

# **Cargo Full Loading Tests for Ships Carrying Liquefied Gases in Bulk**

## **Amended Guidance**

Guidance for the Survey and Construction of Steel Ships Part N

## **Reasons for Amendment**

Regulation 4.20.3.5 of the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code) specifies that the overall performance of cargo containment systems is to be verified for compliance with the design parameters during the first full loading and discharging of the cargo. In addition, IACS adopted Unified Interpretation (UI) GC13 in 2008 to clarify the inspection items required by the regulation and has subsequently reviewed the UI as deemed necessary. The UI has already been incorporated into ClassNK's Part N of the Guidance for the Survey and Construction of Steel Ships.

In recent years, it has been pointed out that in some cases, depending on the kind of cargo initially loaded, it may not be possible to carry out an operational test of high-level alarms as stipulated in Regulation 13.3.5 of the IGC Code during cargo full loading tests due to circumstances such as cargo density or different cargoes being loaded. In response, IACS reviewed UI GC13 and agreed that it is acceptable to conduct operational tests of high-level alarms at the first feasible opportunity. Furthermore, IACS also reviewed the UI's provision stating that its application is limited to LNG carriers and agreed to clarify that the UI also applied to liquefied gas bulk carriers other than LNG carriers.

These interpretations were submitted to the IMO Sub-committee on Carriage of Cargoes and Containers (CCC) at its 8th session (CCC8) held in September 2022 and agreed upon as a draft MSC circular. This draft MSC circular was approved as MSC.1/Circ.1669 by the IMO Maritime Safety Committee (MSC) at its 107th session (MSC107) held in June 2023.

Accordingly, relevant requirements are amended based on the MSC circular.

## **Outline of Amendment**

The main details of the amendment are as follows:

- (1) Specifies that operation tests of high-level alarms may be conducted at the first feasible opportunity in cases where such tests cannot be conducted at the first cargo full loading test.
- (2) Deletes the requirement specifying that attendance of a Society surveyor at cargo full loading tests may be omitted for ships other than those carrying LNG in bulk.

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

## Part N SHIPS CARRYING LIQUEFIED GASES IN BULK

### N4 CARGO CONTAINMENT

#### N4.20 Construction Processes

##### N4.20.3 Testing

Sub-paragraph -4 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) tests are to be conducted in the ~~attendance~~ presence of the Surveyor to verify the performance of the cargo containment installations and cargo handling equipment:

((1) is omitted.)

(2) Cargo full loading test

On items given in ~~Table N4.20.3-2 (a) and (b)~~, 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. In addition, the documents specified in (c) are to be submitted to the Surveyor. Furthermore, it is acceptable to carry out the items specified in (a) and (b) during gas trials, except for those specified to be carried out during cargo full loading tests.~~

(a) During loading operations

When attending at first full cargo loading, priority is to be given to latter stages of loading.

i) Verify the satisfactory functionality of the emergency shutdown systems during testing

ii) Satisfactory operation of gas detection systems

iii) Satisfactory operation of cargo tank pressure monitoring systems

iv) Satisfactory operation of interbarrier space and insulation space pressure monitoring systems, as applicable

v) Satisfactory operation of cargo tank temperature monitoring systems

vi) Satisfactory operation of cargo tank level indicating systems

vii) Satisfactory operation of interbarrier space and inner hull temperature monitoring systems, as applicable

viii) Satisfactory operation of cargo compressors

ix) Inert gas generators, if operating

x) Nitrogen generating plants, if operating

xi) Nitrogen pressure control systems for insulation, interbarrier and annular spaces, as applicable

xii) Reliquefaction plants, if fitted

xiii) Equipment fitted for the burning of cargo vapours such as boilers, engines, gas

- combustion units, etc., if operating
- xiv) Examination of on-deck cargo piping systems, including expansion and supporting arrangements
  - xv) Verification and examination of all piping systems, including valves, fittings and associated equipment for handling cargoes or vapours, as specified in 5.13.2-5, Part N of the Rules.
  - xvi) Advise masters to carry out cold spot examinations of the hull and external insulation during transit voyages to unloading ports and record the results in ship's logbooks
  - xvii) Advise masters to test high-level alarms with liquid cargoes during voyages and record the results in ship's logbooks, when loading conditions permit
  - xviii) Continuous loading rates
- (b) During discharging operations
- When attending at first full cargo unloading, priority is to be given to the commencement of unloading.
- i) Examination of on-deck cargo piping systems including expansion and supporting arrangements
  - ii) Review logbook entries of emergency shutdown systems testing prior to commencement of unloading
  - iii) Review cargo logs and alarm reports for cargo tank pressure, temperature and level indicating systems\*
  - iv) Satisfactory operation of cargo compressors
  - v) Satisfactory operation of cargo pumps
  - vi) Inert gas generators, if operating
  - vii) Nitrogen generating plants, if operating
  - viii) Nitrogen pressure control systems for insulation, interbarrier and annular spaces, as applicable
  - ix) Review of records for satisfactory operation of reliquefaction plants, if fitted\*
  - x) Review of records for equipment fitted for the burning of cargo vapours such as boilers, engines, gas combustion units, etc.
  - xi) On ships fitted with membrane tanks, review records of cofferdam and inner hull temperature sensors to verify their readings are not below the allowable temperature for the selected grade of steel\*
  - xii) Cofferdam heating systems, if in operation\*
  - xiii) Review logbook entries for cold spot examinations\*
  - xiv) Review logbook entries for the testing of high-level alarms with liquid cargoes\*
  - xv) Discharging rates
- \* These items are to be carried out during cargo full loading tests, not during gas trials.
- (c) Documentation to be requested to the masters
- To demonstrate satisfactory functionality of the verifications, the masters are required to arrange and provide surveyors with the following materials:
- i) Trends of cargo tank pressures and temperatures
  - ii) Trends of pressure and temperature distributions of interbarrier spaces and insulation spaces, and temperature distributions of inner hulls, as applicable
  - iii) Trends record of performance of cofferdam heating systems, if fitted
  - iv) Trends record of nitrogen gas consumption, and whether any abnormalities have been observed
  - v) List of any gas alarm activated, if any
  - vi) Cargo tanks containment system cold spot inspection statements
  - vii) Activation of cargo tanks high-level alarms and overfill protection tests

Sub-paragraph -6 has been amended as follows.

**6** The quantities of the real cargo and vapour used in the gas trials and cargo full loading tests referred to in the preceding -4 are to be sufficient to conducting the tests specified in said -4. However, in cases where cargo conditions do not permit operation tests of high level alarms, such tests are to be carried out at the first occasion in which cargo conditions allow for said testing. In such cases, the logbook entries for testing and relevant records are to be reviewed no later than the first Annual Survey specified in 1.1.3-1, Part B of the Rules.

Table N4.20.3-1 has been amended as follows.

Table N4.20.3-1 Test Items at ~~the~~ Gas Trials

Test item	◎:Attendance of the Surveyor ○:Submission of <del>the</del> records	Inspection equipment	Survey item
1. Drying test	○	• Inert gas generator ( <i>IGG</i> )	• Dew point • Change of dryness in cargo tanks and hold spaces
2. Inerting test	○	• Inert gas generator	• Operation of <del>the</del> inert gas generator • Measuring of atmosphere in cargo tanks
3. Inert gas purge test using cargo vapour	◎/○	• Cargo vapourizer • Compressor	• Change of O <sub>2</sub> /temperature of cargo vapour in cargo tanks • Quantity of cargo vapour (or liquid) supply • Capacity of the vapourizer • Capacity of the compressor
4. Cool-down test	◎/○	• Spray pump • Compressor • Cargo piping • Temperature indicators for cargo tank • Spray piping	• Temperature curve of cargo tanks • Inspection of hold spaces/condition of insulation of tanks <sup>1)</sup> (after cool-down) • Cooling condition of spray piping • Cooling condition of cargo piping • Capacity of spray pump • Cargo consumption • Capacity of Compressor (property of return gas) • Temperature/pressure in cargo tank • Shrinkage of cargo tank <sup>2)</sup>
5. Loading test of cargo liquid	◎/○	• Compressor • Cargo piping related for loading • Level gauge/temperature indicator	• Temperature/pressure level in cargo tanks • Temperature/pressure in hold spaces • Temperature/pressure of cargo liquid/gas at manifolds • Service condition of cargo piping
6. Operation test of cargo pump	◎/○	• All cargo pumps	• Discharge pressure/current of cargo pumps • Liquid level/pressure in cargo tanks • Stripping
7. Operation test of pressure/temperature control system	◎/○	• Depend on the type of controls	• Depend on the type of controls

Notes:

- 1) The Society may approve omission in consideration of the quality control status and manufacturing records of the insulation materials.
- 2) To be verified only in the case of independent tanks.

Table N4.20.3-2 has been deleted.

~~Table N4.20.3-2 Survey Items of Full Loading Test~~

	Survey items
<del>1. At loading operation<sup>1)</sup></del>	<del> <ul style="list-style-type: none"> <li>• Continuous loading rate</li> <li>• Proper operation of gas detection systems<sup>4)</sup></li> <li>• Proper operation of cargo control and monitoring systems such as level gauging equipment, temperature sensors, pressure gauges, cargo pumps, compressors and cargo heat exchangers<sup>4)</sup></li> <li>• Proper operation of over flow control systems<sup>5)</sup></li> <li>• Proper operation of nitrogen generating plants or inert gas generators and pressure control systems for insulation, interbarrier and annular spaces<sup>4)</sup></li> <li>• Proper operation of cofferdam heating systems, if fitted<sup>4)</sup></li> <li>• Proper operation of reliquefaction plants, if fitted<sup>4)</sup></li> <li>• Proper operation of equipment fitted for the burning of cargo vapours<sup>4)</sup></li> <li>• On-deck cargo piping system</li> <li>• Topping-off process for cargo tanks including proper operation of high level alarms</li> </ul> </del>
<del>2. After full loading or during voyage<sup>2)</sup></del>	<del> <ul style="list-style-type: none"> <li>• Cargo tanks and supports</li> <li>• Hull adjacent to cargo tanks (cold spot)</li> <li>• Insulation capacity of cargo tanks and supports (cold spot)</li> <li>• Atmosphere in hold spaces</li> <li>• Capacity of pressure/temperature indicator</li> </ul> </del>
<del>3. At discharging operation<sup>3)</sup></del>	<del> <ul style="list-style-type: none"> <li>• Emergency shutdown system testing prior to commencement of unloading</li> <li>• Discharging rate</li> <li>• Conditions of related installations such as those listed in 1.</li> <li>• On membrane vessels, verification that the readings of the cofferdam and inner hull temperature sensors are not below the allowable temperature for the selected grade of steel</li> <li>• On-deck cargo piping system</li> <li>• Other operation of discharging</li> <li>• Submission/Survey of related records such as cold spot examination records<sup>6)</sup>, cargo logs, operation logs of installations related to cargo operations and alarm reports where no attendance during the cargo loaded voyage of 2.</li> </ul> </del>

~~Notes:~~

- ~~1) Priority is to be given to latter stages of loading (approximately last 6 hours).~~
- ~~2) May be exempted from the presence of Surveyors. In such cases, each survey item is to be recorded in order that the Surveyors can check this record.~~
- ~~3) Priority is to be given to the commencement of unloading (approximately first 4-6 hours).~~
- ~~4) Overall inspection may be accepted where an installation are not in operation.~~
- ~~5) In case where implementation is difficult, the verification of operation may be made by suitable other method.~~
- ~~6) Surveyors are to check the sampling of cold spot records, if possible.~~