GUIDANCE FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

Part GF Ships Using Low-Flashpoint Fuels

Guidance for the Survey and Construction of Steel Ships
Part GF **2017 AMENDMENT NO.1**

Notice No.27 1st June 2017
Resolved by Technical Committee on 30th January 2017

ClassNK
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Notice No.27 1st June 2017
AMENDMENT TO THE GUIDANCE FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

"Guidance for the survey and construction of steel ships" has been partly amended as follows:

Part GF SHIPS USING LOW-FLASHPOINT FUELS

Amendment 1-1

GF2 DEFINITIONS

GF2.2 Definitions

GF2.2.1 Terms

Sub-paragraph -3 has been renumbered to Sub-paragraph -5, and Sub-paragraphs -3 and -4 have been added as follows.

3 In applying **2.2.1-15(3), Part GF of the Rules**, the following **(1)** and **(2)** apply.

(1) A tank connection space may be required also for tanks on open deck in the case of ships where restriction of hazardous areas is safety critical. A tank connection space may also be necessary in order to provide environmental protection for essential safety equipment related to the gas fuel system like tank valves, safety valves and instrumentation; and

(2) A tank connection space may also contain equipment such as vaporizers or heat exchangers. Such equipment is considered to only contain potential sources of release, but not sources of ignition.

4 In applying **2.2.1-17, Part GF of the Rules**, a tank connection space which has equipment such as vaporizers or heat exchangers installed inside is not regarded as a fuel preparation room. Such equipment is considered to only contain potential sources of release, but not sources of ignition.

~~**3**~~**5** In applying **2.2.1-38, Part GF of the Rules**, reference is to be made to *IEC* 60092-502:1999.

GF5 SHIP DESIGN AND ARRANGEMENT

Section GF5.4 has been added as follows.

GF5.4 Machinery Space Concepts

GF5.4.1 General

In applying **5.4.1, Part GF of the Rules**, premixed engines using fuel gas mixed with air before the turbocharger are to be located in *ESD*-protected machinery spaces.

Section GF5.8 has been added as follows.

GF5.8 Fuel Preparation Room Design

In applying **5.8, Part GF of the Rules**, fuel preparation rooms are to be in accordance with the following **-1** to **-4**:

1 Fuel preparation rooms, regardless of location, are to be arranged to safely contain cryogenic leakages;

2 The material of the boundaries of the fuel preparation room is to have a design temperature corresponding with the lowest temperature it can be subjected to in a probable maximum leakage scenario unless the boundaries of the space, i.e., bulkheads and decks, are provided with suitable thermal protection;

3 The fuel preparation room is to be arranged to prevent surrounding hull structure from being exposed to unacceptable cooling, in case of leakage of cryogenic liquids; and

4 The fuel preparation room is to be designed to withstand the maximum pressure build up during such a leakage as specified in **-1** to **-3** above. Alternatively, pressure relief venting to a safe location (mast) can be provided.

GF6 FUEL CONTAINMENT SYSTEM

Section GF6.2 has been added as follows.

GF6.2 Functional Requirements

GF6.2.2 Additional Requirements

In applying **6.2.2-1(1), Part GF of the Rules**, fuel preparation rooms are to be in accordance with **GF5.8**.

GF6.7 Pressure Relief System

Paragraph GF6.7.3 has been added as follows.

GF6.7.3 Sizing of Pressure Relieving System

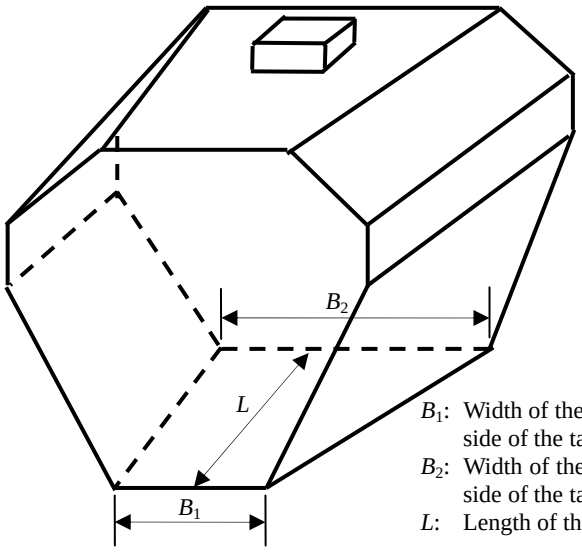
In applying **6.7.3-1(1)(b)** and **Fig. GF6.4, Part GF of the Rules**, the external surface area A (m^3) of prismatic tanks is to be calculated in accordance with the following **(1)** or **(2)**. In this context, the L_{min} specified in the following **(1)** and **(2)**, for non-tapered tanks, is the smaller of the horizontal dimensions (length or width) of the flat bottom of the tank. For tapered tanks (See **Fig. GF6.7.3-1**), the L_{min} is the smaller of the length and the average width.

(1) In cases where distance between the flat bottom of the tank and bottom of the hold space is equal to or less than $L_{min}/10$:
External surface area minus flat bottom surface area

(2) In cases where distance between the flat bottom of the tank and bottom of the hold space is greater than $L_{min}/10$:
External surface area

Fig. GF6.7.3-1 has been added as follows.

Fig. GF6.7.3-1 Example of Tapered Tank



B_1: Width of the tank's flat bottom on the shorter side of the taper
B_2: Width of the tank's flat bottom on the longer side of the taper
L: Length of the flat bottom of the tank

Average width of the tank's flat bottom of trapezium: $(B_1+B_2) / 2$

Section GF6.9 has been added as follows.

GF6.9 The Maintaining of Fuel Storage Condition

GF6.9.1 Control of Tank Pressure and Temperature

1 In applying **6.9.1-1, Part GF of the Rules**, liquefied gas fuel tanks' pressure and temperature are to be controlled and maintained within the design range at all times including after activation of the safety system required in **15.2.2-2, Part GF of the Rules** for a period of minimum 15 *days*.

2 In applying **6.9.1-2, Part GF of the Rules**, the activation of the safety system specified in **-1** above alone is not deemed as an emergency situation.

GF8 has been added as follows.

GF8 BUNKERING

GF8.3 Bunkering Station

GF8.3.1 General

The "special consideration" referred to in **8.3.1-1, Part GF of the Rules** includes as a minimum, but not be restricted to, the following **(1)** to **(7)**:

(1) Segregation towards other areas on the ship;
(2) Hazardous area plans for the ship;
(3) Requirements for forced ventilation;
(4) Requirements for leakage detection (e.g., gas detection and low temperature detection);
(5) Safety actions related to leakage detection (e.g., gas detection and low temperature detection);
(6) Access to bunkering station from non-hazardous areas through airlocks; and
(7) Monitoring of bunkering station by direct line of sight or by *CCTV*.

GF13 VENTILATION

GF13.5 Machinery Spaces

Paragraph GF13.5.1 has been added as follows.

GF13.5.1 Ventilation Systems for Machinery Spaces Containing Gas-fuelled Consumers

In applying **13.5.1, Part GF of the Rules**, spaces enclosed in the boundaries of machinery spaces (such as purifier's room, engine-room workshops and stores) are considered an integral part of machinery spaces containing gas-fuelled consumers, and their ventilation system need not be independent of the one of machinery spaces.

Section GF13.8 has been added as follows.

GF13.8 Ducts and Double Pipes

GF13.8.2 Ventilation Systems for Double Piping and for Gas Valve Unit Spaces in Gas Safe Engine-rooms

In applying **13.8.2, Part GF of the Rules**, double piping and gas valve unit spaces in gas safe engine-rooms are considered an integral part of the fuel supply systems, and their ventilation system need not be independent of other fuel supply ventilation systems provided such fuel supply systems contain only gaseous fuel.

GF13.8.3 Ventilation Inlets

In applying **13.8.3, Part GF of the Rules**, the ventilation inlet for the double wall piping or duct is always to be located in a non-hazardous area in open air away from ignition sources.

EFFECTIVE DATE AND APPLICATION (Amendment 1-1)

1. The effective date of the amendments is 1 June 2017.

2. Notwithstanding the amendments to the Guidance, the current requirements apply to ships the keels of which were laid or which were at *a similar stage of construction* before the effective date.

(Note) The term "*a similar stage of construction*" means the stage at which the construction identifiable with a specific ship begins and the assembly of that ship has commenced comprising at least 50 *tonnes* or 1%* of the estimated mass of all structural material, whichever is the less.

* For high speed craft, "1%" is to be read as "3%".

Amendment 1-2

GF6 FUEL CONTAINMENT SYSTEM

GF6.4 Liquefied Gas Fuel Containment

Paragraph GF6.4.8 has been amended as follows.

GF6.4.8 Thermal Insulation

For the purpose of the requirements in **6.4.8**, **Part GF of the Rules**, the insulation ~~of~~ system for vacuum insulated tanks is to be ~~as deemed appropriate by the Society~~ approved in accordance with the requirements in **Annex 1** "**Guidance for Equipment and Fittings of Ships Using Low-flashpoint Fuels**".

Annex 1 GUIDANCE FOR EQUIPMENT AND FITTINGS OF SHIPS USING LOW-FLASHPOINT FUELS

Chapter 13 has been added as follows.

Chapter 13 INSULATION SYSTEM FOR VACUUM INSULATED TANKS

13.1 General

13.1.1 Application

1 The requirements in this chapter apply to vacuum insulation systems used for vacuum insulated tanks according to the requirements in **GF6.4.8**, **Part GF of the Guidance**.

2 The scope of the requirements in this chapter is vacuum insulation systems using type *C* independent tanks as inner vessels and using, as appropriate, filler materials for improvement of insulation performance or layered insulations as countermeasures for heat radiation in a vacuumed space. Other insulation systems used for vacuum insulated tanks are to be as deemed appropriate by the Society.

3 In general, approval is to be obtained for each ship.

13.1.2 Definition

A "vacuum insulation system" is a type of thermal insulation system which consists of an inner vessel (i.e., the primary barrier) and an outer shell with an empty space separating the two in which heat ingress caused by convection is inhibited for the most part by maintaining a negative pressure within the empty space. Such systems also include accessories such as supporting structures and filler materials.

13.2 Submission of Plans and Documents

13.2.1 Submission of Plans and Documents

Notwithstanding **1.2**, in accordance with the requirements in **2.1.2-1(5)**, **2.1.3-1(9)** and **2.1.3-2, Part B of the Rules**, the plans and documents related to vacuum insulation systems which are to be submitted to the Society are as follows:

(1) Plans and documents for approval

(a) Specification of vacuum insulation system (including an outline of the system, required degree of vacuum, data related to the deterioration rate of the degree of vacuum during operation and, if deemed necessary by the Society, a degree of vacuum – insulation performance curve)

(b) Construction drawing (including the arrangement of major elements for the system)

(c) Details (specification, standard for manufacturing and quality control, maker, type, etc.) of major elements (outer shell, filler material or layered insulation, if applied, and supporting structure, etc.)

(d) Other associated accessories which are attached directly to the inner vessel or outer shell and their arrangements.

(e) Test and inspection procedures for the vacuum insulation system.

(f) Installation procedure for the vacuum insulation system (installation and manufacturing method/process, arrangement of filler material or layered insulation, procedure and

criteria for vacuumization (including means for confirming the degree of vacuum), setting plan for the supporting structure, procedure for quality control, non-destructive testing procedure and standards for welds and other connection parts, and a repair plan for defects)

(2) Other plans and documents for reference
  (a) Calculation sheet for performance of insulation
  (b) Strength calculation of major elements

13.3 Materials, Construction and Strength

13.3.1 Materials and Welding

1 Materials used for outer shells are to comply with **Part K of the Rules**.

2 Welding procedures for outer shells are to be approved in accordance with relevant requirements in **11.2**, **Part D of the Rules** and **Chapter 4**, **Part M of the Rules**.

3 Elements of insulation systems which do not contribute to vacuums (such as supporting structures installed between inner vessels and outer shells, and layered insulation installed on inner vessels as countermeasure for heat radiation) are to be type approved in accordance with **Guidance for the Approval and Type Approval of Materials and Equipment for Marine Use**. Type approval for filler material such as pearlite, glass wool, etc. used between inner vessels and outer shells is not required except for cases where the Society deems it especially necessary.

13.3.2 Construction and Strength

1 Construction of insulation systems is to ensure that no excessive stress, failure of supporting structure, reduction of insulation performance, etc. occur due to thermal deformation.

2 Suitable means are to be provided such as protection from flames or the use of non-combustible materials for elements which are likely to lead to significant deterioration of the performance of insulation systems due to vacuum breaks with melting elements or deformation with changes in the property of elements from heat in cases where insulation systems are exposed to the flames.

13.4 Tests and Inspections

13.4.1 Tests and Inspections

The following tests **(1)** through **(3)** are to be conducted:

(1) Dye penetrant tests for all welded joints of outer shell;

(2) Tightness test of the outer shell and measurement of the degree of vacuum in accordance with standards as deemed appropriate by the Society; and

(3) Tests to confirm insulation performance in accordance with standards as deemed appropriate by the Society. In general, such tests are to use appropriate test fluids such as liquid nitrogen and to measure amount of boil-off gas.

EFFECTIVE DATE AND APPLICATION (Amendment 1-2)

1. The effective date of the amendments is 1 December 2017.

2. Notwithstanding the amendments to the Guidance, the current requirements apply to ships for which the date of contract for construction is before the effective date.