Regulation of 17 June 2002 No. 644 concerning cargo ships with natural gas fuelled internal combustion engines


Chapter 1
General provisions

§ 1
Scope of application

(1) This Regulation applies to the following Norwegian cargo ships:
   a) cargo ships with an internal combustion engine installation fuelled by liquefied natural gas (LNG);
   b) cargo ships with a gas plant in which the pressure does not exceed 10 bars and arrangement for dual fuel or gas-only operation; and
   c) cargo ships in which the principle of ESD-protected gas engine-rooms is applied.

(2) The Regulation may, insofar as it is appropriate and for matters not regulated by any international body of rules, also be made applicable to LNG carriers where the cargo is used as bunker fuel.

Amended by Regulation of 29 June 2007 No. 1006 (in force on 1 July 2007).

§ 2
Relation to classification society rules

(1) Matters which are not regulated herein shall comply with the rules contained in the DNV publication Gas fuelled engine installations of January 2001, with July 2002 amendments, or the equivalent rules of any other recognized classification society upon the approval of the Norwegian Maritime Directorate.

(2) Where this Regulation is applied to LNG carriers in accordance with § 1 second paragraph, the rules of the classification society shall apply correspondingly.

§ 3
Relations with bodies etc. concerned

Matters which concern bodies or authorities etc. outside the area of responsibility of the maritime administration shall not be submitted to the Norwegian Maritime Directorate, but to the body concerned for consideration and, where appropriate, approval in accordance with the requirements of that body.
§ 4
Definitions

For the purpose of this Regulation, the following definitions shall apply:

a) **Recognized classification society:** Any classification society with which the Ministry has entered into an agreement pursuant to Section 41 of the Ship Safety and Security Act:
   - 1. Det Norske Veritas (DNV).
   - 2. Lloyd's Register of Shipping (LRS).
   - 5. American Bureau of Shipping (ABS).

b) **A-60 fire integrity:** Class A-60 fire-resistant division, ref. chapter II-2 of the SOLAS Convention.

c) **ESD:** Emergency shutdown. The abbreviation refers to the rules contained in the DNV publication *Gas fuelled engine installations* of January 2001.

d) **Semi-enclosed space:** Any area where natural conditions of ventilation are notably different from those on open decks due to the presence of structures such as deck, floor, wind breakers or bulkheads which are so arranged that there may be accumulation of gas.

e) **Dual-fuel engine:** An internal combustion engine which can burn gaseous and liquid fuel simultaneously and in a variety of proportions.

f) **Formal safety assessment:** An analysis which is in accordance with the resolution currently in force concerning *Formal Safety Assessment* (FSA) developed by the IMO (International Maritime Organization).

g) **Gas-dangerous space:** An enclosed or semi-enclosed space containing a gas source or sources or arranged with direct access or openings into any other gas-dangerous area.

h) **Gas-dangerous zones:** Zones on open decks or semi-enclosed spaces on open decks within:
   - 3 metres of the gas tank pressure relief valve exhaust outlets.
   - 3 metres of gas tank openings, gas pipe flanges, or openings to gas-dangerous spaces containing gas sources.
   - 3 metres of ventilation exhaust openings from spaces where any gas compressors, pumps or similar equipment are present and of ventilation exhaust openings from pipe ducting and gas-fuelled engine or valve installation spaces.
   - 2.4 metres of the outer surface of a gas containment system where such surface is exposed to the weather.

i) **Gas source:** Any valve, detachable pipe joint, pipe packing, compressor or pump seal in the gas fuel system.

j) **Gas-safe areas:** Spaces or zones not being gas dangerous.

k) **Gas machinery spaces:** Spaces where internal combustion engines fuelled by gas and any generators are located.

l) **Gas lock:** An enclosed space for passage between gas-dangerous and gas-safe areas to prevent the ingress of gas to a gas-safe area.

m) **Classed vessel:** A ship/barge assigned class in a recognized classification society.

n) **Control station:** A space defined as a control station in the SOLAS Convention, chapter II-2.

o) **Cargo ship:** Any ship that is not a passenger ship, fishing vessel, mobile offshore unit, barge or pleasure craft.

p) **LNG:** Liquefied natural gas.

q) **LNG carrier:** Cargo ship constructed or equipped for the carriage of LNG in bulk, ref. the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code).

r) **SOLAS Convention:** International Convention for the Safety of Life at Sea, 1974, as amended.

s) **Stoichiometric gas mixture:** The air-gas mixture which gives maximum explosion pressure for the gas used.

t) **Tank space:** A space in which a gas storage tank with its associated and necessary equipment is fitted.

u) **Valve installation space:** A space in which necessary gas control equipment for gas-fuelled engines is fitted.

§ 5
Duties

The company, master and other persons working on board shall perform their duties in accordance with the Ship Safety and Security Act and the supplementary provisions laid down in this Regulation.

Amended by Regulation of 29 June 2007 No. 1006 (in force on 1 July 2007).
§ 6
Exemptions

The Norwegian Maritime Directorate may, in individual cases and upon written application, grant exemption from the requirements of this Regulation. There must be special reasons that make an exemption necessary and it must be justifiable in terms of safety. Exemptions must not contravene international agreements to which Norway has acceded.

Chapter 2
Approval, etc.

§ 7
Approval – Verification

(1) For classed vessels, a written statement shall be submitted by the classification society declaring that the vessel complies with this Regulation prior to any initial survey report, trading certificate, or safety construction certificate being issued.

(2) Prior to the initial issue of certificates and at subsequent renewals, the Norwegian Maritime Directorate may demand verification of compliance with the requirements of this Regulation.

(3) The Norwegian Maritime Directorate may demand that practical tests be conducted to document correspondence between rules, regulations and preconditions.

(4) The company shall ensure that for every construction project a responsible coordinator is designated who is charged with ensuring compatibility between components from subvendors, designing a testing and control programme, as well as ensuring the right combination of all control and regulation arrangements in connection with propulsion and power generation, including the associated emergency arrangement.

(5) Conditions or incidents which may affect the vessel’s surroundings are not considered by the Norwegian Maritime Directorate, but shall be submitted to the competent authority for consideration and, where appropriate, approval.

Chapter 3
Documentation and general construction requirements

§ 8
Documentation

(1) All matters contained in this Regulation shall be documented but the documentation shall be submitted to the Norwegian Maritime Directorate only as required by the Directorate.

(2) A formal safety assessment shall be undertaken for any new or altered concept, which is required to document a safety level which is at least equivalent to a new, comparable diesel-engine vessel. Such assessments shall be made of the final concept and shall comprise all relevant risks, including such conditions as are exterior to the vessel itself, such as densely populated areas, ports, terminals, and oil installations.

(3) An explosion assessment shall be made to ascertain the design overpressure for gas machinery spaces, valve installation spaces or any similar gas-dangerous space with bulkhead, hull, deck, ventilation ducts, and any blowdown installations and/or relief spaces. The assessment shall be based on a stochiometric gas mixture and made by an institution that is recognized for this type of assessment.

§ 9
Passive safety

The following requirements shall be complied with in respect of passive safety and redundancy in the event of failure of operational or fitted technical active safety arrangements:

a) The gas machinery, valve installation and tank spaces shall be so located that the safety level provided in § 8 second paragraph is ensured;

b) the gas machinery, tank and valve installation spaces shall contain only a minimum of such necessary equipment, components and systems as are required to ensure that any piece of equipment in each individual space shall maintain its principal function;

c) the internal combustion engines for propulsion, associated control systems and engines and power generation systems with appurtenant distribution and wiring shall be located in at least two redundant zones so separated that fire or explosion in any one space does not:
1. cause damage to any space other than that in which the incident occurs;
2. disrupt the proper functioning of other zones;
3. open the ship in such a way that there is flooding of water below the main deck or any other progressive flooding;
4. damage work areas or accommodation in such a way that people who stay in such areas under normal operating conditions are injured;
5. disrupt the proper functioning, according to the principles of redundant machinery, of control stations and switchboard rooms for necessary power distribution;
6. damage life-saving equipment or associated launching arrangements;
7. disrupt the proper functioning of fire-fighting equipment located outside the explosion-damaged space; or
8. affect other areas in the vessel in such a way that chain reactions involving, *inter alia*, cargo, gas and bunker oil may arise.
§ 10

Arrangement

(1) For the arrangement of spaces, accesses, etc., the following shall apply:
   a) A gas machinery space shall under normal conditions not be considered to be gas dangerous unless there is gas leakage, in which case the space shall be considered to be a gas-dangerous space.
   b) Tank spaces shall be so secured that access will not be possible during normal operation.

(2) Gas supply to internal combustion engines shall be protected against mechanical damage.

(3) There shall be a separate earth cable between the tank wagon or tank ashore and the bunkering station on board whenever flammable gas or liquid is transferred. Additionally, the bunkering system shall meet any requirements laid down by the shore plant and the competent authority.

(4) The bunkering station shall be located on the open deck and be physically shielded from accommodation, cargo/working deck and control stations. Connections and piping shall be so positioned and arranged that any damage to the gas piping does not cause damage to the vessel’s gas storage tank arrangement leading to uncontrolled gas discharge.

(5) The following ventilation requirements shall apply:
   a) Combustion air to engines shall be supplied in a separate system from an open-air gas-safe area. Where this is not possible, air ducts shall be provided with dampers which close automatically when gas is drawn into the system.
   b) Where generators in gas machinery spaces are air cooled they shall be arranged with overpressure ventilation from a gas-safe area.
   c) Every valve installation space shall be provided with separate ventilation with the same number of air exchanges as tank spaces.

(6) The following structural fire safety requirements shall apply:
   a) Bulkheads and decks surrounding gas storage tank spaces and associated ventilation ducts shall have an A-60 fire integrity, unless bounded by tanks with substances that are neither combustible nor dangerous.

(7) Gas machinery spaces shall be provided with an appropriate fixed water-based fire-extinguishing system.

(8) The following strength requirements shall apply:
   a) Gas storage tanks, generators and other heavy components of the gas-fuel system shall have such foundations as to withstand a longitudinal retardation of 2g. Other critical components of the gas and control system shall be dimensioned and constructed to withstand the same load.
   b) Gas storage tanks shall be so arranged that they do not float free in the event of flooding of water into the tank space.
   c) Gas storage tanks which are fitted in or below an area for cargo-handling operations shall be protected by a structure dimensioned to reduce the risk of damage to the storage tank.

Chapter 4

Operational and training requirements

§ 11

Operational conditions

(1) Procedures shall be developed to take care of the safety aspects of the vessel’s ordinary operation, for instance during navigation, in ports, at bases, oil installations, oil fields, and repair yards.

(2) Operations which may involve a risk of ignition or damage to the bunkering system shall not be performed on deck or in the area surrounding the bunkering station simultaneously with a gas bunkering operation. Operational aspects of the machinery and gas-dangerous spaces and areas shall be specially considered. The gas storage tank involved shall be shut off from the machinery system during a gas bunkering operation.

§ 12

Training

(1) The whole operational crew of a gas-fuelled cargo ship shall have necessary training in gas-related safety, operation and maintenance prior to the commencement of work on board.

(2) Additionally, crew members with a direct responsibility for the operation of gas-related equipment on board shall receive special training. The company shall document that the personnel have acquired the necessary knowledge and that this knowledge is maintained at all times.

(3) Gas-related emergency exercises shall be conducted at regular intervals. Safety and response systems for the handling of defined hazards and accidents shall be reviewed and tested.
(4) A training manual shall be developed and a training programme and exercises shall be specially designed for each individual vessel and its gas installations.

Chapter 5
Concluding provisions

§ 13
Entry into force

This Regulation enters into force on 1 July 2002 for new ships and existing ships that are converted for gas-fuelled operation after the entry into force.