TÜRK LOYDU

TL-R G

Requirements Concerning Gas Tankers

January 2024

These requirements are prepared by embedding related IACS Unified Requirements. In order to have consistency, the numbering of the requirements are kept as the same with related IACS Unified Requirements.

Unless otherwise specified, these Rules apply according to the implementation dates as defined in each requirement. See Rule Change Summary on TL website for revision details.

This latest edition incorporates all rule changes.

"General Terms and Conditions" of the respective latest edition will be applicable (see Rules for Classification and Surveys).

If there is a difference between the rules in English and in Turkish, the rule in English is to be considered as valid. This publication is available in print and electronic pdf version. Once downloaded, this document will become UNCONTROLLED. Please check the website below for the valid version.

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TL- R G2 Liquefied gas cargo tanks and process pressure vessels

G2.1 General

G2.1.1 The present texts give the general principles which are applied by TL for approval and survey of the relevant items of liquefied gas tankers for classification purpose. They do not intend to cover full details of such approval and survey procedures which are to be found in TL Rules.

G2.1.2 Where appropriate, these Rules refer to the basic tank types which are defined under 4.1 of IMO Resolution MSC.370(93) Amendments to the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code). Tanks differing from these definitions will be the subject of special consideration.

G2.1.3 Consideration of future technical advances may warrant modifications to the principles and details set forth in the text. TL will accordingly review continuously these requirements.

G2.2 Scope

The requirements here below apply to independent cargo tanks type C (pressure cargo tanks) such as defined in 4.23 of the IGC Code. They may also apply to process pressure vessels if required by TL. The words 'pressure vessels' are used in this text to cover the two above-mentioned categories. These requirements apply to tanks and vessels made of materials defined in TL- R W1.

Note:

1. This requirement is implemented by for independent cargo tanks type C (pressure cargo tanks) such as defined in 4.23 of the IGC Code:

   i) when an application for certification is dated on or after 1 January 2020; and

   ii) which are installed in new ships for which the date of contract for construction is on or after 1 January 2020.

2. The “contracted for construction” date means the date on which the contract to build the vessel is signed between the prospective owner and the shipbuilder. For further details regarding the date of “contract for construction”, refer to TL- PR 29.

G2.3 Calculation of thickness under internal pressure

G2.3.1 General

For pressure vessels, the thickness calculated according to 4.23.2.4 of the IGC Code shall be considered as a minimum thickness after forming, without any negative tolerance.

Scantlings based on internal pressure shall be calculated as follows: the thickness and form of pressure containing parts of pressure vessels under internal pressure, including flanges, are to be determined according to TL Rules. These calculations are to be based in all cases on generally accepted pressure vessel design theory. Openings in pressure containing parts of pressure vessels are to be reinforced in accordance with TL Rules.

G2.3.2 Design pressure

For calculation according to G2.3.1, the design liquid pressure defined under 4.13.2 of the IGC Code is to be taken into account in the internal pressure calculations.

G2.3.3 Efficiency factor for welded joints

The welded joint efficiency factor to be used in calculation according to G2.3.1 is to be 0.95 when the inspection and nondestructive examination stated under G2.9.2 (i) are carried out.

This figure may be increased up to 1.0 taking into account other considerations, such as materials used, type of joints, welding procedure, type of loading, etc. For process pressure vessels, TL may accept partial nondestructive examinations, but not less than those under G2.9.2 (ii) may be allowed depending on the material used, the design temperature, the nil ductility temperature of the material as fabricated, the type of joint, welding procedure, etc., but in this case the efficiency factor 0.85 is to be adopted.

For special materials, the above mentioned factors are to be reduced depending on the specified mechanical properties of the welded joint.

G2.3.4 Maximum allowable stress

The maximum allowable stresses to be used in calculation according to G2.3.1 shall not exceed the value defined in 4.23.3.1 of the IGC Code.

G2.3.5 Corrosion allowance

Corrosion allowance need not be required in addition to the thickness resulting from the structural analysis. However, where there is no environmental control, such as inerting around the cargo tank, or where the cargo is of a corrosive nature, TL require a suitable corrosion allowance.

G2.3.6 Minimum thickness of shell and heads

The thickness, including corrosion allowance, after forming of any shell and head is not to be less than 5mm for C-Mn steels and Ni steels, 3 mm for austenitic steel or 7 mm for aluminium alloy.

G2.4 Buckling criteria

G2.4.1 General

Buckling criteria shall be as follows: the thickness and form of pressure vessels subject to external pressure and other loads causing compressive stresses are to be calculated according to TL Rules. These calculations in all cases are to be based on generally accepted pressure vessel buckling theory and are to adequately account for the difference in theoretical and actual buckling stress as a result of plate edge misalignment, ovality and deviation from true circular form over a specified arc or chord length.

G2.4.2 Design external pressure

The design external pressure *P*e to be used for verifying the buckling of the pressure vessels is given by the following formula:

$$Pe = P_1 + P_2 + P_3 + P_4 \text{ (MPa)}$$

Where

P_1 = setting value of vacuum relief valves. For vessels not fitted with vacuum relief valves, *P*1 is to be specially considered, but is, in general, not to be taken less than 0.025 MPa.

P_2 = for pressure vessels or parts of pressure vessels in completely closed spaces: the set pressure of the pressure relief valves for these spaces.
Elsewhere $P_2 = 0$.

P_3 = compressive actions in the shell due to the weight and contraction of insulation, weight of shell, including corrosion allowance, and other miscellaneous external pressure loads to which the pressure vessel may be subjected. These include but are not limited to weight of domes, weight of towers and piping, effect of product in the partially filled condition, accelerations and hull deflection. The local effect of external and/or internal pressure is also to be taken into account.

P_4 = external pressure due to head of water for pressure vessels or part of pressure vessels on exposed decks.
Elsewhere $P_4 = 0$.

G2.5 Stress analysis in respect of static and dynamic loads

G2.5.1 Pressure vessel scantlings are to be determined in accordance with G2.3 and G2.4.

G2.5.2 Calculations of the loads and stresses in way of the supports and the shell attachment of the support are to be made. Loads as applicable, from 4.12 to 4.15 of the IGC Code, are to be used. Stresses in way of the supports are to be according to a recognized standard acceptable to TL.

G2.5.3 Furthermore, when required by TL, secondary stresses and thermal stresses are to be specially considered.

G2.5.4 In special cases, a fatigue analysis may be required by TL.

G2.6 Accident design condition

G2.6.1 The tanks and the tank supporting structures shall be designed for the accidental loads and design conditions specified in 4.3.4.3 and 4.15 of the IGC Code, as applicable.

G2.6.2 When subjected to the accidental loads specified in 4.15 of the IGC Code, the stress shall comply with the acceptance criteria specified in 4.23.3.1 of the IGC Code, modified as appropriate taking into account their lower probability of occurrence.

G2.7 Welding joints details

G2.7.1 All longitudinal and circumferential joints of pressure vessels are to be of butt welded, full penetration, double vee or single vee type. Full penetration butt welds are to be obtained by double welding or by the use of backing rings. If used, backing rings are to be removed except from very small process pressure vessels. Other edge preparations may be permitted depending on the results of the tests carried out at the approval of the welding procedure.

G2.7.2 The bevel preparation of the joints between the pressure vessel body and domes and between domes and relevant fittings are to be designed according to a standard acceptable to TL. All welds connecting nozzles, domes or other penetrations to the vessel and all welds connecting flanges to the vessel or nozzles, are to be full penetration welds.

G2.8 Stress relieving

G2.8.1 For pressure vessels made of carbon and carbon-manganese steel, post-weld heat treatment is to be performed after welding if the design temperature is below -10°C. Post-weld treatment in all other cases and for materials other than those mentioned above shall be to recognized standards acceptable to TL. The soaking temperature and holding time are to be according to the recognized standards acceptable to TL.

G2.8.2 In the case of large cargo pressure vessels of carbon or carbon-manganese steel for which it is difficult to perform the heat treatment, mechanical stress relieving by pressurizing may be carried out as an alternative to the heat treatment if agreed by TL and subject to the conditions of 6.6.2.3 of the IGC Code.

G2.9 Inspection and nondestructive examination

G2.9.1 Manufacture and workmanship

The tolerances relating to manufacture and workmanship (i.e. out-of-roundness, local deviations from the true form, welded joints alignment, tapering of plates having different thicknesses, etc.) are to comply with recognized standards acceptable to TL. The tolerances are also to be related to the buckling analysis (see G2.4).

G2.9.2 Nondestructive examination

The extent of nondestructive testing shall be total or partial according to recognized standards acceptable to TL, but the controls to be carried out shall not be less than the following:

(i) Total nondestructive examination (see G2.3.3)

Radiography
butt welds: 100%
Surface crack detection
all welds: 10%
reinforcement rings around holes, nozzles, etc: 100%

Ultrasonic testing
Ultrasonic testing may be accepted for replacing partially the radiographic examination, if so specially allowed by TL. In addition TL may require a total ultrasonic examination on welding of reinforcement rings and holes, nozzles, etc.

(ii) Partial nondestructive examination (see G2.3.3)

Radiography
butt welds: all welded joints crossing and at least 10% of the full length at selected positions uniformly distributed
Surface crack detection
reinforcement rings around holes, nozzles, etc 100%

Ultrasonic testing
as may be required by TL each instance.

G2.10 Pressure testing

G2.10.1 Each pressure vessel is to be subjected to a hydrostatic test according to TL Rules , at a pressure, measured at the top of the tanks, of not less than 1.5 P_0, In no case during the pressure test is the calculated primary membrane stress at any point to exceed 90% of the yield stress of material (for definition of P_0, see 4.1.2 of the IGC Code). To ensure that this condition is satisfied where calculations indicate that this stress will exceed 0.75 times the yield strength, the prototype test is to be monitored by the use of strain gauges or other suitable equipment in pressure vessels except simple cylindrical and spherical pressure vessels.

G2.10.2 The temperature of the water used for test is to be at least 30°C above the nil ductility transition temperature of the material as fabricated.

G2.10.3 The pressure is to be held for two hours per 25 mm of thickness but in no case less than two hours.

G2.10.4 Where necessary for cargo pressure vessels, there may be carried out with specific approval of TL, a hydropneumatic test in the conditions prescribed under G2.10.1, G2.10.2 and G2.10.3.

G2.10.5 Special consideration will be given to testing of tanks in which higher allowable stresses are used depending on service temperature. However, the requirements of G2.10.1 are to be fully complied with.

G2.10.6 After completion and assembly, each pressure vessel and relative fittings are to be subjected to an adequate tightness test which may be performed in combination with the pressure testing referred to in G2.10.1.

G2.10.7 Pneumatic testing of pressure vessels other than cargo tanks will be considered on an individual case basis by TL. Such testing will be permitted only for those vessels which are so designed and/or supported that they cannot be safely filled with water, or for those vessels which cannot be dried and are to be used in a service where traces of the testing medium cannot be tolerated.

TL-R G3 Liquefied gas cargo and process piping

G3.1 General

G3.1.1 The present texts give general principles for approval and survey of the relevant items of liquefied gas tankers for classification purposes. They do not intend to cover full details of such approval and survey procedures which are to be found in the rules of each Classification Society.

G3.1.2 Consideration of future technical advances may warrant modifications to the principles and details set forth in the text. TLill accordingly review continuously these requirements.

G3.2 Scope

The requirements here below apply to liquefied gas cargo and process piping including cargo gas piping and exhaust lines of safety valves or similar piping.

Note:

1. The “contracted for construction” date means the date on which the contract to build the vessel is signed between the prospective owner and the shipbuilder. For further details regarding the date of “contract for construction”, refer to TL-PR 29.

2. The requirements of TL-R G3 are to be uniformly implemented for piping components and pumps:
   i) when an application for testing is dated on or after 1 January 2021; or
   ii) which are installed in new ships for which the date of contract for construction is on or after 1 January 2021.

G3.3 Scantlings for internal pressure

G3.3.1 Piping Scantlings

Piping systems are to be designed in accordance with recognized standards acceptable to the Classification Society.

G3.3.2 Design pressure

(a) The design pressure *P* in the formula in G3.3.4 (a) is the maximum pressure to which the system may be subjected in service.

(b) The greatest of the following design conditions is to be used for piping, piping systems and components, based on the cargoes being carried:

(i) for vapour piping systems or components which may be separated from their relief valves and which may which contain some liquid, the saturated vapour pressure at 45°C, or higher or lower values, if agreed upon by the Classification Society, may be used (see 4.13.2.2 of the IGC Code).

(ii) for systems or components which may be separated from their relief valves and which contain only vapour at times, the superheated vapour pressure at 45°C or higher or lower values, if agreed upon by the Classification Society, may be used (see 4.13.2.2 of the IGC Code), assuming an initial condition of saturated vapour in the system operating pressure and temperature; or

(iii) design conditions defined in 5.4.2.3 to 5.4.2.5 of the IGC Code (Resolution MSC.370(93)).

(c) The minimum design pressure is not to be less than the value defined in 5.4.1 of the IGC Code (Resolution MSC.370(93)).

(d) The additional requirements regarding surge pressures defined in 5.4.3 of the IGC Code (Resolution MSC.370(93)) are to be complied with.

(e) The design pressure of the outer pipe or duct of gas fuel systems are not to be less than the value defined in 5.4.4 of the IGC Code (Resolution MSC.370(93)).

G3.3.3 Allowable stress

For pipes, the allowable stress K referred to in the formula in G3.3.4 (a) is the lower of the values defined in 5.11.3.1 of the IGC Code (Resolution MSC.370(93)).

G3.3.4 Minimum wall thickness

(a) The wall thickness of pipes is not to be less than that determined from the following formula:

$$t = (t_0 + b + c) \Big/ \left(1 - \frac{a}{100}\right)$$

where t = minimum thickness (mm)
t_0 = theoretical thickness (mm)
$t_0 = PD/(2Ke + P)$

P = design pressure (MPa)
D = outside diameter (mm)
K = allowable stress (N/mm^2) (see G3.3.3)
e = efficiency factor

(i) e = 1 for seamless pipes and for longitudinally or spirally welded pipes, delivered by manufactures approved for making welded pipes which are considered equivalent to seamless pipes when non destructive testing on welds is carried out in accordance with the Rules of the Classification Society.

(ii) in other cases an efficiency factor of less than 1.0 may be required by the Classification Society depending on the manufacturing process.

b = allowance for bending (mm). The value of b is to be chosen so that the calculated stress in the bend, due to internal pressure only, does not exceed the allowable stress. Where such justification is not given, b is to be determined from the following formula:

$$b = \frac{1}{2{,}5}\frac{D}{r}t_0$$

with r = mean radius of the bend (mm)

c = corrosion allowance (mm). When corrosion or erosion is expected, an increase in wall thickness of the piping is to be provided over that required by other design requirements.
This allowance is to be consistent with the expected life of the piping.

a = negative manufacturing tolerance for thickness (%).

(b) The minimum thickness is to be in accordance with recognized standards acceptable to the Classification Society.

(c) The additional requirements in 5.11.2.4 of the IGC Code (Resolution MSC.370(93)) are to be complied with.

(d) In fuel gas piping systems of design pressure greater than the critical pressure, the tangential membrane stress of straight section of pipe or ducting shall be according to 5.11.4 of the IGC Code (Resolution MSC.370(93)).

G3.3.5 Flanges, valves, fittings etc.

(a) For selection of flanges, valves, fittings etc., a recognised Standard is to used taking into account the design pressure defined under 5.4 of the IGC Code (Resolution MSC.370(93)).

(b) For flanges not complying with a recognised standard, the dimension of flanges and relative bolts are to be to the satisfaction of the Classification Society.

(c) The design and installation of expansion bellows shall be in accordance with recognized standards acceptable to the Classification Society and to be fitted with means to prevent damage due to over-extension or compression.

G3.4 Stress analysis

G3.4.1 When design temperature is -110°C or lower, a complete stress analysis, taking into account all the stresses due to weight of pipes (including acceleration if significant), internal pressure, thermal contraction and loads induced by hog and sag of the ship for each branch of the piping system is to be submitted to the Classification Society. For temperatures above -110°C, stress analysis may be required in relation to design or stiffness of the piping system, choice of materials, etc; in any case, consideration is to be given by the designer to thermal stresses, even though calculations are not submitted.

G3.4.2 This analysis is to take into account the various loads such as pressure, weight of piping with insulation and internal medium, loads due to the contraction, for the various operating conditions. The analysis may be carried out according to the Rules of the Classification Society or to a recognised code of practice.

G3.5 Materials

G3.5.1 Choice and testing of materials used in piping systems are to comply with 5.12.1 and 5.12.2 of the IGC Code (Resolution MSC.370(93), Corr.1) and with W1 taking into account the minimum design temperature.

G3.5.2 For an outer pipe or duct equipped with mechanical exhaust ventilation having a capacity of at least 30 air changes per hour, the effects of both pressure and possible low temperature in the event of a high pressure line failure shall be taking into account

G3.5.3 Where the cargo piping system is of a material susceptible to stress corrosion cracking in the presence of a salt-laden atmosphere, requirements of 5.12.4 of the IGC Code (Resolution MSC.370(93)) are to be complied with.

G3.6 Tests of piping components and pumps prior to installation on board

G3.6.1 Valves

G3.6.1.1 Prototype Testing

Each type of valve intended to be used at a working temperature below -55ºC shall be subject to the type tests defined in 5.13.1.1.1 to 5.13.1.1.3 of the IGC Code (Resolution MSC.370(93)).

For emergency shutdown valves, with materials having melting temperatures lower than 925°C, the type testing shall include a fire test to a standard acceptable to the Classification Society.

G3.6.1.2 Unit Production Testing

All valves are to be tested at the plant of manufacturer in the presence of the Society's representative. Testing is to include hydrostatic test of the valve body at a pressure equal to 1.5 times the design pressure for all valves, seat and stem leakage test at a pressure equal to 1.1 times the design pressure for valves other than safety valves. In addition, cryogenic testing consisting of valve operation and leakage verification for a minimum of 10% of each type and size of valve for valves other than safety valves intended to be used at a working temperature below -55°C. The set pressure of safety valves is to be tested at ambient temperature.

For valves used for isolation of instrumentation in piping not greater than 25mm, unit production testing need not be witnessed by the surveyor. Records of testing are to be available for review.

As an alternative to the above, if so requested by the relevant Manufacturer, the certification of a valve may be issued subject to the following:

- The valve has been approved as required by 3.6.1.1 for valves intended to be used at a working temperature below -55°C, and

- The manufacturer has a recognized quality system that has been assessed and certified by the Society subject to periodic audits, and

- The quality control plan contains a provision to subject each valve to a hydrostatic test of the valve body at a pressure equal to 1.5 times the design pressure for all valves and seat and stem leakage test at a pressure equal to 1.1 times the design pressure for valves other than safety valves. The set pressure of safety valves is to be tested at ambient temperature. The manufacturer is to maintain records of such tests, and

- Cryogenic testing consisting of valve operation and leakage verification for a minimum of 10% of each type and size of valve for valves other than safety valves intended to be used at a working temperature below -55°C in the presence of the Society's representative.

G3.6.2 Bellows

The prototype tests defined in 5.13.1.2.1 to 5.13.1.2.4 of the IGC Code (Resolution MSC.370(93)) are to be performed on each type of expansion bellows intended for use on cargo piping outside the cargo tank and where required by the Administration or recognized organization acting on its behalf, on those installed within the cargo tanks.

G3.6.3 Cargo Pumps

G3.6.3.1 Prototype Testing

Each size and type of pump is to be approved through design assessment and prototype testing. Prototype testing is to be witnessed in the presence of the Society's representative.

In lieu of prototype testing, satisfactory in-service experience, of an existing pump design approved by a Society submitted by the manufacturer may be considered.

Prototype testing is to include hydrostatic test of the pump body equal to 1.5 times the design pressure and a capacity test. For submerged electric motor driven pumps, the capacity test is to be carried out with the design medium or with a medium below the minimum working temperature. For shaft driven deep well pumps, the capacity test may be carried out with water. In addition, for shaft driven deep well pumps, a spin test to demonstrate satisfactory operation of bearing clearances, wear rings and sealing arrangements is to be carried out at the minimum design temperature. The full length of shafting is not required for the spin test, but must be of sufficient length to include at least one bearing and sealing arrangements. After completion of tests, the pump is to be opened out for examination.

G3.6.3.2 Unit Production Testing

All pumps are to be tested at the plant of manufacturer in the presence of the Society's representative. Testing is to include hydrostatic test of the pump body equal to 1.5 times the design pressure and a capacity test. For submerged electric motor driven pumps, the capacity test is to be carried out with the design medium or with a medium below the minimum working temperature. For shaft driven deep well pumps, the capacity test may be carried out with water.

As an alternative to the above, if so requested by the relevant Manufacturer, the certification of a pump may be issued subject to the following:

- The pump has been approved as required by 3.6.3.1, and
- The manufacturer has a recognised quality system that has been assessed and certified by the Society subject to periodic audits, and
- The quality control plan contains a provision to subject each pump to a hydrostatic test of the pump body equal to 1.5 times the design pressure and a capacity test. The manufacturer is to maintain records of such tests.

G3.7 Piping fabrication and joining details

G3.7.1 General

The requirements of this section apply to piping inside and outside the cargo tanks. However, the Classification Society may accept relaxations from these requirements for piping inside cargo tanks and open ended piping.

G3.7.2 Direct connection of pipe lengths (without flanges)

The types of connections defined in 5.8.2.1 to 5.8.2.3 of the IGC Code (Resolution MSC.370(93)) may be considered.

G3.7.3 Flange connections

(a) Flanges are to be of the welding neck, slip-on or socket welding type.

(b) Flanges are to be selected as to type, made and tested in accordance with the Rules of the Classification Society. For all piping (except open end lines) the restrictions defined in 5.8.3.2.1 and 5.8.3.2.2 of the IGC Code (Resolution MSC.370(93)) apply.

G3.7.4 Other types of pipes connections

Acceptance of types of piping connections other than those mentioned in G3.7.2 and G3.7.3 may be considered by the Classification Society in each particular case.

G3.7.5 Bellows and expansion joints

Where bellows and expansion joints are provided, requirements in 5.8.4 of the IGC Code (Resolution MSC.370(93)) are to be complied with.

G3.7.6 Welding, post-weld heat treatments and nondestructive tests

(a) Welding is to be carried out in accordance with W1.

(b) Post-weld heat treatments are required for all butt welds of pipes made with carbon, carbon-manganese and low alloy steels.

The Classification Society may waive the requirement for thermal stress relieving for pipes having a wall thickness less than 10 mm in relation to the design temperature and pressure of the concerned piping system.

(c) In addition to normal procedures before and during the welding and also visual inspection of the finished welds, as necessary for proving that the manufacture has been carried out in a correct way according to the requirements, the following inspections are required:

(i) 100% radiographic or ultrasonic inspection testing of butt welded joints for piping systems with service temperatures lower than -10°C, and with inside diameters of more than 75 mm or wall thickness greater than 10 mm.

(ii) For butt welded joints of pipes not included in (i), spot radiographic controls or other non-destructive controls are to be carried out at the discretion of the Classification Society depending upon service, position and materials. In general at least 10% of butt welded joints of pipe are to be subjected to radiographic or ultrasonic inspection.

G3.8 Tests onboard

G3.8.1 General

The requirements of this section apply to piping inside and outside the cargo tanks.

G3.8.2 Pressure tests (strength and leak test)

(a) After assembly, all cargo and process piping should be subjected to a strength test with a suitable fluid in accordance with 5.13.2.2 of the IGC Code (Resolution MSC.370(93)).

(b) The additional requirements regarding leak tests defined in 5.13.2.3 of the IGC Code (Resolution MSC.370(93)) are to be complied with.

(c) The additional requirements regarding double wall gas-fuel piping system defined in 5.13.2.4 of the IGC Code (Resolution MSC.370(93)) are to be complied with.

G3.8.3 Functional tests

All piping systems including all valves, fittings and associated equipment for handling cargo or vapours are to be tested under normal operating conditions not later than at the first loading operation, in accordance with recognized standards acceptable to the Classification Society.

G3.9 Cargo piping insulation system

G3.9.1 Requirements regarding cargo piping insulation in 5.12.3.1 and 5.12.3.2 of the IGC Code (Resolution MSC.370(93)) are to be complied with.

TL-R G5 Fail-close action of Emergency Shut Down (ESD) valve

1 General

1.1 The present texts specify the arrangements for emergency shut down valve (hereinafter referred to as ESD valve) installed in cargo piping of ships engaged in the carriage of liquefied gases to stop cargo flow in the event of an emergency, either internally within the ship, or during cargo transfer to other ships or shore facilities.

1.2 This requirement addresses the fail-close action of ESD valves in association with the requirement in 18.10.2.1.2 of the IGC Code* for ESD valves of the fail-closed type.

*As amended by IMO Resolutions MSC.370(93), MSC.411(97) and MSC.441(99).

2 Requirements

2.1 When ESD valve is actuated by hydraulic or pneumatic system, the following shall be complied with.

1. Audible and visible alarm shall be given in the event of loss of pressure that causes activation of fail-close action. The alarm shall be provided in a normally manned control station (e.g. Cargo Control Room and/or the navigation bridge, etc.).

2. The following conditions shall also be complied to ensure the fail-close action:

    1. Failure of hydraulic or pneumatic system shall not lead to loss of fail-close functionality (i.e. activated by spring or weight); or

    2. Hydraulic or pneumatic system for fail-close action shall be arranged with stored power and separated from normal valve operation.

Note:

1. The requirements of TL-R G5 is to be uniformly implemented on ships constructed on or after 1 January 2024.