07-440

RULES FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

GUIDANCE FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

Part N Ships Carrying Liquefied Gases in Bulk

Rules for the Survey and Construction of Steel Ships
Part N 2007 AMENDMENT NO.1
Guidance for the Survey and Construction of Steel Ships
Part N 2007 AMENDMENT NO.2

Rule No.48 / Notice No.51 27th September 2007
Resolved by Technical Committee on 2nd July 2007
Approved by Board of Directors on 24th July 2007

ClassNK
NIPPON KAIJI KYOKAI

RULES FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

RULES

Part N Ships Carrying Liquefied Gases in Bulk

2007 AMENDMENT NO.1

Rule No.48 27th September 2007

Resolved by Technical Committee on 2nd July 2007

Approved by Board of Directors on 24th July 2007

Rule No.48 27th September 2007
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

Chapter 11 FIRE PROTECTION AND FIRE EXTINCTION

11.1 Fire Safety Requirements (*IGC Code* 11.1)

Paragraph 11.1.1 has been amended as follows.

11.1.1 General

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 ~~**(3)**~~**(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℃ and other liquid products having a similar fire hazard.

(1) **1.1.1** (except **1.1.1-2**), ~~and~~ **4.5.1-6** and **4.5.10, Part R** are not to apply;
(2) **10.2**~~(except **10.2.1-7**)~~, **10.4.4** and **10.5**(except **10.5.5**)**, Part R** are to apply, regarding the ships to be tankers of 2,000 *gross tonnage* and over;
(3) The following requirements in other Parts related to tankers are not to apply and are to be replaced by Chapters and Sections of this Part as shown in **Table N11.1**.
(4) **13.3.3** and **13.4.4**, **Part R** are to apply to ships of 500 *gross tonnage* and over.

11.2 Fire Water Main Equipment (*IGC Code* 11.2)

Paragraphs 11.2.1 and 11.2.2 have been amended as follows.

11.2.1 Fire Pump and Fire Main

All ships, irrespective of size and carrying products which are subject to this Part are to comply with the requirements of **10.2**, **10.4** and **10.5, Part R** except that the required fire pump capacity and fire main and water service pipe diameter are not to be limited by the provisions of **10.2.1-3** and **10.2.2-4(1), Part R** when the fire pump and fire main are used as part of the water spray system as permitted by **11.3.3.** In addition, the **10.2.1-6(1), Part R** is to be met at a pressure of at least 0.5 *MPa* gauge.

11.2.2 Arrangement of Fire Hydrants

The arrangements are to be such that at least two jets of water can reach any part of the deck in

the cargo area and those portions of the cargo containment system and tank covers above the deck. The necessary number of fire hydrants is to be located to satisfy the above arrangements and to comply with the requirements of **10.2.1-5** and **10.2.3-3, Part R**, with hose lengths ~~not exceeding 33 *m*~~ as specified in **10.2.3-1(1)**.

Section 11.6 has been amended as follows.

11.6 ~~Fireman's~~Fire-fighter's Outfits

11.6.1 Number of Outfits (*IGC Code* 11.6.1)

Every ship carrying flammable products are to carry ~~fireman's~~fire-fighter's outfits complying with the requirements of **10.10** as shown in **Table N11.2**.

Table N11.2

Total cargo capacity	Number of outfits
5,000 m^3 and below	4
above 5,000 m^3	5

11.6.2 Breathing Apparatus (*IGC Code* 11.6.3)

Any breathing apparatus required as part of a ~~fireman's~~fire-fighter's outfit is to be a self-contained air-breathing apparatus having a capacity of at least 1,200 *l* of free air.

Chapter 19 MINIMUM REQUIREMENTS (with reference to *IGC CODE* Chapter 19)

The following two products have been added to Table N19.1.

Table N19.1 Summary of Minimum Requirements 19.1.1

a	b	c	d	e	f	g	h	i
Product name	UN number	Ship type	Independent tank type C required	Control of vapour space within cargo tanks	Vapour detection	Gauging	MFAG table No.	Special requirements
Dimethyl ether	-	2G/2PG	-	-	*F+T*	*C*	-	
Carbon dioxide	-	3G	Yes	-	-	*C*	-	

EFFECTIVE DATE AND APPLICATION

1. The effective date of the amendments is 1 July 2008.

2. Notwithstanding the amendments to the Rules, the current requirements may 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.

GUIDANCE FOR THE SURVEY AND CONSTRUCTION OF STEEL SHIPS

GUIDANCE

Part N Ships Carrying Liquefied Gases in Bulk

2007 AMENDMENT NO.2

Notice No.51 27th September 2007
Resolved by Technical Committee on 2nd July 2007

Notice No.51 27th September 2007
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 2-1

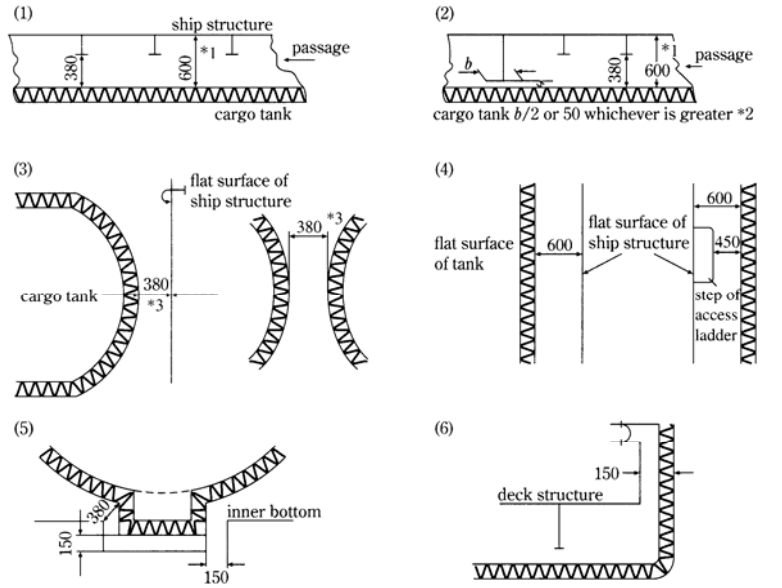
N3 SHIP ARRANGEMENTS

N3.5 Access to Spaces in the Cargo Area

N3.5.1 Access for Inspection of Inner Hull

Fig N3.5.1 has been amended as follows.

Fig N3.5.1 Access for Inspection of Insulation (*mm*)



Notes:

＊1: This distance between the surface to be inspected and the surface to which above structural elements are fitted, e.g. deck, bulkhead or shell, should be at least 450*mm* in case of a curved tank surface(e.g. in case of C-tank).

＊2: Where the surveyor does not require to pass between the surface to be inspected and any part of the structure.

＊3: Where the surveyor does not require to pass between that curved surface, a smaller distance than 380*mm* may be accepted taking into account the curved surface.

Notes:

1) If necessary for inspection, fixed or portable staging should be installed. This staging should not impair the distances required above (1) to (4).

2) If fixed or portable ventilation ducting has to be fitted in compliance with **1.2.2, Part N of the Rules**, such ducting should not impair the distances required above (1) to (4).

3) If there is no suction well, notwithstanding figure (5) above, the distance between the cargo tank sump and the inner bottom may be reduced to 50 mm.

N4 CARGO CONTAINMENT

N4.2 Definitions

Paragraph N4.2.4 has been added as follows.

N4.2.4 Independent Tanks

If the carriage of products, having a relative density exceeding1.0 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 **4.2.4-4, Part N of the Rules**.

$$\Delta P = \frac{\rho}{1.02\times10^5}(\alpha_{\beta1}Z_{\beta1} - \alpha_{\beta2}Z_{\beta2}) \qquad (MPa)$$

where ρ, α_β, Z_β are as defined in **4.3.2, Part N of the Rules**.

$\alpha_{\beta1}$ and $Z_{\beta1}$ are the α_β- and Z_β- values giving the maximum liquid pressure as defined in **4.3.2, Part N of the Rules**.

$\alpha_{\beta2}$ and $Z_{\beta2}$ are the α_β- and Z_β- values giving the minimum liquid pressure as defined in **4.3.2, Part N of the Rules**.

N4.6 Supports

Paragraph N4.6.2 has been added as follows.

N4.6.2 Allowable Stresses of Tanks with Supports

For the purpose of the requirements in **4.6.2, 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:

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

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 **4.6.2** and **4.6.3, 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 **4.5.1-7(1), 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

N7 CARGO PRESSURE/TEMPERATURE CONTROL

N7.2 Refrigeration Systems

Paragraph N7.2.1 has been amended as follows.

N7.2.1 Stand-by Unit and Heat Exchanger

1 For the purpose of the requirements in **7.2.1, Part N of the Rules**, the stand-by unit of the refrigeration system and stand-by heat exchangers are to comply with the following requirements **(1)** through **(4)** :

(1) The stand-by refrigeration system referred to in the requirements of the Rules does not include heat exchanger.

(2) Where the whole necessary capacity is shared by multiple sets of units, the capacity of the stand-by unit may be made in such a way that it compensates the capacity of one unit having the largest capacity among others.

(3) Where the refrigeration plants are all driven by electric motors, electrical supply to the motors is to be fed from two or more generators.

(4) The piping of the stand-by heat exchangers may, for example, be made as given in **Fig. N7.2.1**. In this case, the total capacity of the heat exchangers including stand-by unit is to be 125% or more of the maximum requirement.

2 Reliquefaction plant of methane (*LNG*) is to comply with the following requirements **(1)** and **(2)** :

(1) Mechanical refrigeration fitted as the primary system for cargo pressure control

(a) **7.2, Part N of the Rules** is to apply to refrigeration systems when fitted on *LNG* carriers, i.e. standby capacity is to be determined in accordance with **7.2.1, Part N of the Rules**. A stand-by *LNG*/refrigerant heat exchanger need not be provided and the fitted *LNG*/refrigerant heat exchanger will not be required to have 25% excess capacity over that for normal requirements. Other heat exchangers utilizing water cooling are to have a stand-by or have at least 25 % excess capacity.

(b) Unless an alternative means of controlling the cargo pressure/temperature is provided to the satisfaction of the Society, the stand-by unit affording spare capacity at least equal to the largest required single unit is to be fitted. For the purpose of complying with the above, a suitable alternative means of pressure/temperature control is to be following i) or ii):

i) The auxiliary boiler capable of burning the boil-off vapours and disposing of the generated steam or an alternative waste heat system acceptable to the Society. Consideration may be given to systems burning only part of the boil-off vapour if it can be shown that *MARVS* will not be reached within a period of 21 *days*.

ii) Controlled venting of cargo vapours as specified in **7.3.2, Part N of the Rules**, if permitted by the Administrations concerned.

(2) Mechanical refrigeration fitted as the secondary system for cargo pressure control

Where a refrigeration plant is fitted as a means of disposing of excess energy as detailed in **7.1.1(2), Part N of the Rules**, no stand-by unit is required for the refrigeration plant.

N8 CARGO TANK VENT SYSTEMS

N8.2 Pressure Relief Systems

Paragraph N8.2.2 has been amended as follows.

N8.2.2 Pressure Relief System for Interbarrier Spaces

1 The "pressure relief devices to the satisfaction of the Society" referred to in the requirements in **8.2.2, Part N of the Rules** means pressure relief valves, rupture discs or equivalent, or two or more of them in combination are to be provided in each space to be covered. Interbarrier space pressure relief devices in the scope of this interpretation are emergency devices for protecting the hull structure from being unduly overstressed in case of a pressure rise in the interbarrier space due to primary barrier failure. Therefore such devices need not comply with the requirements of **8.2.9** and **8.2.10, Part N of the Rules**.

2 When only pressure relief valves are provided as the pressure relief devices given in the preceding **-1**, the following requirements **(1)** and **(2)** are to be complied with :

(1) In case where the cargo tank is of the type *A* independent tank, semi-membrane tank provided with complete secondary barrier, membrane tank or integral tank, the following requirements **(a)** and **(b)** are to be complied with :

(a) The capacity of the pressure relief system is to be sufficient to relieve the greater of the maximum supply capacity of the inerting system and dry air supply system or the estimated volume of cargo evaporation in an event of failure of the cargo tank.

(b) Pressure relief valves are to be in accordance with the requirements in **N8.2.5**.

(2) In case where the cargo tank is of the type *B* independent tank or semi-membrane tank provided with partial secondary barrier, the following requirements **(a)** and **(b)** are to be complied with :

(a) The capacity of pressure relief device is to be in accordance with the preceding **(1)(a)**.

(b) Pressure relief valves may not be such as being approved in accordance with the requirements in **N8.2.5**. However, they are to be equivalent to those complying with the requirements for *PV* valves in **R11.6.1**.

3 When, as a pressure relief device referred to in the preceding **-1**, pressure valve and rupture disc are provided in combination, they are to conform to the following requirements **(1)** to **(3)** for the cargo tank types indicated in the preceding **-2(1)** :

(1) The capacity of the pressure relief valve is to be sufficient to relieve the maximum supply capacity of the inerting system.

(2) Pressure relief valves are to be in accordance with the requirements in the preceding **-2(2)(b)**.

(3) The capacity of rupture disc is to be sufficient to relieve the volume of cargo evaporation in an event of failure of the cargo tank, and the construction is to be as deemed appropriate by the Society.

4 Size of pressure relief devices

(1) The combined relieving capacity of the pressure relief devices for interbarrier spaces surrounding type A independent cargo tanks where the insulation is fitted to the cargo tanks may be determined by the following formula:

$$Q_{sa} = 3.4 A_c \frac{\rho}{\rho_v} \sqrt{h} \quad (m^3/s)$$

where:

Q_{sa} = minimum required discharge rate of air at standard conditions of 273 K and 1.013 bar

A_c = design crack opening area (m^2)

$$A_c = \frac{\pi}{4}\delta l \ (m^2)$$

δ = max crack opening width (m)

$\delta = 0.2t$ (m)

t = thickness (m) of tank bottom plating

l = design crack length (m) equal to the diagonal of the largest plate panel of the tank bottom.

h = max liquid height (m) above tank bottom plus $10MARVS$

ρ = density of product liquid phase (kg/m^3) at the set pressure of the interbarrier space relief device

ρ_v = density of product vapour phase (kg/m^3) at the set pressure of the interbarrier space relief device and a temperature of 273 K

$MARVS$ = max allowable relief valve setting (bar) of the cargo tank.

(2) The relieving capacity of pressure relief devices of interbarrier spaces surrounding independent type B cargo tanks may be determined on the basis of the method given in **(1)** above, however, the leakage rate is to be determined in accordance with **4.7.6-1., Part N of the Rules**.

(3) The relieving capacity of pressure relief devices for interbarrier spaces of membrane and semimembrane tanks is to be evaluated on the basis of specific membrane/semi-membrane tank design.

(4) The relieving capacity of pressure relief devices for interbarrier spaces adjacent to integral type cargo tanks may, if applicable, be determined as for type A independent cargo tanks.

N13 INSTRUMENTATION (GAUGING, GAS DETECTION)

N13.2 Level Indicators for Cargo Tanks

Paragraph N13.2.1 has been amended as follows.

N13.2.1 General

For the purpose of the requirements **13.2.1, Part N of the Rules**, the following requirements **(1)** and **(2)** are to be complied with :

(1) The performance and construction of level gauges are to be approved by the **Guidance for the Approval and Type Approval of Materials and Equipment for Marine Use**.

(2) The effectiveness and number of units of level gauges are to be in accordance with the following requirements **(a)** and **(b)** :

(a) Where only one level gauge is fitted, it is to be arranged so that any necessary maintenance, such as an overhaul, can be carried out while the cargo tank is in service.

(b) For example, in case where gauging of levels is limited at high level and low level, such level is considered effective on condition that cargo is loaded within such range.

EFFECTIVE DATE AND APPLICATION (Amendment 2-1)

1. The effective date of the amendments is 1 October 2007.

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

* "contract for construction" is defined in IACS Procedural Requirement (PR) No.29 (Rev.4).

IACS PR No.29 (Rev.4)

1. The date of "contract for construction" of a vessel is the date on which the contract to build the vessel is signed between the prospective owner and the shipbuilder. This date and the construction numbers (i.e. hull numbers) of all the vessels included in the contract are to be declared to the classification society by the party applying for the assignment of class to a newbuilding.

2. The date of "contract for construction" of a series of vessels, including specified optional vessels for which the option is ultimately exercised, is the date on which the contract to build the series is signed between the prospective owner and the shipbuilder.

For the purpose of this Procedural Requirement, vessels built under a single contract for construction are considered a "series of vessels" if they are built to the same approved plans for classification purposes. However, vessels within a series may have design alterations from the original design provided:

(1) such alterations do not affect matters related to classification, or

(2) If the alterations are subject to classification requirements, these alterations are to comply with the classification requirements in effect on the date on which the alterations are contracted between the prospective owner and the shipbuilder or, in the absence of the alteration contract, comply with the classification requirements in effect on the date on which the alterations are submitted to the Society for approval.

The optional vessels will be considered part of the same series of vessels if the option is exercised not later than 1 year after the contract to build the series was signed.

3. If a contract for construction is later amended to include additional vessels or additional options, the date of "contract for construction" for such vessels is the date on which the amendment to the contract, is signed between the prospective owner and the shipbuilder. The amendment to the contract is to be considered as a "new contract" to which **1.** and **2.** above apply.

4. If a contract for construction is amended to change the ship type, the date of "contract for construction" of this modified vessel, or vessels, is the date on which revised contract or new contract is signed between the Owner, or Owners, and the shipbuilder.

Notes:

1. This Procedural Requirement applies to all IACS Members and Associates.
2. This Procedural Requirement is effective for ships "contracted for construction" on or after 1 January 2005.
3. Revision 2 of this Procedural Requirement is effective for ships "contracted for construction" on or after 1 April 2006.
4. Revision 3 of this Procedural Requirement was approved on 5 January 2007 with immediate effect.
5. Revision 4 of this Procedural Requirement was adopted on 21 June 2007 with immediate effect.

Amendment 2-2

N8 CARGO TANK VENT SYSTEMS

N8.2 Pressure Relief Systems

Paragraph N8.2.4 has been amended as follows.

N8.2.4 Arrangement of Pressure Relief Valves

For the purpose of the requirements in **8.2.4, Part N of the Rules**, for the cargo tank with the design temperature lower than 0^{o}C, it is to be verified through temperature distribution calculation, etc. that the valve would not freeze or it is provided with anti-freezing construction. In ships where the requirements in ~~Chapter 28, Part C~~**Part I of the Rules** apply or ships regularly navigate through the sea of cold zone, the pressure relief valves are to have satisfactory proved function under freezing condition or to be provided with heating system to prevent functional inability due to freezing.

EFFECTIVE DATE AND APPLICATION (Amendment 2-2)

1. The effective date of the amendments is 1 March 2008.

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

* "contract for construction" is defined in IACS Procedural Requirement (PR) No.29 (Rev.4).

IACS PR No.29 (Rev.4)

1. The date of "contract for construction" of a vessel is the date on which the contract to build the vessel is signed between the prospective owner and the shipbuilder. This date and the construction numbers (i.e. hull numbers) of all the vessels included in the contract are to be declared to the classification society by the party applying for the assignment of class to a newbuilding.

2. The date of "contract for construction" of a series of vessels, including specified optional vessels for which the option is ultimately exercised, is the date on which the contract to build the series is signed between the prospective owner and the shipbuilder.

For the purpose of this Procedural Requirement, vessels built under a single contract for construction are considered a "series of vessels" if they are built to the same approved plans for classification purposes. However, vessels within a series may have design alterations from the original design provided:

(1) such alterations do not affect matters related to classification, or

(2) If the alterations are subject to classification requirements, these alterations are to comply with the classification requirements in effect on the date on which the alterations are contracted between the prospective owner and the shipbuilder or, in the absence of the alteration contract, comply with the classification requirements in effect on the date on which the alterations are submitted to the Society for approval.

The optional vessels will be considered part of the same series of vessels if the option is exercised not later than 1 year after the contract to build the series was signed.

3. If a contract for construction is later amended to include additional vessels or additional options, the date of "contract for construction" for such vessels is the date on which the amendment to the contract, is signed between the prospective owner and the shipbuilder. The amendment to the contract is to be considered as a "new contract" to which **1.** and **2.** above apply.

4. If a contract for construction is amended to change the ship type, the date of "contract for construction" of this modified vessel, or vessels, is the date on which revised contract or new contract is signed between the Owner, or Owners, and the shipbuilder.

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5. Revision 4 of this Procedural Requirement was adopted on 21 June 2007 with immediate effect.