



CHINA CLASSIFICATION SOCIETY

**RULES FOR CONSTRUCTION AND EQUIPMENT
OF SHIPS CARRYING DANGEROUS
LIQUID CHEMICALS IN BULK**

AMENDMENTS

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PART TWO CLASSIFICATION SURVEY AND ADDITIONAL REQUIREMENTS FOR HULL STRUCTURE

Chapter A2 CLASSIFICATION AND SURVEYS

A2.3 SURVEYS

A2.3.2.2 Annual surveys

(1) In addition to the applicable requirements of 5.4.2, 5.6.2, 5.8.2, 5.9.2 and 5.10.2 of Chapter 5 of PART ONE of CCS Rules for Classification of Sea-Going Steel Ships, the following survey items are to be covered:

- ① to confirm that wheelhouse doors and windows, sidescuttles and windows in superstructure and deckhouse ends facing the cargo area are in a satisfactory condition;
- ② to examine the cargo pump room, including:
 - a. confirming that potential sources of ignition, such as loose gear, combustible materials, etc., in or near the cargo pump room are eliminated, such as loose gear, combustible materials, etc., that there are no signs of undue leakage and that access ladders are in a satisfactory condition;
 - b. confirming that removable pipe lengths or other approved equipment necessary for cargo separation are available in the pump room and are in a satisfactory condition;
 - c. confirming that the remote operation of the cargo pump room bilge system is satisfactory;
- ③ to examine the bilge and ballast arrangements and to confirm that pumps and pipelines are identified;
- ④ to examine the cargo tank vent system, including the liquid level indicators and alarms, pressure/vacuum valves and secondary means to prevent over- or under pressure and devices to prevent the passage of flame, and the arrangements of cargo tank purging with inert gas (as applicable) and to confirm that they are in a satisfactory condition;
- ⑤ to examine the cargo handling piping and machinery, including:
 - a. confirming, when applicable, that the bow or stern loading/unloading arrangements and machinery are in order and testing the means of communication and the remote shutdown for the cargo pumps;
 - b. examining, when applicable, the cargo heating or cooling systems, including any sampling arrangements, and confirming that the means for measuring the temperature and associated alarms are operating satisfactorily;
 - c. examining the cargo transfer arrangements and all pipelines, and confirming that any hoses are type approved or marked with date of testing and are suitable for their intended purpose;
 - d. examining the gauging devices, high-level alarms and valves associated with overflow control;
 - e. verifying that the means for measuring the cargo temperature and associated fittings are in a satisfactory condition;
- ⑥ environmental control of vapour spaces within cargo tanks and void spaces surrounding cargo space, including:

- a. examining the control means and confirming that arrangements are made for sufficient agents (gas) to be carried or generated;
 - b. confirming that the means provided for monitoring losses of agents (gas) are satisfactory;
 - c. confirming that arrangements are made for sufficient agents to be carried on board the ship where drying agents are used on air inlets to cargo tanks;
- ⑦ to examine the fire safety equipment, including:
- a. examining the fixed fire-fighting system for the cargo pump room and the deck foam system for the cargo area and confirming that their means of operation are clearly marked;
 - b. confirming that the condition of the portable fire-extinguishing equipment for the cargoes to be carried in the cargo area is satisfactory;
 - c. confirming that the condition of the system for continuous monitoring of the concentration of flammable vapours is satisfactory;
- ⑧ to examine the ventilation systems, including:
- a. examining as far as practicable, and confirming the satisfactory operation of the arrangements for the ventilation of spaces normally entered during cargo handling operations and other spaces in the cargo area;
 - b. examining the means for closing the air intakes and openings into the accommodation and control spaces;
 - c. examining the movable ventilation equipment used in the cargo area;
- ⑨ to examine the electrical equipment^①, including:
- a. confirming that the electrical equipment in all hazardous locations, including the cargo pump room, is suitable for use in such locations, in a satisfactory condition and being properly maintained;
 - b. confirming, as far as practicable, that the intrinsically safe systems and circuits used for measurement, monitoring, control and communication purposes in all hazardous locations are being properly maintained;
- ⑩ to examine the equipment for personnel protection, including:
- a. protective clothing provided for the crew during loading and unloading operations are effective and properly stored;
 - b. confirming that necessary safety equipment, related breathing apparatus and breathing-air supply are satisfactory and properly stored;
 - c. confirming that emergency escape breathing devices and eye protection provided as required are satisfactory and properly stored;
 - d. medical first-aid equipment, including stretchers and oxygen delivery equipment are in satisfactory condition;

① In accordance with IEC60079-17:Part 17: Inspection and Maintenance of Electric Installations in Hazardous Areas (other than mines), at least visual inspections are to be performed.

- e. antidotes for cargoes actually carried onboard have been provided;
 - f. decontamination equipment and eyewash equipment are operable;
 - g. necessary gas detection equipment have been provided onboard and vapour detection pipes are appropriately arranged;
 - h. storage of cargo samples is satisfactorily arranged;
- ⑩ to confirm that sampling points or detector heads are located in suitable positions in order that potentially dangerous leakages are readily detected.

(2) To verify that operation instructions and information, such as cargo stowage plan, loading manual and loading limits, are available on board.

A2.3.2.3 Intermediate surveys

(1) In addition to the requirements of 5.4.3, 5.6.3, 5.8.3, 5.9.3 and 5.10.3 of Chapter 5 of PART ONE of CCS Rules for Classification of Sea-Going Steel Ships, and the requirements of A2.3.2.2(1)① to ⑩ and (2) of the Rules, the following survey items are to be covered:

- ① to examine ventilation line drainage arrangements;
- ② to confirm, where applicable, that pipelines and independent cargo tanks are electrically bonded to the hull;
- ③ to generally examine the electrical equipment and cables in dangerous zones such as cargo pump rooms and areas adjacent to cargo tanks to check for defective equipment, fixtures and wiring; the insulation resistance of the circuits is to be tested and in cases where a proper record of testing is maintained, consideration is to be given to accepting recent readings.

① In accordance with IEC60079-17:Part 17: Inspection and Maintenance of Electric Installations in Hazardous Areas (other than mines), at least visual inspections are to be performed.

Chapter A3 APPROVAL OF PLANS AND DOCUMENTS OF SHIPS

A3.1 General requirements

A3.1.2 The following plans and documents are to be submitted to CCS for approval:

- (1) Construction profile of independent cargo tank (where applicable);
- (2) Arrangement of supporting and securing devices of independent cargo tank (where applicable);
- (3) Details of reinforcement structure to supporting and securing devices of independent cargo tank (may be included in the construction profile where applicable);
- (4) Insulation arrangement of independent cargo tank (where applicable);
- (5) Arrangement of emergency towing arrangements (where applicable);
- (6) Arrangement of means of access to cargo areas;
- (7) Arrangement of permanent means of access for inspections (where applicable);
- (8) Anti-pollution calculations (where applicable);
- (9) Information on accidental oil outflow performance (where applicable);
- (10) Plans for ventilation in cargo area (including removal of residues, where applicable);
- (11) Cargo-handling and stripping systems;
- (12) Arrangement of cargo pump rooms (where applicable);
- (13) Cargo tank venting and gas-freeing system (including vapour return, where applicable);
- (14) Cargo heating (cooling) systems;
- (15) Cargo environment control system;
- (16) Tank washing piping system;
- (17) Fixed deck fire extinguishing system;
- (18) Underwater discharge system;
- (19) Ventilation systems of cargo pump-rooms;
- (20) Calculations of pressure drop in vapour return;
- (21) Manual of vapour return system (where applicable);

- (22) Measurement, alarm systems and arrangement plans (liquid level, pressure, temperature, detection of flammable gas, etc.);
- (23) Bilge ballast system in cargo area;
- (24) Procedures and Arrangements Manual (or to be submitted to the flag State Administration);
- (25) Marine Pollution Emergency Plan (or to be submitted to the flag State Administration);
- (26) List of products intended to be carried;
- (27) Deck ~~water-mist~~water spray system (where applicable);
- (28) Cargo Handling Manual (where applicable).

A3.1.3 The following plans and documents are to be submitted to CCS for information:

- (1) Specifications for the chemical tanker (including ship particulars, detailed description of the final state of the surface of the material in contact with the liquid cargo within the cargo tank and associated fabrication and repair, characteristics of special structure materials, particulars of any special containment features (e.g. pressure tanks));
- (2) Calculations of fixed deck fire extinguishing system;
- (3) Calculations of underwater discharge outlet;
- (4) Direct strength assessment report (where applicable);
- (5) Fatigue strength assessment report (where applicable);
- (6) Calculation report of temperature field distribution and thermal stress analysis (where applicable);
- (7) Sloshing load and sloshing strength assessment report (where applicable).

~~A3.1.4 The following documents are to be submitted to CCS for reference during plan approval:~~

- ~~(1) direct calculation report of strength assessment of cargo hold (where applicable);~~
- ~~(2) fatigue strength assessment report (where applicable);~~
- ~~(3) thermal stress analysis report of hull structure (where applicable);~~
- ~~(4) report of sloshing loads and sloshing strength assessment (where applicable).~~

Chapter A4 ADDITIONAL REQUIREMENTS FOR HULL STRUCTURE

A4.2 Material factor

A4.2.2 Stainless steel

A4.2.2.1 The stainless steel is to be applied in compliance with the requirements of 1.3.6, Chapter 1, PART TWO in CCS Rules for Classification of Sea-going Steel Ships.

A4.2.2.1 The material factor K of stainless steel is to be calculated by the following formula:

$$K = \frac{235}{R_{eHT}}$$

where: R_{eHT} — the minimum yield strength or proof strength in annealed condition of stainless steel at maximum permissible cargo temperature, in N/mm^2 , to be obtained from the following formulae:

For austenitic stainless steels not containing nitrogen: $R_{eHT} = -40 \ln(T) + 127 + R_{p0.2}$

For austenitic stainless steels containing nitrogen: $R_{eHT} = -48 \ln(T) + 142 + R_{p0.2}$

For duplex stainless steels: $R_{eHT} = -65 \ln(T) + 200 + R_{p0.2}$

T — maximum permissible cargo temperature, in $^{\circ}C$;

$R_{p0.2}$ — the minimum yield strength or proof strength in annealed condition of stainless steel at room temperature, in N/mm^2 , to be in compliance with the requirements of Section 8, Chapter 3 of PART ONE of CCS Rules for Materials and Welding;

For duplex stainless steels, the material factor K is to be taken as not less than 0.68.

A4.9 Cargo tank boundary

A4.9.6 Symmetrical corrugated bulkheads forming part of the boundary structure of cargo tanks

A4.9.6.2 The section modulus W of symmetrical corrugated bulkheads forming part of the boundary structure of cargo tanks is not to be less than the value obtained from the following formulae:

$$W = K C_s t^2 [\rho h_1 + 100(P_V - 0.02)] \quad \text{cm}^3$$

$$W = 0.50 K C_s \rho h_1^2 \quad \text{cm}^3$$

$$W = 0.53 K C_s t^2 (2.45 + h_1) \quad \text{cm}^3$$

Where: $W = d_w t \left(a + \frac{b}{3} \right)$, in cm^3 , is the section modulus of a corrugation over a spacing;

s — spacing of corrugations, in m, see Figure 1.2.4.3 of Chapter 1, PART TWO of CCS Rules for Classification of Sea-Going Steel Ships;

a — width of corrugation flange, in m, see Figure 1.2.4.3 of Chapter 1, PART TWO of CCS Rules for Classification of Sea-Going Steel Ships;

b — width of corrugation web, in m, see Figure 1.2.4.3 of Chapter 1, PART TWO of CCS Rules for Classification of Sea-Going Steel Ships;

d_w — depth of corrugation, in mm, see Figure 1.2.4.3 of Chapter 1, PART TWO of CCS Rules for Classification of Sea-Going Steel Ships;

- t — thickness of corrugated bulkhead plating, in mm, see Figure 1.2.4.3 of Chapter 1, PART TWO of CCS Rules for Classification of Sea-Going Steel Ships;
- K — material factor, see A4.2 of this Chapter;
- C — coefficient, to be taken according to the end fixity as specified in Table 2.13.3.1 of Section 13, Chapter 2 of PART TWO of CCS Rules for Classification of Sea-Going Steel Ships;
- l — span of corrugations, i.e. distance between supporting points, in m;
- ρ — the maximum cargo density, in t/m³, to be taken as not less than 1.025 t/m³;
- P_v — maximum pressure gauge, in MPa, to be taken as not less than 0.02 MPa;
- h_1 — vertical distance measured from the mid span of corrugation to tank top, in m;
- h — vertical distance measured from the mid span of corrugation to top of the overflow, in m.

Where the span of corrugated bulkhead exceeds 15 m, a horizontal girder is to be arranged near the mid-span.

The section moment of inertia I of corrugated bulkheads is not to be less than that obtained from the following formulae:

$$I = 2.3 \frac{Wl}{K} \quad \text{cm}^4$$

Where: W , l , K are mentioned as above.

The thickness of plating required in 4.9.6.2 is to be maintained within the range of at least 2/3 l from the lower end of the span of corrugations. The thickness of plating above that, which is required in 4.9.6.2, may be appropriately reduced if comply with the direct strength assessment, and the reduction value is not to exceed 20% of the required value in 4.9.6.2. The direct strength assessment report is to be submitted to CCS for information.

A4.10 The effect of cargo temperature on the hull structure

A4.10.4 When the temperature of liquid cargo carried in independent cargo tank exceeds 180°C, the temperature field distribution of the cargo tank and its associated structures are to be calculated by thermal analysis, and if the thermal analysis shows that the temperature of the main hull structure exceeds 80°C, further thermal stress analysis is to be carried out for the cargo tank area, see Section 24, Chapter 2, PART TWO of CCS Rules for Classification of Sea-going Steel Ships. If the actual means of loading may cause a relatively large temperature difference in the cargo tank structures (such as asymmetric loading of two adjacent cargo tanks along the ship's breadth, and remarkable liquid level difference between two adjacent cargo tanks during loading and unloading operations, as well as the alternate loading mode along the ship's length, etc.), the thermal stress analysis and calculation in the cargo tank areas may be required.

PART THREE INTERNATIONAL CODE FOR THE CONSTRUCTION AND EQUIPMENT OF SHIPS CARRYING DANGEROUS CHEMICALS IN BULK

Chapter 3 SHIP ARRANGEMENTS

3.2 Accommodations, service and machinery spaces and control stations

CCS3.2.1a Accommodation, service spaces or control stations may be located above the oil fuel tank which has common boundary with cargo or slop tank, provided that the space complies with other relevant requirements of the rules.

3.2.3 Entrances, air inlets and openings to accommodation, service and machinery spaces and control stations shall not face the cargo area. They shall be located on the end bulkhead not facing the cargo area and/or on the outboard side of the superstructure or deck-house at a distance of at least 4% of the length (L) of the ship but not less than 3 m from the end of the superstructure or deck-house facing the cargo area. This distance, however, need not exceed 5 m. No doors shall be permitted within the limits mentioned above, except that doors to those spaces not having access to accommodation and service spaces and control stations, such as cargo control stations and store-rooms, may be fitted. Where such doors are fitted, the boundaries of the space shall be insulated to "A-60" standard. Bolted plates for removal of machinery may be fitted within the limits specified above. Wheelhouse doors and wheelhouse windows may be located within the limits specified above so long as they are so designed that a rapid and efficient gas- and vapour-tightening of the wheelhouse can be ensured. Windows and sidescuttles facing the cargo area and on the sides of the superstructures and deck-houses within the limits specified above shall be of the fixed (non-opening) type. Such sidescuttles in the first tier on the main deck shall be fitted with inside covers of steel or equivalent material.

3.7 Bow or stern loading and unloading arrangements

3.7.4 Entrances, air inlets and openings to accommodation, service and machinery spaces and control stations shall not face the cargo shore-connection location of bow or stern loading and unloading arrangements. They shall be located on the outboard side of the superstructure or deck-house at a distance of at least 4% of the length of the ship but not less than 3 m from the end of the house facing the cargo shore-connection location of the bow or stern loading and unloading arrangements. This distance, however, need not exceed 5 m. Sidescuttles facing the shore-connection location and on the sides of the superstructure or deck-house within the distance mentioned above shall be of the fixed (non-opening) type. In addition, during the use of the bow or stern loading and unloading arrangements, all doors, ports and other openings on the corresponding superstructure or deck-house side shall be kept closed. Where, in the case of small ships, compliance with 3.2.3 and this paragraph is not possible, CCS may approve relaxations from the above requirements.

Chapter 5 CARGO TRANSFER

5.5 Piping arrangements

5.5.2 Cargo piping located below the main deck may run from the tank it serves and penetrate tank bulkheads or boundaries common to longitudinally or transversally adjacent cargo tanks, ballast tanks, empty tanks, pump-rooms or cargo pump-rooms provided that inside the tank it serves it is fitted with a stop valve operable from the weather deck and provided cargo compatibility is assured in the event of piping failure. As an exception, where a cargo tank is adjacent to a cargo pump-room, the stop valve operable from the weather deck may be situated on the tank bulkhead on the cargo pump-room side, provided an additional valve is fitted between the bulkhead valve and the cargo pump. A totally enclosed hydraulically operated valve located outside the cargo tank may, however, be accepted, provided that the valve is:

- .1 designed to preclude the risk of leakage;
- .2 fitted on the bulkhead of the cargo tank which it serves;
- .3 suitably protected against mechanical damage;
- .4 fitted at a distance from the shell as required for damage protection; and
- .5 operable from the weather deck.

Chapter 8 Cargo Tank Venting and Gas-freeing Arrangements

8.2 Cargo tank venting

~~CCS 8.2.3b Where cargoes with density greater than the maximum density of cargoes in full cargo tank are carried, more than one means of limiting cargo tank overpressure are to be provided. When cargoes with the density greater than the design full tank maximum permissible density are carried in partial loading, measures are to be taken correspondingly to the relevant partial load condition so as to prevent overpressure of the cargo tanks. It is also acceptable to set the cargo tank measurement and high level alarm under the relevant partial load condition.~~

8.3 Types of tank venting systems

~~CCS 8.3.4.b Electrical equipment of a type which ensures the absence of sparks in compliance with a standard[⊕] acceptable to CCS is to be used in areas within 4 m beyond the zone specified in CCS 8.3.a.~~

[⊕] Refer to IEC60079-15.

Chapter 12 MECHANICAL VENTILATION IN THE CARGO AREA

12.1 Spaces normally entered during cargo-handling operations

12.1.10 Protection screens of not more than ~~13 mm square~~ 13mm×13mm mesh shall be fitted in outside openings of ventilation ducts.

Chapter 15 SPECIAL REQUIREMENTS

15.3 Carbon disulphide

Carriage under suitable inert gas pad

15.3.21 A water spray system of sufficient capacity shall be provided to blanket effectively the area surrounding the loading manifold, the exposed deck piping associated with product handling and the tank domes. The arrangement of piping and nozzles shall be such as to give a uniform distribution rate of 10 l/m²/min. Remote manual operation shall be arranged such that remote starting of pumps supplying the water-spray system and remote operation of any normally closed valves in the system can be carried out from a suitable location outside the cargo area adjacent to the accommodation spaces and readily accessible and operable in the event of fire in the areas protected. The water-spray system shall be capable of both local and remote manual operation, and the arrangement shall ensure that any spilled cargo is washed away. Additionally, a water hose with pressure to the nozzle when atmospheric temperature permits, shall be connected ready for immediate use during loading and unloading operations.

15.8 Propylene oxide and mixtures of ethylene oxide/propylene oxide with an ethylene oxide content of not more than 30% by mass

15.8.29 A water-spray system of sufficient capacity shall be provided to blanket effectively the area surrounding the loading manifold, the exposed deck piping associated with product handling, and the tank domes. The arrangement of piping and nozzles shall be such as to give a uniform distribution rate of 10 l/m²/min. Remote manual operation shall be arranged such that remote starting of pumps supplying the water-spray system and remote operation of any normally closed valves in the system can be carried out from a suitable location outside the cargo area, adjacent to the accommodation spaces and readily accessible and operable in the event of fire in the areas protected. The water-spray system shall be capable of both local and remote manual operation, and the arrangement shall ensure that any spilled cargo is washed away. Additionally, a water hose with pressure to the nozzle, when atmospheric temperatures permit, shall be connected ready for immediate use during loading and unloading operations.

Chapter 21 CRITERIA FOR ASSIGNING CARRIAGE REQUIREMENTS FOR PRODUCTS SUBJECT TO THE IBC CODE

21.4.7 Column g - Tank vents

21.4.7.1 The tank venting arrangements are assigned according to the following criteria:

Controlled: Inhalation LC₅₀ ≤ 10 mg/l/4 h; and/or

Toxic to mammals by prolonged exposure; and/or

Respiratory sensitizer; and/or

Special carriage control needed; and/or

Flash point ≤ 60 °C

Corrosive to skin (≤ 4 h exposure).

Open: Any of the minimum safety or pollution criteria for bulk liquid cargoes subject to Chapter 17 or the IBC Code not meeting the requirements for controlled tank vents.

21.4.10 Column j - Gauging

21.4.10.1 The type of gauging equipment permitted is assigned according to the following criteria:

Closed: Inhalation LC₅₀ ≤ 2 mg/l/4h; and/or

Dermal LD₅₀ ≤ 1000 mg/kg; and/or

Toxic to mammals by prolonged exposure; and/or

Respiratory sensitizer; and/or

Corrosive to skin (≤ 3 min exposure).

Restricted: Inhalation LC₅₀ > 2 ~ ≤ 10 mg/l/4h; and/or

Special carriage control indicates Inerting required; and/or

Corrosive to skin (> 3 min ~ ≤ 1h exposure); and/or

Flash point ≤ 60 °C.

Open: Any of the minimum safety or pollution criteria for bulk liquid cargoes subject to Chapter 17 or the IBC Code not meeting the requirements for closed or restricted gauging.

21.4.12 Column l - Fire protection equipment

21.4.12.1 The appropriate fire-fighting media are defined as being appropriate according to the following criteria related to the properties of the product:

Solubility > 10% (> 100000 mg/l): A Alcohol-resistant foam.

Solubility < 10% (< 100000 mg/l): A Alcohol-resistant foam; and/or

: B Regular foam.

WRI = 0 : C Water spray (generally used as a coolant and can be used with A and/or B providing that the WRI=0).

WRI ≥ 1 : D Dry chemical.

No : No requirements under this Code.

Note: all appropriate media shall be listed.

21.5.5 Paragraph 15.12 - Toxic products

- 21.5.5.1 All of paragraph 15.12 is added to *column o* according to the following criteria:
Inhalation $LC_{50} \leq 2$ mg/l/4 h; and/or
the product is a respiratory sensitizer; and/or
the product is toxic to mammals by prolonged exposure.

21.5.9 Paragraph 15.17 - Increased ventilation requirements

- 21.5.9.1 Paragraph 15.17 shall be added to column o according to the following criteria:

Inhalation $LC_{50} > 0.5 \sim \leq 2$ mg/l/4 h; and/or
Respiratory sensitizer; and/or
Toxic to mammals by prolonged exposure; and/or
Corrosive to skin (≤ 1 h exposure time).