Notice No. 3

Rules and Regulations for the Classification of Natural Gas Fuelled Ships, July 2012

The status of this Rule set is amended as shown and is now to be read in conjunction with this and prior notices. Any corrigenda included in the notice are effective immediately.

Issue date: November 2014

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</table>
Section 1

Rules for the Classification of Natural Gas Fuelled Ships

Effective date 1 January 2015

Section 1

General

1.1 Purpose and scope

1.1.4 Inland Waterways Vessels are to meet the requirements of these Rules. Where it is not possible for Inland Waterways Ships to comply with the requirements of these Rules as a result of conflicting national or regional requirements, details of the design that deviate from the LR requirements are to be submitted for consideration, see 1.1.6.

Existing paragraphs 1.1.4 to 1.1.6 have been renumbered 1.1.5 to 1.1.7.

1.1.8 The periodic survey regulations for natural gas fuel installations are located in the Rules and Regulations for the Classification of Ships, Part 1, Chapter 3, Section 23.

Effective date 1 December 2014

Section 1

General

1.2 Class notation and descriptive note

1.2.2 Ships complying with aspects of these Rules may be eligible for the Gas-Fuelled Readiness (GR) descriptive note. This descriptive note will be added to column 6 of the Register Book. This descriptive note is not an LR class notation and is provided solely for information.

GR Assigned to ships other than LNG carriers, with the extension of one or more of the following associated characters shown in brackets, detailing the aspects of design and construction that are in accordance with LR’s Rules and Regulations in force on the date of ‘contract for construction’. If a ship has been assigned the GF notation then it will not be eligible for the GR descriptive note. Further appraisal against the Statutory and LR requirements at the time of commissioning followed by testing and commissioning under survey will be required if assignment of the GF notation is requested.

A The complete gas fuel system design has been approved in principle. A design screening exercise is to be completed in accordance with the requirements of ShipRight procedure Assessment of Risk Based Designs (ARBD). The following drawings and documents are also to be submitted:

(i) Arrangement drawings of LNG fuel tanks, bunkering station, fuel gas supply system, GVU room, ventilation system, passive and active fire protection associated with the gas fuel system

(ii) Hull key plans (Construction profile and deck plan, Key section of E/R structure) for future installation of LNG fuel tanks and spaces associated with the proposed gas fuel system

(iii) Strength calculations of LNG fuel tank supports and hull structure

(iv) Piping, electric and control diagrams for LNG fuel system.

S Enhanced structural reinforcement and appropriate material grades have been applied to support the proposed fuel tank. Details of the proposed tank type, size and location are to be provided to support the calculations for enhanced scantlings and structural reinforcement.

T Gas storage tank, tank master isolation valve, fuel venting arrangements and, where applicable, the fuel storage hold space, structural fire protection and ventilation arrangements for under deck tank locations are built under survey and installed in accordance with an approved design and certified suitable for gas fuel operations.

P All piping equipment associated with the gas-fuelled system, e.g. pipes, pumps, valves, etc. including all bunkering arrangements and associated access arrangements including structural fire protection as applicable, have been installed in accordance with an approved design and certified fit for gas fuel operations.

E Engineering systems have been installed in accordance with the approved design and certified suitable for using gas as a fuel. Applicable control and electrical systems are installed in accordance with the requirements of these Rules. Additional letters will be assigned in brackets to identify which items meet the requirements for ‘gas-fuelled readiness’:

M main engine(s);
A auxiliary engines;
B boiler;
I incinerator.

Note: For additional characters S, T, P and E the full design, applicable to the character as described above, is to be submitted and approved against the applicable Sections of these Rules including risk-based studies where required.

For example the descriptive note GR(A, S, E(M, I)) indicates that

- the full design of the gas fuel system has been appraised and approved in principle,
- the vessel structure is reinforced to support the proposed gas storage tank but the gas fuel tank and associated arrangements are not yet installed and

...
the main engine and incinerator are approved, certified and installed ready for gas fuel operation, in accordance with the LR Rules and Regulations for the Classification of Natural Gas Fuelled Ships in force on date of contract for construction for the vessel in question.

1.2.3 Where parts of the gas fuel installation are installed on board in order to maintain the GR notation with the applicable associated characters described in 1.2.2, these are to be surveyed as required by the applicable requirements of the survey regulations referenced in 1.1.7.

1.3 Definitions

1.3.35 Contract for construction is the date on which the contract to build the ship is signed between the prospective ship Owner and the ship Builder.

Effective date 1 January 2015

Section 3
Risk based studies

3.2 System safety risk assessment

3.2.3 The assessment may identify the need for additional safety measures in addition to those specifically stated in these Rules (e.g., a Failure Modes and Effects Analysis of the Tank Master Isolation Valve). Where additional safety measures are identified, evidence is to be provided that demonstrates how they are implemented and validated.

Section 6
System design

6.1 General

6.1.3 Where power for the propulsion of the ship or other essential services is solely dependent on gas-fuelled power generation machinery or equipment, no fewer than two independent sources of power are to be provided so that one source is retained in operation or is capable of being brought into operation in the event of unintended loss of one of the gas-fuelled power units. Complete loss of power for propulsion and essential systems is not acceptable, see 1.1.1. Alternative arrangements (e.g., single engine installations) may be considered where supported by risk based studies that demonstrate an equivalent level of dependability to a conventional oil fuelled engine, see 3.1.1(c).

6.4 Tank connection space

6.4.3 The tank connection space is:
(a) to have a design temperature corresponding to the lowest temperature it can be subjected to in the event of a maximum credible leakage scenario. The maximum credible leakage scenario is to be determined and agreed with LR;
(b) to be designed to withstand the maximum calculated pressure within the space in the event of a maximum leakage scenario gas leakage. This is to consider both the rate and volume of release. The calculated maximum pressure can take into account pressure relief venting to a safe location;
(c) to be designed to withstand the weight of accumulated liquid from a maximum credible leakage scenario into the tank connection space, see 6.4.3(b). The maximum credible leakage scenario is to be determined and agreed with LR;
(f) to have insulation and an efficient barrier fitted to all LNG/vapour supply piping, components and equipment to eliminate the possibility of ice build-up and minimise condensation as far as practicable;
(g) to have ventilation arrangements that take into account the expansion of cold vapour as a result of LNG leakage described in 6.4.3 (b). In this respect the ventilation inlet and outlet shall be arranged at least 3 m vertically clear of any structure and at least 6 m from the nearest air intakes or openings to accommodation and from possible sources of ignition.

6.8 Inert gas system

6.8.1 Provision is to be made for a supply of inert gas to the gas fuel systems for purging purposes (i.e., gasfreeing). This is to be either through onboard generation of inert gas or through an inert gas storage system with provision for refilling from shore.

6.8.2 The inerting arrangements are to provide for:
(a) purging of all gas piping during normal operation and ESD;
(b) purging of gas-fuelled machinery;
(c) atmospheric control, e.g. double-walled piping annulus, inter-barrier spaces;
(d) fire protection systems.

6.8.3 The available inert gas (e.g. nitrogen) capacity is to be continuously monitored and replenished before it is unable to meet the functional requirements of 6.8.2.

6.8.4 The inerting supply arrangements are to meet the applicable requirements of the Rules for Ships, Pt 5, Ch 15.7.

Section 7
Piping

7.1 General

7.1.2 The design and construction of low temperature piping is to be in accordance with the requirements of Ch 6, Table 6.1 of the Rules for Ships for Liquefied Gases. The materials of construction of all piping with a design temperature colder than minus 55°C is to be in accordance with the requirements of Ch 6, Tables 6.1 and 6.4 of the Rules for Ships for Carriage of Liquefied Gases in Bulk.
7.1.3 For pipe systems operating with a design temperature colder than minus 55°C, a LR materials certificate is required.

7.2 Piping design

7.2.3 Joints on the entire length of the gas piping are to be butt-welded with full penetration and are to be fully radiographed, except where alternative means of NDE are approved by LR.

7.2.4 All butt-welded joints in gas piping systems are to be subject to 100% radiographic testing where the:
(a) design temperature is colder than -10°C; or
(b) inside diameter is greater than 75 mm; or
(c) wall thicknesses is greater than 10 mm; or
(d) design pressure is greater than 10 bar-g.
As an alternative to radiographic testing, ultrasonic testing will be specially considered.

7.2.5 When butt welded joints of gas piping sections defined in 7.2.4 (a) to (c), having a design pressure less than 10 bar-g, are made by automatic welding procedures in the pipe fabrication shop, application may be made for special approval to progressively reduce the extent of radiographic inspection but in no case is to be less than 10% of each joint. If defects are revealed the extent of examination is to be increased to 100% and will include inspection of previously accepted welds.

Existing paragraphs 7.2.4 to 7.2.23 have been renumbered 7.2.6 to 7.2.25.
Control, alert and safety systems

8.2 Control, alarm and safety functions

Table 1.8.1 Gas fuel supply and storage: Alarms, monitoring and safeguards

<table>
<thead>
<tr>
<th>Item</th>
<th>Alarm</th>
<th>Note</th>
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<tr>
<td>Gas supply pressure</td>
<td>Abnormal</td>
<td>Gas fuel supply shutdown, see Notes 1 to 3</td>
</tr>
<tr>
<td>Valve actuating medium</td>
<td>Loss</td>
<td>Gas fuel supply shutdown, see Note 1</td>
</tr>
<tr>
<td>Supply line pipe duct or casing ventilation</td>
<td>Failure</td>
<td>Automatic closing of supply line master gas fuel valve. See 7.2.19 and Note 6</td>
</tr>
<tr>
<td>Double-walled piping</td>
<td>Loss of pressurisation or ventilation</td>
<td>Gas fuel supply shutdown, see Notes 1 to 3 Automatic closing of supply line master gas fuel valve. See 7.2.18 and Note 6 For bunkering lines, see Note 8 For gas fuel shore connection shutdown arrangements, see 6.2.3</td>
</tr>
<tr>
<td>Hood/casing extraction fan</td>
<td>Failure</td>
<td>See 6.6.20 and 6.6.21</td>
</tr>
<tr>
<td>Gas fuel storage tanks</td>
<td>High level, high temperature</td>
<td>Gas fuel bunkering alarms are to be given in the bunkering control station, see 6.2.1 for monitoring. See Note 4</td>
</tr>
<tr>
<td>Gas fuel storage tanks</td>
<td>High pressure, high-high level, overfill, low pressure (if vacuum insulated tank)</td>
<td>Gas fuel bunkering shutdown</td>
</tr>
<tr>
<td>Bunkering</td>
<td>Bunker line high pressure, loss of communication</td>
<td>Gas fuel bunkering shutdown</td>
</tr>
<tr>
<td>Fire</td>
<td>Fire detection</td>
<td>Gas fuel supply shutdown. See Notes 1 to 3, 5</td>
</tr>
<tr>
<td>Space ventilation system</td>
<td>Failure</td>
<td></td>
</tr>
</tbody>
</table>

NOTES
1. Gas fuel supply shutdown by automatic operation of gas supply line double block-and-bleed valves. See 6.5.8 to 6.5.11.
2. Alarms associated with gas fuel supply and ventilation arrangements are to be given in the machinery space and machinery control station.
3. See 6.5.4 for alternative gas fuel supply requirements.
4. High temperature alarm to operate at all times when tank is in operation.
5. Fire detection in spaces containing gas fuelled equipment or in adjacent spaces to result in gas fuel supply shutdown.
6. Actual valve position is to be positively indicated at the required remote control position.
7. Arrangements are to prevent automatic or remote starting under conditions which could cause a hazardous situation, see 8.2.17.
8. Alarm is to be given at the gas fuel bunkering control station.
9. For high pressure alarm, see 6.3.18.
Cross-references

Section 6

6.2.4 Reference to paragraph 7.2.17 now reads 7.2.19

Section 7

7.2.16 now 7.2.18 Reference to paragraph 7.2.17 now reads 7.2.19

7.2.16 now 7.2.18 Reference to paragraph 7.2.18 now reads 7.2.20

7.2.16 now 7.2.18 Reference to paragraph 7.2.19 now reads 7.2.21

7.2.17(a) now 7.2.19(a) Reference to paragraph 7.2.19 now reads 7.2.21

7.2.17(b) now 7.2.19(b) Reference to paragraph 7.2.18 now reads 7.2.20

Section 8

Table 1.8.1 Reference to paragraph 7.2.18 now reads 7.2.20

Table 1.8.1 Reference to paragraph 7.2.19 now reads 7.2.21

Table 1.8.3 Reference to paragraph 7.2.19(d) now reads 7.2.21(d)