certificate number, issue and expiration dates. As such, 46 CFR 154.1803 requires that a current COF be maintained on file at MSC for the vessel's Certificate of Compliance to remain valid.

In May 2005, the MSC modified the SOE procedures to eliminate the administrative overhead associated with updating and reissuing the SOE. After the initial SOE is issued, the owner/operator need only submit an updated IMO Certificate of Fitness (COF) to the Marine Safety Center if the subject vessel's cargo containment system and/or list of authorized cargoes on the IMO COF have changed.

Certification of Fitness Review, All Vessels

Because the newly formatted SOE no longer references a specific IMO COF, resubmission of the subject vessel's COF is not necessary when the name, issue/expiration dates, and/or certificate number changes. Therefore, if the vessel's cargo containment system and/or list of authorized cargoes on the IMO COF have not changed, the local Coast Guard Officer in Charge of Marine Inspections (OCMI) can issue the SOE after the COC inspection.

- The COF must have a valid signature and issue and expiration dates, and correct vessel name. Ensure that the certificate includes a list of authorized cargoes, conditions of carriage and a tank plan. The COF should follow the format prescribed in the IGC Code, reference (d).

- Determine which resolution applies to the vessel based on the Build/Keel Laid date on the COF. This will determine whether the vessel is a "New" or "Existing" vessel. The following defines the current resolutions:

  "Existing" Ships
  - Code for Existing Ships Carrying Liquefied Gases in Bulk
    Resolution A.329 (IX), reference (b).
    Adopted: 12 November 1975
    Applies to: Ships delivered on or before 31 October 1976, or
    Ships delivered after 31 October 1976 but prior to the application of the Gas Carrier Code (Resolution A.328 (IX))

  "New" Ships
  - Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (Gas Carrier Code), reference (c).
    Resolution A.328 (IX)
    Adopted: 12 November 1975
    Applies to: Ships for which a building contract is placed after 31 October 1976, or
    In the absence of a building contract, the keel of which is laid or which is at a similar stage of construction after 31 December 1976, or

    Ships for which the delivery date is after 30 June 1980,

    or

    Major conversions for which the contract was placed after 31 October 1976, or
    In the absence of a contract, the conversion of which is begun after 31 December 1976, or
    Conversion was completed after 30 June 1980.

  - International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code), reference (d).
    Resolution MSC.5(48)
    Adopted: 17 June 1983
    Applies to: Ships for which the keel is laid, or
    Construction identifiable with the ship began; and assembly of that ship commenced comprising at least 50 tonnes or 1% of the estimated mass of all structural material, whichever is less, or

Irrespective of the construction date, construction for conversion to a Gas Carrier that commenced,
On or after 1 July 1986

- International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code) 1993 edition: Resolution MSC.30(61)
  Adopted: December 1992, amendments that entered into force on 1 July 1994
  Applies to: Ships for which the keel is laid, or
  Construction identifiable with the ship began; and assembly of that ship commenced comprising at least 50 tonnes or 1% of the estimated mass of all structural material, whichever is less, or
  On or after 1 October 1994

Certificate of Fitness Review, New Vessels

Tank types will either be Integral; Independent Type A, B, or C; Membrane; or Semi-membrane. See reference (a) for definitions of the tank types.

- **Membrane and Semi-Membrane Tanks**: 154.426 limits the design pressure of these tank types to 24.5 kPa gauge without specific approval from Commandant, Hazardous Material Standards Division (CG-5215; was CG-5223) accepts a design pressure of 25 kPa. For tanks exceeding 25 kPa, the vessel must submit a waiver request to CG-5215 to operate in US waters at a higher pressure.

- **Membrane, Semi-Membrane, or Independent Type B Tanks**: For an initial application, verify CG-5215 has previously approved the cargo containment system's conceptual design. If not, a request for special approval must be submitted to CG-5215, in accordance with 46 CFR 154.34. MSC will not issue an SOE if the tank design has not been approved by CG-5215. A table with a list of approved conceptual designs for each type is located at the end of this document.

- **Independent Type A Tanks**: 154.438(a) limits the design pressure of these tank types to 69 kPa gauge. In Harbor MARVS are acceptable for Type A tanks, provided that they do not exceed this value.

- **Independent Type B or Independent Type C Cargo and Deck Tanks**:

- Check to ensure the proper stress factor was used in determining the Tank Maximum Allowable Relief Valve Setting (MARVS), based on the tank material. For Type C Tanks, use stress factor of A=4. For type B tanks see Table 2, 46 CFR 154. If an incorrect stress factor has been applied, the COF will not be accepted. See references (a) and (e), and 46 CFR 154.447.

- Ambient design criteria listed on the COF:

  - Check the minimum design temperature of the cargo tanks, which should be listed in the "Conditions of Carriage" section of the COF. Compare this to 46 CFR 154.459, Table 3 to determine if a secondary barrier is required. If a secondary barrier is NOT required, ensure the ambient design temperature values are less than or equal to 5^{o}C for Air and 0^{o}C for Water. (ref. (d) Ch. 4.7). These ambient temperatures are acceptable for all waters. If a secondary barrier is required, proceed to the following step.

  - If a secondary barrier is required, check the ambient design temperature values. Ensure they are less than or equal to -18^{o}C for Air and 0^{o}C for Water. This allows cargo carriage in the United States, EXCLUDING Alaska. For carriage in ALL US waters INCLUDING Alaska, ensure the temperatures are less than or equal to -29^{o}C for Air and -2^{o}C for Water. If the ambient design temperatures are not within these standards, the vessel must meet 46 CFR 154.178 for hull heating systems. If documentation is not provided certifying this, then the vessel can ONLY be authorized carriage of those cargoes that do NOT require a secondary barrier. See 46 CFR 154.459, Table 3, and 154.465/6.

- The MARVS must meet 46 CFR 154.405:

  - If the vessel has a refrigeration system meeting 46 CFR 154.702, the minimum design temperature of the tanks must be equal to or lower than the lowest cargo temperature at the MARVS pressure.
  - If no refrigeration system is installed, the MARVS must be greater than or equal to the vapor pressure of the authorized cargoes at 45° C (113° F). This is especially important when the US MARVS are lower than the IMO MARVS, and typically affects propane, propylene and

butane/propane mixtures. Butane/propane mixtures may be limited to a maximum propane content.
- Cargoes with vapor pressures exceeding the MARVS may not be carried in US waters and will not appear on a vessel's SOE.
- Pressure-Temperature curves may be found in several publications, including the Matheson Gas Data Book.

- Review the list of cargoes. Ensure that they are approved for carriage in the United States and are listed in Table 1 of 46 CFR 153 or Table 4 of 46 CFR 154, and are listed in Chapter 19 of the International Gas Carrier Code.

Certificate of Fitness Review, Existing Vessels

Existing vessels were originally approved for cargo carriage in US waters based on vessel plan review. Therefore, as a general rule, the authorizations granted and/or restrictions placed on the vessel through the plan review process should remain in effect. Some general things we review are:

- Verify that the vessel had previously been issued a SOE based on USCG plan review. If no SOE has previously been issued, the vessel must be reviewed and certified under reference (c) or (d).

- Check the ambient design temperature values. Ensure they are less than or equal to 5^{o}C for Air and 0^{o}C for Water, in accordance with the International Gas Carrier (IGC) Code.

- Verify whether or not the vessel has been granted authorization for cargo carriage in Alaskan waters. Note: As a result of Coast Guard Plan Review, the vessel may have been granted authorization for carriage in Alaskan waters without Type C tanks and/or without meeting the lower ambient design temperatures. This authorization will remain in effect (i.e. we will not place Alaska Restriction on these vessels because the hull ambient design temperatures don't meet IGC Code). See 46 CFR 154.12 (b).

- Check the minimum design temperature of the tanks. The temperature must be equal to or lower than the lowest boiling temperature at atmospheric pressure of the cargoes being carried. If the minimum design temperature is not within this standard, the vessel must meet 46 CFR 154.701 for cargo refrigeration systems.

- Compare the cargo list of the current COF to that of the previous COF and/or previous "new" format SOE. The lists should be the same. Only cargoes authorized through plan review should be carried. Authorization for other cargoes requires a special request. See procedures in 46 CFR 154.12.

Subchapter O Endorsement (SOE)

The following list details specific cargo carriage requirements which may appear on the vessel's SOE depending on the cargoes authorized for carriage:

- Per chapter 17.20 of the ICG Code, Propylene Oxide is authorized for carriage subject to the following special restrictions:
  - Classification certification that the required cargo piping separation has been achieved must be on board the vessel and available to Coast Guard boarding personnel.
  - All gaskets which may contact propylene oxide liquid or vapor must be constructed from spirally wound stainless steel with a filler of Teflon or similar fluorinated polymer.
  - Neoprene, natural rubber, asbestos mixed with other materials, and materials containing oxides of magnesium (such as mineral wools) may not be used for packing, insulation, and similar items in the propylene oxide containment system and piping.

- Per chapter 17.16 and 17.20 of the ICG Code, the following requirements apply to the carriage of ethylene oxide/propylene oxide mixtures (containing a maximum of 30% ethylene oxide):
  - The requirements for propylene oxide listed in the Certificate of Fitness and listed above must be followed.
  - When this cargo is carried without refrigeration, the cargo tank relief valve setting shall not be less than 120 kPa gauge (17 psig).

- The following requirements apply to the cargo C-4 Mixture:
  - The weight percent of acetylene may not exceed 5.0 percent.
  - The weight percent of propadiene may not exceed 0.5 percent.
  - If the weight percent of butadiene exceeds 10 percent, the C-4 Mixture must be inhibited to prevent self-reaction in accordance with paragraph 11 above.
  - A manufacturer's certificate specifying the composition of the cargo must be on board the vessel and available to Coast Guard boarding personnel.

- Methyl acetylene propadiene mixtures (MAPP gas) shall be carried only in one of the two compositions specified in section 17.12.2 of the IMO Gas Code (Resolution A.328(IX)).

- The person in charge of the transfer of vinyl chloride shall ensure that:
  - 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 an accuracy (with a confidence level of 95 percent) of not less than ± 50 % from 0.25 through 0.5 ppm, ± 35% from over 0.5 ppm through 1.0 ppm, and ± 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 on the 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: “CANCER-SUSPECT 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.

- Based on the ambient design temperatures listed in the vessel's IMO Certificate of Fitness, the cargoes authorized for carriage in Paragraph 4 may not be carried in Alaskan waters.

- Discharge of a Moss-Rosenberg model Independent Type B cargo tank by over-pressurization is only authorized with the approval of the cognizant Captain of the Port. Otherwise, the "In Harbour" MARVS listed on the vessel's IMO Certificate of Fitness are not permitted in US waters.

- The following cargoes, listed on the IMO Certificate of Fitness, may not be carried in US waters because they are not regulated under the US Code of Federal Regulations:

  C3/C4 (except under the conditions listed in the SOE)
  Crude C4 Product (except under the conditions listed in the SOE)
  Natural Gas Liquids

- The The following cargoes are subject to the provisions of MARPOL 73/78 Annex II. Their carriage is contingent on the vessel having on board an approved Procedures & Arrangements Manual and a valid International Pollution Prevention Certificate for the Carriage of Noxious Liquid Substances in Bulk which lists these cargoes:

  Diethyl ether
  Ethylene oxide/propylene oxide mixtures (containing a maximum of 30% ethylene oxide)
  Isoprene
  Isopropylamine
  Monoethylamine
  Pentanes (all isomers)
  Pentenes (all isomers)
  Propylene oxide
  Vinyl ethyl ether
  Vinylidene chloride

Attachments:

- SOE Checklist

- Cargo Containment Concept Approvals Issued by CG-5215

Disclaimer:

This guidance is not a substitute for applicable legal requirements, nor is it itself a rule. It is not intended to nor does it impose legally-binding requirements on any party. It represents the Coast Guard's current thinking on this topic and may assist industry, mariners, the general public, and the Coast Guard, as well as other federal and state regulators, in applying statutory and regulatory requirements. You can use an alternative approach for complying with these requirements if the approach satisfies the requirements of the applicable statutes and regulations. If you want to discuss an alternative, you may contact the MSC, the unit responsible for implementing this guidance.

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U.S. Department of Homeland Security
United States Coast Guard

Commandant
United States Coast Guard

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Washington, DC 20593-7126
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16710
CG-ENG Policy Letter
No. 04-12
August 8, 2012

From: J. W. MAUGER, CAPT
COMDT (CG-ENG)

To: Distribution

Subj: ALTERNATE PRESSURE RELIEF VALVE SETTINGS ON VESSELS CARRYING LIQUEFIED GASES IN BULK IN INDEPENDENT TYPE B AND TYPE C TANKS

Ref:
(a) International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk, 1993 Edition (IGC Code)
(b) Title 46 Code of Federal Regulations (CFR) Part 54
(c) Title 46 Code of Federal Regulations (CFR) Part 154
(d) American Society of Mechanical Engineers (AMSE) Boiler and Pressure Vessel Code (BPVC) Section VIII

1. PURPOSE. To provide policy for alternate pressure relief valve settings for ships carrying liquefied gases in bulk in independent type B and type C tanks.

2. ACTION. USCG Headquarters Units and Offices and Districts and Sector Commanders shall use the guidance in this policy letter to ensure compliance with U.S. statutory and regulatory requirements.

3. DIRECTIVES AFFECTED. This policy will be reflected in a subsequent regulatory update to applicable U.S. regulations.

4. BACKGROUND. The IGC Code, reference (a), specifies lower stress factors for Type B and Type C tanks than the requirements in references (b) and (c). As a result, all ships carrying liquefied gases in bulk entering the navigable waters of the United States must use lower maximum allowable relief valve settings (MARVS) on Type B and C tanks than required by the IGC Code. Therefore vessels operating in US and international waters opt to have two pressure relief valve (PRV) settings per tank which must be switched upon entering and exiting U.S. territorial waters.

5. DISCUSSION.

   a. When references (b) and (c) were written, the stress factors were influenced by the requirements of reference (d) at the time. ASME has since lowered the stress factors.

   b. According to 46 CFR 154.32, vessels may meet an alternative standard if the Commandant determines that the alternate standard provides an equivalent or greater

level of safety. Materials, manufacturing, and inspection have advanced since the current regulations were written, and tanks designed and manufactured with these more advanced techniques and with the stress factors in the IGC Code have an equivalent level safety to the current regulations. Therefore tanks manufactured under certain conditions are considered to meet the level of safety required in 46 CFR 154.447 and 46 CFR 154.450.

6. PROCEDURES.

   a. Tanks meeting the following two requirements may use MARVS specified in reference (a):

      1. They must be designed and built according to the 1993 edition of the IGC code, including all amendments through 1 October 1994.

      2. They must be on a vessel having an International Certificate of Fitness for the Carriage of Liquefied Gases in Bulk issued by a U.S. Coast Guard Recognized Classification Society authorized to issue such a certificate. (See 46 CFR part 8, subpart B). A current listing of U.S. Coast Guard Recognized Classification Societies is available at http://www.uscg.mil/hq/cg5/acp/.

   b. Tanks that do not meet these requirements must meet current U.S. regulations. See references (b) and (c). Alternately, shipowners may request equivalencies to use the MARVS as determined from the IGC Code. Requests for equivalencies should be directed to the U.S. Coast Guard Commandant (CG-ENG-5) and must include the information required in 46 CFR 154.32(b) and should include a copy of the Certificate of Fitness.

7. DISCLAIMER. This policy is not a substitute for applicable legal requirements, nor is in itself a regulation. It is not intended to nor does it impose legally-binding requirements on any party. It represents the Coast Guard's current thinking on this topic and may assist industry, mariners, the general public, and the Coast Guard, as well as other federal and state regulators, in applying U.S. statutory and regulatory requirements.

8. QUESTIONS. Questions or concerns regarding this policy may be directed to Commandant (CG-ENG-5) at (202) 372-1412 or emailed to HazmatStandards@uscg.mil.

Coast Guard Tactics, Techniques and Procedures (TTP)
CGTTP 3-72.6: Foreign Gas Carrier Examiners

The CGTTP for foreign gas carrier examiners provides step-by-step guidance to perform the many tasks involved with conducting foreign gas carrier examinations. The document can be found in the TTP Library within the References section of the CGPortal or by following the link below:

https://cgportal2.uscg.mil/units/forcecom/TTP/SitePages/Home.aspx

PQS Task Number	Task Description	TTP Section
FGCE-PE01	Prepare a Certificate of Compliance for Issuance	Chapter 2, Section A & Appendix C
FGCE-PE02	Conduct a safety meeting	Chapter 2, Section B & Appendices B/H
FGCE-CD01	Examine the International Pollution Prevention Certificate for the Carriage of Noxious Liquid Substances in Bulk **(LPG Carriers Only)**	Chapter 3, Section A
FGCE-CD02	Examine the International Certificate of Fitness for the Carriage of Liquefied Gases in Bulk (IGC Code)	Chapter 3, Section B & Appendix E
FGCE-CD03	Examine the Certificate of Fitness for the Carriage of Liquefied Gases in Bulk (GC Code)	Chapter 3, Section C & Appendix D
FGCE-CD04	Examine the Certificate of Fitness for the Carriage of Liquefied Gases in Bulk (EGC Code)	Chapter 3, Section D
FGCE-CD05	Verify that the information required to be provided to the master concerning allowable loading limits and maximum loading reference temperatures for each product carried is onboard	Chapter 3, Section E
FGCE-CD06	Examine documentation applicable to the changing and setting of cargo tank pressure relief valves	Chapter 3, Section F
FGCE CD07	Examine crew training documentation	Chapter 3, Section G
FGCE-CD08	Examine the Subchapter “O” endorsement	Chapter 3, Section H & Appendices F/G
FGCE-CD09	Examine Certificate of Inhibition **(LPG Carriers Only)**	Chapter 3, Section I
FGCE-LM01	Examine the Cargo Record Book **(LPG Carriers Only)**	Chapter 4, Section A
FGCE-LM02	Examine the Procedures & Arrangement (P&A) Manual **(LPG Carriers Only)**	Chapter 4, Section B
FGCE-LM03	Examine the Shipboard Marine Pollution Emergency Plan (SMPEP) for Noxious Liquid Substances **(LPG Carriers Only)**	Chapter 4, Section C
FGCE-LM04	Verify that required cargo information is onboard (Cargo Operations Manual)	Chapter 4, Section D
FGCE-LM05	Verify that the ship has a loading and stability information booklet	Chapter 4, Section E
FGCE-GH01	Examine decontamination showers **(LPG Carriers Only)**	Chapter 6, Section A

PQS Task Number	Task Description	TTP Section
FGCE-GH02	Examine eye wash stations **(LPG Carriers Only)**	Chapter 6, Section A
FGCE-GH03	Examine respiratory and eye protection [provided for emergency escape purposes] **(LPG Carriers Only)**	Chapter 6, Section B
FGCE-GH04	Examine personnel safety equipment	Chapter 6, Section C
FGCE-GH05	Examine First Aid equipment	Chapter 6, Section D
FGCE-AL01	Examine air locks	Chapter 7, Section A
FGCE-LS01	Examine lifeboats	Chapter 10, Section A
FGCE-FF01	Examine fire water main equipment	Chapter 14, Section A
FGCE-FF02	Examine the deck water spray system	Chapter 14, Section B
FGCE-FF03	Examine chemical powder fire-extinguishing system	Chapter 14, Section C
FGCE-FF04	Examine cargo machinery room fixed fire-extinguishing system	Chapter 14, Section D
FGCE-FF05	Examine cargo motor machinery room fixed fire-extinguishing system	Chapter 14, Section E
FGCE-FF06	Examine firemen's outfits	Chapter 14, Section F
FGCE-ES01	Examine electrical installations in the cargo machinery room	Chapter 11, Section A & Appendix J
FGCE-ES02	Examine electrical installations in gas dangerous zones on open decks and in spaces other than cargo machinery rooms	Chapter 11, Section B & Appendix J
FGCE-IE01	Examine fixed gas detection system	Chapter 5, Section A
FGCE-IE02	Examine portable gas detection equipment	Chapter 5, Section B
FGCE-IE03	Examine temperature indicating devices	Chapter 5, Section C
FGCE-IE04	Examine pressure monitoring devices	Chapter 5, Section D
FGCE-IE05	Examine overflow control system	Chapter 5, Section E
FGCE-CS01	Examine the Emergency Shutdown (ESD) system	Chapter 8, Section A & Appendix I
FGCE-CS02	Examine cargo tank pressure relief valves	Chapter 8, Section B
FGCE-CS03	Examine cargo piping	Chapter 8, Section C
FGCE-CS04	Examine cargo system valves	Chapter 8, Section D
FGCE-CS05	Examine cargo machinery room equipment	Chapter 8, Section E
FGCE-CE01	Examine the Inert Gas System (IGS)	Chapter 9, Section A
FGCE-CE02	Examine the Nitrogen Gas Generating System	Chapter 9, Section B
FGCE-CE03	Examine Inert Gas/Nitrogen storage tanks	Chapter 9, Section C
FGCE-CV01	Examine cargo machinery motor room ventilation	Chapter 12, Section A

PQS Task Number	Task Description	TTP Section
	system	
FGCE-CV02	Examine cargo machinery room ventilation system	Chapter 12, Section B
FGCE-GF01	Examine the master gas valve **(LNG Carriers Only)**	Chapter 13, Section A
FGCE-GF02	Examine ventilation within the ventilation hood or casing **(LNG Carriers Only)**	Chapter 13, Section B
FGCE-GF03	Examine the gas detection system used for the protection of the cargo fuel system **(LNG Carriers Only)**	Chapter 13, Section C
FGCE-GF04	Examine the gas utilization unit(s) **(LNG Carriers Only)**	Chapter 13, Section D
FGCE-GF05	Examine gas fuel piping (double wall piping system) **(LNG Carriers Only)**	Chapter 13, Section E
FGCE-GF06	Examine gas fuel piping (ventilated pipe or duct system) **(LNG Carriers Only)**	Chapter 13, Section F
FGCE-GF07	Examine the Gas Combustion Unit (GCU) **(LNG Carriers Only)**	Chapter 13, Section G
FGCE-FU01	Complete MISLE Activity	Chapter 15, Sections A, B, C & Appendix C

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