
RULES FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

RULES

Part N

Ships Carrying Liquefied Gases in Bulk

2017 AMENDMENT NO.1

Rule No.29 1st June 2017

Resolved by Technical Committee on 30th January 2017

Approved by Board of Directors on 20th February 2017

An asterisk (*) after the title of a requirement indicates that there is also relevant information in the corresponding Guidance.

AMENDMENT TO THE RULES FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

“Rules for the survey and construction of steel ships” has been partly amended as follows:

Part N SHIPS CARRYING LIQUEFIED GASES IN BULK

Amendment 1-1

Chapter 5 PROCESS PRESSURE VESSELS AND LIQUID, VAPOUR, AND PRESSURE PIPING SYSTEMS

5.9 Welding, Post-weld Heat Treatment and Non-destructive Testing (*IGC Code 5.9*)

5.9.3 Non-destructive Testing*

Sub-paragraph (1) has been amended as follows.

In addition to normal controls before and during the welding, and to the visual inspection of the finished welds, as necessary for proving that the welding has been carried out correctly and according to the requirements of this Chapter, the following tests are to be required:

- (1) 100% radiographic or ultrasonic inspection of butt-welded joints for piping systems with design temperatures colder than -10°C , ~~or~~ and with inside diameters of more than 75 mm, or wall thicknesses greater than 10 mm;

5.11 Piping System Component Requirements (*IGC Code 5.11*)

5.11.6 Flanges, Valves and Fittings*

Sub-paragraph -3 has been amended as follows.

- 3** All emergency shutdown valves are to be of the “~~fire-closed~~ fail-closed” type (See **5.13.1-1** and **18.3.1-2**).

Chapter 13 INSTRUMENTATION AND AUTOMATION SYSTEMS

13.6 Gas Detection Requirements (*IGC Code 13.6*)

Paragraph 13.6.4 has been amended as follows.

13.6.4 Oxygen Deficiency Monitoring Equipment

Where indicated by an “A” in column “F” in **Table N19.1** ships certified for carriage of non-flammable products, oxygen deficiency monitoring are to be fitted in cargo machinery spaces and ~~cargo tank hold spaces~~ hold spaces for independent tanks other than type C tanks. Furthermore, oxygen deficiency monitoring equipment is to be installed in enclosed or semi-enclosed spaces containing equipment that may cause an oxygen-deficient environment such as nitrogen generators, inert gas generators or nitrogen cycle refrigerant systems.

EFFECTIVE DATE AND APPLICATION (Amendment 1-1)

1. The effective date of the amendments is 1 June 2017.
2. Notwithstanding the amendments to the Rules, 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.

Chapter 11 FIRE PROTECTION AND EXTINCTION

11.1 Fire Safety Requirements (*IGC Code 11.1*)

11.1.1 General*

Sub-paragraph (1) has been amended as follows.

The requirements for tankers in **Part R** are to apply to ships covered by this Part, irrespective of tonnage including ships of less than 500 *gross tonnage*, except those specified in (1) to (4) below. Where alternative and supplementary arrangements are provided to the satisfaction of the Society, the requirements in **Part R** need not apply to ships covered by this Part. Where alternative arrangements for inert gas systems are provided to ships covered by this Part, the requirements in **4.5.5-1, Part R** need not apply to these ships, even if these ships carry crude oil and petroleum products having a flashpoint not exceeding 60°C and other liquid products having a similar fire hazard.

(1) **1.1.1** (except **1.1.1-2**), **4.5.1-6** and -8, **4.5.10** and **Chapter 21, Part R** are not to apply;

EFFECTIVE DATE AND APPLICATION (Amendment 1-2)

1. The effective date of the amendments is 1 July 2017.
2. Notwithstanding the amendments to the Rules, the current requirements apply to ships other than those for which the application for Classification Survey during Construction or the application for examinations of altered parts is dated on or after the effective date.

GUIDANCE FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

Part N

Ships Carrying Liquefied Gases in Bulk

GUIDANCE

2017 AMENDMENT NO.1

Notice No.27 1st June 2017

Resolved by Technical Committee on 30th January 2017

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 N SHIPS CARRYING LIQUEFIED GASES IN BULK

Amendment 1-1

N2 SHIP SURVIVAL CAPABILITY AND LOCATION OF CARGO TANKS

N2.2 Freeboard and Stability

N2.2.2 Solid Ballast

Sub-paragraph -1 has been amended as follows.

1 In case where solid ballast is arranged under unavoidable reasons to ensure stability of the ship, the distance between such solid ballast and the cargo tank is standardized to be not less than 760mm ~~at any point~~.

2 The solid ballast is to be of concrete blocks and similar materials which can be fitted securely to the hull structure of the ship. No solid ballast consisting of scrap iron in bulk, etc. is accepted.

Paragraph N2.2.5 has been amended as follows.

N2.2.5 Conditions of Loading

To ensure the compliance with the survival requirements in **2.7, Part N of the Rules** for “all anticipated conditions of loading and variations in draught and trim” specified in **2.2.5, Part N of the Rules** at least one or combination of the following **(1)** to **(3)** are to be taken for the draught up to the ~~summer water~~ tropical load line:

- (1) Carry out damage stability calculations for all anticipated conditions of loading.
- (2) Provide manual or calculating machine capable of carrying out the required damage stability calculations. When calculating machine is provided, suitable means of redundancy is to be provided for possible failure of the machine.
- (3) Provide diagrams permitting to verify compliance with the survival requirements on the basis of the data in intact condition of the ship. (e.g. *KG* values)

N4 CARGO CONTAINMENT

N4.13 Functional Loads

Paragraph N4.13.9 has been amended as follows.

N4.13.9 Static Heel Loads

~~1~~ For the purpose of the requirements in **4.13.9, Part N of the Rules**, the added mass due to hull damage or flooding may not be considered.

~~2~~ For the purpose of the requirements in **4.13.9, Part N of the Rules**, the strength assessment in way of supports of type C independent tanks made of carbon manganese steel is to be in accordance with the following **(1)** through **(3)**:

~~(1)~~ The following criterion for the allowable stresses in way of supports may be used:

$$\sigma_e = \sqrt{(\sigma_n + \sigma_b)^2 + 3\tau^2} \leq \sigma_a$$

~~where:~~

~~σ_e = equivalent stress (N/mm^2), to be calculated over the full extent of the stiffening ring for a sufficient number of load cases as defined in **4.13.9, Part N of the Rules**.~~

~~σ_n = normal stress (N/mm^2) in the circumferential direction of the stiffening ring~~

~~σ_b = bending stress (N/mm^2) in the circumferential direction of the stiffening ring~~

~~τ = shear stress (N/mm^2) in the stiffening ring~~

~~σ_a = allowable stress (N/mm^2), to be taken as the smaller of the values:~~

~~$0.57R_m$ or $0.85R_e$~~

~~R_m and R_e as defined in **4.18.1(3), Part N of the Rules**.~~

~~(2)~~ The following assumptions are to be made for the stiffening rings:

~~(a)~~ The stiffening ring is to be considered as a circumferential beam formed by web, face plate, doubler plate, if any, and associated shell plating. The effective width of the associated plating is to be taken as the following **i)** and **ii)**:

~~i)~~ For cylindrical shells:

~~An effective width (mm) not greater than $0.78\sqrt{rt}$ on each side of the web. A doubler plate, if any, may be included within that distance.~~

~~where:~~

~~r = mean radius of the cylindrical shell (mm)~~

~~t = shell thickness (mm)~~

~~ii)~~ For longitudinal bulkheads (in the case of lobe tanks):

~~The effective width is to be determined according to established standards. A value of $20t_b$ on each side of the web may be taken as a guidance value.~~

~~where:~~

~~t_b = bulkhead thickness (mm).~~

~~(b)~~ The stiffening ring is to be loaded with circumferential forces, on each side of the ring, due to the shear stress, determined by the bi-dimensional shear flow theory from the shear force of the tank.

~~(3)~~ The following **(a)** through **(c)** are to be taken into account:

~~(a)~~ Elasticity of support material (intermediate layer of wood or similar material)

~~(b)~~ Change in contact surface between tank and support, and of the relevant reactions, due to the following **i)** and **ii)**

~~i)~~ thermal shrinkage of tank

- ~~ii) elastic deformations of tank and support material.~~
- ~~The final distribution of the reaction forces at the supports is not to show any tensile forces.~~
- ~~(c) Buckling strength of stiffening rings~~

N4.23 Type C Independent Tanks

Paragraph N4.23.1 has been amended as follows.

N4.23.1 Design Basis

1 For the purpose of the requirements in **4.23.1, Part N of the Rules**, for the scantlings, shapes and reinforcements of openings of cargo tanks against internal pressure in cargo tanks, the requirements for Group 1 Pressure Vessels in **Chapter 10, Part D of the Rules** apply.

2 If the carriage of products, having a relative density exceeding 1.0 and not covered by **Part N of the Rules** is intended in type C independent tanks, it is to be verified that the double amplitude of the primary membrane stress $\Delta\sigma_m$ created by the maximum dynamic pressure differential ΔP does not exceed the allowable double amplitude of the dynamic membrane stress $\Delta\sigma_A$ as specified in **4.23.1-2, Part N of the Rules**.

$$\Delta P = \frac{\rho}{1.02 \times 10^5} (\alpha_{\beta 1} Z_{\beta 1} - \alpha_{\beta 2} Z_{\beta 2}) \quad (MPa)$$

where ρ , α_{β} , Z_{β} are as defined in **4.28.1-2, Part N of the Rules**.

$\alpha_{\beta 1}$ and $Z_{\beta 1}$ are the α_{β} and Z_{β} values giving the maximum liquid pressure $(P_{gd})_{max}$ as defined in **4.28.1-2, Part N of the Rules**.

$\alpha_{\beta 2}$ and $Z_{\beta 2}$ are the α_{β} and Z_{β} values giving the minimum liquid pressure $(P_{gd})_{min}$ as defined in **4.28.1-2, Part N of the Rules**.

In order to evaluate the maximum pressure differential ΔP , pressure differentials are to be evaluated over the full range of the acceleration ellipse (refer to **Fig. N4.1 to Fig. N4.3, Part N of the Rules**).

Paragraph N4.23.3 has been amended as follows.

N4.23.3 Ultimate Design Condition

1 For the purpose of the requirements in **4.23.3-1, Part N of the Rules**, the circumferential stress at supports of type C independent tanks is to be assessed in accordance with the following **(1)** through **(4)**:

(1) For horizontal cylindrical tanks made of carbon manganese steel supported in saddles, the equivalent stress in the stiffening rings is not to exceed the following values if calculated using finite element method:

$$\sigma_e \leq \sigma_{all}$$

where:

$$\sigma_{all} = \min(0.57R_m; 0.85R_e)$$

$$\sigma_e = \sqrt{(\sigma_n + \sigma_b)^2 + 3\tau^2}$$

σ_e : von Mises equivalent stress (N/mm²)

σ_n : normal stress (N/mm²) in the circumferential direction of the stiffening ring

σ_b : bending stress (N/mm^2) in the circumferential direction of the stiffening ring

τ : shear stress (N/mm^2) in the stiffening ring

R_m and R_e as defined in **4.18.1(3), Part N of the Rules**.

Equivalent stress values σ_e are to be calculated over the full extent of the stiffening ring for a sufficient number of load cases.

(2) The following assumptions are to be made for the stiffening rings:

(a) The stiffening ring is to be considered as a circumferential beam formed by web, face plate, doubler plate, if any, and associated shell plating. The effective width of the associated plating is to be taken as the following **i)** and **ii)**:

i) For cylindrical shells:

An effective width (mm) not greater than $0.78\sqrt{rt}$ on each side of the web. A doubler plate, if any, may be included within that distance.

where:

r = mean radius of the cylindrical shell (mm)

t = shell thickness (mm)

ii) For longitudinal bulkheads (in the case of lobe tanks):

The effective width is to be determined according to established standards. A value of $20t_b$ on each side of the web may be taken as a guidance value.

where:

t_b = bulkhead thickness (mm).

(b) The stiffening ring is to be loaded with circumferential forces, on each side of the ring, due to the shear stress, determined by the bi-dimensional shear flow theory from the shear force of the tank.

(3) For calculation of reaction forces at the supports, the following **(a)** and **(b)** are to be taken into account:

(a) Elasticity of support material (intermediate layer of wood or similar material)

(b) Change in contact surface between tank and support, and of the relevant reactions, due to the following **i)** and **ii)**

i) thermal shrinkage of tank

ii) elastic deformations of tank and support material.

The final distribution of the reaction forces at the supports is not to show any tensile forces.

(4) The buckling strength of the stiffening rings are to be examined.

2 The “calculations using accepted pressure vessel buckling theory” referred to in the requirements in **4.23.3-2, Part N of the Rules** means calculations based on standards such as *JIS*, *ASME*, etc. P_4 among design external pressure P_e is to be the value computed by applying the requirements in **10.2, 18.2 and 19.2, Part C of the Rules** corresponding to the location of the tanks.

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 for which the date of contract for construction is before the effective date.

N3 SHIP ARRANGEMENTS

N3.2 Accommodation, Service and Machinery Spaces and Control Stations

Paragraph N3.2.6 has been amended as follows.

N3.2.6 Closing Devices of Air Intakes, Outlets and Other Openings

1 The closing devices that need not be operable from within the single spaces may be located in centralized positions.

2 Engine-room casings, cargo machinery spaces, electric motor rooms and steering gear compartments are generally considered as spaces not covered by 3.2.6, Part N of the Rules and, therefore, the requirement for closing devices need not be applied to these spaces.

3 The closing devices are to give a reasonable degree of gas tightness. Ordinary steel fire-flaps without gaskets/seals are not to be considered satisfactory.

4 Regardless of this interpretation, the closing devices are to be operable from outside of the space (see 5.2.1-1, Part R of the Rule).

~~1 For the purpose of the requirements in 3.2.6, Part N of the Rules, closing devices for air intakes and openings are to have suitable gas tightness where steel made fire protection flaps without gaskets are not accepted.~~

~~2 For the purpose of the requirements in 3.2.6, Part N of the Rules, the closing devices in ships intended to carry toxic products the following requirements (1) and (2) are to be complied with:~~

~~(1) The requirements in the 1 above are to be complied with.~~

~~(2) The requirement for fitting air intakes and openings with closing devices operated from inside the space need not apply to engine room casings, cargo machinery spaces, electric motor rooms and steering gear compartments.~~

N3.3 Cargo Machinery Spaces and Turret Compartments

Paragraph N3.3.1 has been amended as follows.

N3.3.1 Location

1 For the purpose of the requirements in 3.3.1, Part N of the Rules, where cargo machinery spaces are permitted to be fitted at the after end of the aftermost hold space or at the forward, the arrangements are, for example, as shown in Fig. N3.3.1-1.

2 For the purpose of the requirements in 3.3.1, Part N of the Rules, the requirements in 4.5.10, Part R of the Rules do not apply.

N8 CARGO TANK VENT SYSTEMS

N8.2 Pressure Relief Systems

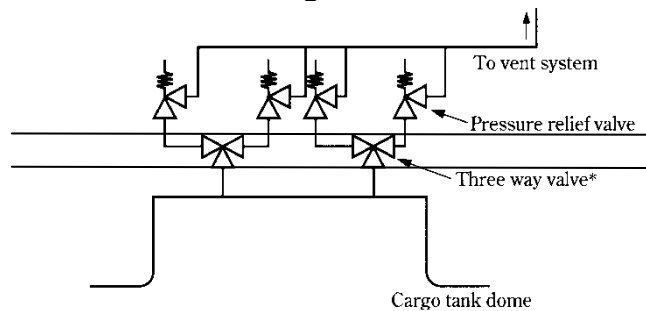
N8.2.9 Means of Emergency Isolation of PRVs

Sub-paragraph -2 has been amended as follows.

2 The requirement “to allow only one of the cargo tank installed PRVs to be isolated” “safe means of emergency isolation” specified in **8.2.9(2), Part N of the Rules** ~~may be achieved, for example, by the arrangement shown in Fig. N8.2.7, the 3 way valve arrangement shown in Fig. N8.2.9-1, the arrangements with an interlocking stop valve as shown in Fig. N8.2.9-2 or arrangements with balloons~~ is to be provided so that a PRV can be isolated on a temporary basis to reseal or repair the valve before putting the PRV back into service. Such means of emergency isolation are to be installed in a manner that does not allow their inadvertent operation.

Fig. N8.2.9-1 and Fig. N8.2.9-2 have been deleted.

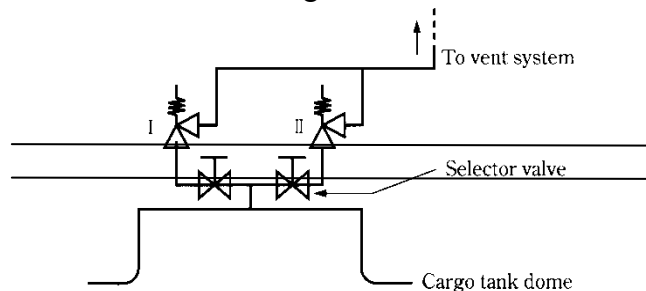
~~Fig. N8.2.9-1~~



~~Note:~~

~~*: 3 way valve in which the direction of opening is indicated where means are provided to prevent any intermediate valve position.~~

~~Fig. N8.2.9-2~~



N8.4 Sizing of Pressure Relieving Systems

Paragraph N8.4.1 has been amended as follows.

N8.4.1 Sizing of PRVs

1 For the purpose of the requirements in **8.4.1(2), Part N of the Rules**, the fire exposure factor (F) is to be in accordance with the following requirements (1) to (4):

((1) to (4) are omitted.)

2 For the purpose of the requirements in **8.4.1(2)** and **Fig. N8.1, Part N of the Rules**, the external surface area A (m^2) 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. N8.4.1-1**), 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 $L_{min}/10$:

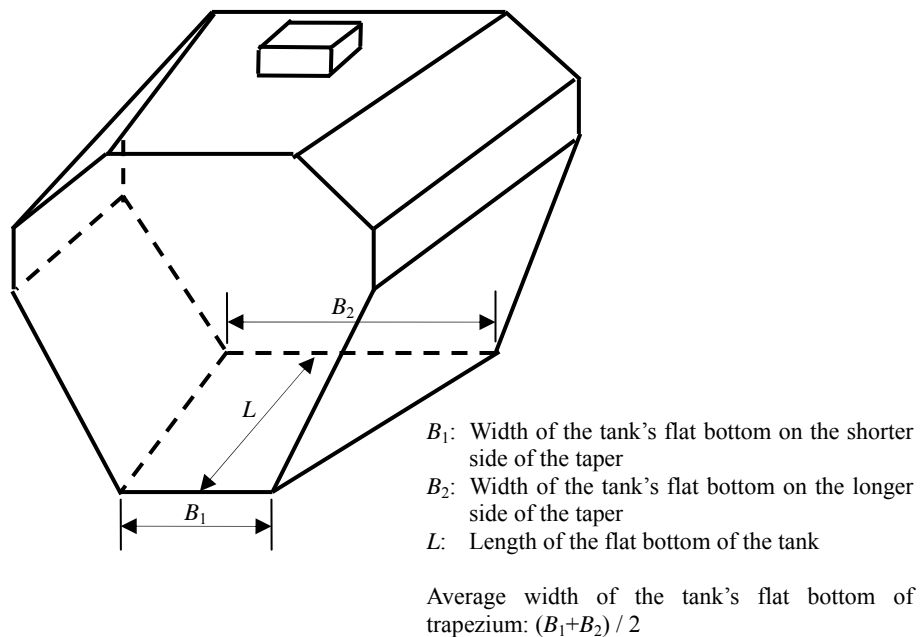
External surface area minus flat bottom surface area

(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. N8.4.1-1 has been added as follows.

Fig. N8.4.1-1 Example of Tapered Tank



N11 FIRE PROTECTION AND EXTINCTION

N11.3 Water Spray System

Paragraph N11.3.6 has been added as follows.

N11.3.6 Pipes, Valves, Nozzles and Other Fittings

The wording “means are to be provided to back-flush the system with fresh water” referred to in 11.3.6, Part N of the Rules is to be understood to mean that arrangements are to be provided so that the water-spray system as a whole (i.e. piping, nozzles and in-line filters) can be flushed or back-flushed, as appropriate, with fresh water to prevent the blockage of pipes, nozzles and filters.

EFFECTIVE DATE AND APPLICATION (Amendment 1-2)

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.

N4 CARGO CONTAINMENT

N4.20 Construction Processes

N4.20.3 Testing

Sub-paragraph -4(1) has been amended as follows.

4 In accordance with the requirements in **4.20.3-5** and **5.13.2-5, Part N of the Rules** the following tests **(1)** and **(2)** are to be conducted in the attendance of the Surveyor to verify the performance of the cargo containment installations and cargo handling equipment:

(1) Gas trial

On items given in **Table N4.20.3-1**, tests are to be conducted to verify the performance of the cargo containment system, cargo handling equipment and instrumentation using a suitable quantity of the cargo after the completion of all the construction work. However, for cargo tanks ~~with a design temperature of 0°C or more which do not require either cool-down operations or the cargo pressure/temperature controls specified in 7.1.1, Part N of the Rules, the omission of this test~~ gas trials may be accepted ~~if substitution is made by the operating test with the substituting medium to verify the requirements given in~~ in cases where the performance of the equipment specified in items **5** and **6** of **Table N4.20.3-1** is verified through operating tests using a substitute medium at manufacturing plants or shipyards, except for the case where the tank is of the first cargo tank manufactured by the manufacturer of cargo tanks.

(2) Cargo full loading test

On items given in **Table N4.20.3-2**, tests are to be conducted after completion of all the construction work to verify that the cargo containment installations, cargo handling equipment and instrumentation satisfy the design conditions under the fully loaded condition of cargo. However, for this test, the attendance of the Surveyor may be omitted for ships, other than those carrying liquefied methane (*LNG*) in bulk, whose cargo containment and cargo transfer installations can be regarded as of the same specification of those which have previously been built and tested at the same shipyard.

EFFECTIVE DATE AND APPLICATION (Amendment 1-3)

1. The effective date of the amendments is 1 June 2017.
2. Notwithstanding the amendments to the Guidance, the current requirements apply to the surveys for which the application is submitted to the Society before the effective date.
3. Notwithstanding the provision of preceding **2.**, the amendments to the Guidance may apply to the surveys for which the application is submitted to the Society before the effective date upon request by the owner.