



CCS Rule Change Notice For:
RULES FOR CLASSIFICATION OF SEA-GOING
STEEL SHIPS

Version: 2016 RCN No.2

Effective from 01/01/2017

Beijing



CHINA CLASSIFICATION SOCIETY

**CCS Rule Change Notice For:
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STEEL SHIPS**

**PART ONE
PROVISIONS OF CLASSIFICATION**

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CHAPTER 2 SCOPE AND CONDITIONS OF CLASSIFICATION

Section 9 ASSIGNMENT, MAINTENANCE, SUSPENSION, CANCELLATION AND REINSTATEMENT OF CLASS

2.9.2 Suspension and cancel of class

2.9.2.4 Notification of suspension or cancellation of class

(3) For ~~new ships to which SOLAS applies, constructed on or after 1 July 1998 under SOLAS Reg. H-1/3.1,~~ the notification will state that certain statutory certificates are implicitly invalidated by the suspension or withdrawal of class.

Section 12 AVAILABILITY AND CONFIDENTIALITY OF INFORMATION

2.12.2 Disclosure of information

2.12.2.3 Notwithstanding the general duty of confidentiality owed by CCS to its client in accordance with its Rules, CCS' clients hereby accept that CCS will ~~participate in~~ implement IACS' Procedure for Early Warning System¹ which requires each IACS Member to provide its fellow IACS Members with relevant technical information on serious failures of hull structure and engineering systems, as defined in the IACS' Procedure for Early Warning System (but not including any drawings relating to the ship which may be the specific property of another party), to enable such useful information to be shared and utilized ~~to facilitate the proper working of IACS' Early Warning System.~~ CCS will provide its client with written details of such information upon sending the same to IACS Members.

Appendix 1 LIST OF CLASS NOTATIONS FOR SEA-GOING SHIPS

Special Equipment and System Notations

Table G

Class notation	Description		Technical requirements to be complied with
LNG Fuel <u>Natural Gas Fuel</u>	Liquefied n Natural gas used as fuel	This notation may be added for ships using liquefied natural gas as fuel <u>This notation may be assigned to ships of which main propulsion and/or auxiliary machinery uses natural gas or fuel oil and natural gas as fuel, except for liquefied gas carriers</u>	Rules for Ships Powered by Natural Gas Fuel <u>RULES FOR NATURAL GAS FUELLED SHIPS</u>
CNG Fuel	Compressed natural gas used as fuel	This notation may be added for ships using compressed natural gas as fuel	
Dual Fuel	Dual Fuel	This notation may be added for ships which not only use natural gas as fuel but also burn fuel oil, or burn fuel oil and natural gas fuel at the same time	

¹ For details of the procedure, refer to IACS PR2A "Procedure for Hull Failure Incident Reporting" and PR2B "Procedure for Early Warning of Serious Hull Failure Incidents - "Early Warning Scheme – EWS".

CHAPTER 5 SURVEYS AFTER CONSTRUCTION

Section 1 GENERAL PROVISIONS

5.1.9 Procedures for thickness measurements

5.1.9.1 General requirements

(1) ~~This paragraph applies to ESP ships and general dry cargo ships. Except for 5.1.9.3, this paragraph applies to all ships.~~

(3) The thickness measurement company is to be part of the survey planning meeting prior to the commencement of the survey as stated in 5.1.6.6.

5.1.9.5 Monitoring of the thickness measurement process onboard

(1) The Surveyor is to decide final extent and location of thickness measurements after completion of overall survey of representative spaces onboard.

5.1.12 ESP Survey

5.1.12.1 On ships of 20,000 tonnes DWT and above, subject to ESP, starting with special survey No.3, ~~at~~ special and intermediate hull classification surveys, surveys of hull structures and piping systems in way of cargo holds / cargo tanks, cofferdams, cargo pump rooms, pipe tunnels, void spaces and the selected fuel oil tanks of bulk carriers within the cargo length area and all ballast tanks are to be carried out by at least two qualified exclusive Surveyors at the same time.

5.1.12.2 On bulk carriers of single side skin construction and 100,000 DWT and above, at the intermediate hull classification survey between 10 and 15 years of age, surveys of hull structures and piping systems in way of cargo holds, cofferdams, pipe tunnels, void spaces and the selected fuel oil tanks within the cargo length area and all ballast tanks are ~~is~~ to be performed by at least two qualified exclusive Surveyors at the same time.

Section 2 TYPES AND PERIODS OF SURVEYS

5.2.3 Periodical surveys of the outside of the ship's bottom and related items

5.2.3.8 For passenger ships (including ro-ro passenger ships) engaged on international voyages, the outside of the bottom of the ship is to be inspected once a year, and at least twice in dry-dock during each five-year special survey period ~~within a five-year period~~. In-water surveys may be carried out in lieu of the others when the ship is afloat. The minimum number of inspections in dry-dock of the outside of the bottom of a passenger ship (which is not a ro-ro passenger ship) of 15 years of age or less during each five-year special survey period ~~in any five-year period~~ may be reduced from two to one if relevant technical requirements are met². In such cases, the interval between consecutive inspections in dry-dock is not to exceed 60 months, unless otherwise specified by the flag Administration.

5.2.7 Continuous surveys

5.2.7.2 Continuous survey system for machinery

(1) At the request of the owner and with the consent of CCS, all examination and test items of the special survey of the machinery (including electrical installations), other than those specified in

² Refer to MSC.1/Circ.1348.

5.9.4.3(1) and (2) of this Chapter, may be carried out on the continuous survey basis.

(2) When the continuous survey is carried out, all items for special survey of the machinery (including electrical installations), other than those specified in 5.9.4.3(1) and (2) of this Chapter, are to be examined in rotation, evenly distributed within the cycle of the special survey (5 years).

(3) The longest interval between consecutive examinations of each item is not to exceed 5 years. All items to be inspected are to be submitted to the Surveyors for examination after opening and cleaning, as in the special survey. Control, alarm and safety systems are in general to be checked only by operation test or simulation test.

5.2.8 Survey of planned maintenance scheme (PMS) for machinery

5.2.8.1 For machinery and installations which are subject to planned maintenance and with the consent of CCS, the survey of planned maintenance scheme (for details, see Appendix 16 of this Chapter) may be introduced to replace the ~~special or~~ continuous survey, provided that:

Section 4 HULL AND EQUIPMENT SURVEYS

5.4.2 Annual surveys

5.4.2.2 Scope of the survey for all ships

(1) Hull

⑦ ~~examining, as far as is practicable, the means of access to cargo and other void spaces when examining internal spaces of oil tankers and bulk carriers;~~
confirming, when appropriate and as far as is practicable when examining internal spaces on oil tankers and bulk carriers, that the means of access to cargo and other spaces remain in good condition;

⑩ examining the cargo hold water level detector and its audible and visual alarms of single skin single-hold cargo ships;

(6) Fire-fighting equipment

③ ~~confirming that the firemen' outfits are complete and in good condition and that the cylinders, including the spare cylinders, of any required self-contained breathing apparatus are suitably charged;~~

confirming that the firefighters' outfits including its self-contained compressed air breathing apparatus and emergency escape breathing devices (EEBDs) are complete and in good condition, that the cylinders, including the spare cylinders, of any required self-contained breathing apparatus are suitably charged, and that on board means of recharging breathing apparatus cylinders used during drills or a suitable number of spare cylinders to replace those used are provided, and provision of two-way portable radiotelephone apparatus of an explosion-proof type or intrinsically safe;

5.4.3 Intermediate surveys

5.4.3.2 Survey items for all ships

(5) Thickness measurements

Where extensive areas of wastage are found, thickness measurements ~~may~~are to be required and renewals made when wastage exceeds allowable margins.

Section 6 ADDITIONAL REQUIREMENTS FOR HULL AND EQUIPMENT SURVEYS OF OIL TANKERS

5.6.3 Intermediate surveys

5.6.3.1 General requirements

(1) The intermediate survey extent is dependent on the age of the ship as specified in 5.6.3.2 to 5.6.3.4 and Table 5.6.3 of this Section.

Minimum Requirements for Overall and Close-Up Survey and Thickness Measurements at Intermediate Survey of Double Hull Oil Tankers

Table 5.6.3

Age of ship at time of intermediate survey due date		
5 < age ≤ 10	10 < age ≤ 15	age > 15
Overall survey of Representative ballast tanks selected by the attending surveyor (see 5.6.3.2)	The requirements of the previous Special Survey (see 5.6.3.3)	The requirements of the previous Special Survey (see 5.6.3.4)
Suspect areas identified at previous surveys are to be examined (see 5.6.3.2)		

Section 7 ADDITIONAL REQUIREMENTS FOR HULL AND EQUIPMENT SURVEYS OF BULK CARRIERS

5.7.4 Special surveys

5.7.4.4 Extent of overall and close-up surveys

(2) Double skin bulk carriers

⑤ For areas in spaces where hard protective coatings are found to be in a GOOD condition, the extent of close-up surveys according to Table 5.7.4.4(2)② or Table 5.7.4.4(2)③ may be specially considered.

Section 9 SURVEYS OF MACHINERY

5.9.2 Annual surveys

5.9.2.3 Survey items for all ships

~~(7) Examining the means for the operation of the main and auxiliary machinery essential for the propulsion and the safety of the ship, including, when applicable, the means of remotely controlling the propulsion machinery from the navigating bridge and the arrangements to operate the main and other machinery from a machinery control room.~~

Examining the means for the operation of the main and auxiliary machinery essential for the propulsion and the safety of the ship, including, when applicable, the means of remotely controlling the propulsion machinery from the navigating bridge (including the control, monitoring, reporting, alert and safety actions) and the arrangements to operate the main and other machinery from a machinery control room.

Section 14 INITIAL CLASSIFICATION SURVEYS OF SHIPS CONSTRUCTED NOT UNDER THE SUPERVISION OF CCS

5.14.1 General requirements

5.14.1.3 Whenever CCS is requested by an owner to accept the transfer of class for a ship and the losing Society is the Society accepted by CCS, CCS is to immediately notify the owner in writing that:

(5) the principles given in items (1), (2) and (3) above apply to any additional recommendations/conditions of class issued against the ship arising from surveys which were not included in the initial survey status provided by the losing Society because the surveys were carried out in close proximity to the request for transfer of class. Such additional recommendations/conditions of class if received after the issuance of the Interim Certificate of Class by CCS and which are overdue are to be dealt with at the first port of call by the relevant Society depending on the age of the ship;

5.14.3 Initial classification surveys of ships after construction

5.14.3.1 Initial classification surveys of ships which have been surveyed by the Societies accepted by CCS

(1) Initial classification surveys of ships which have been certified by the Societies accepted by CCS:

① When applying for an initial classification survey, as the prerequisite for issuance of a long-term classification certificate by CCS, the owner is to submit at least one copy each of the plans, calculations and other technical documents to CCS for check, including at least the following:

g. Additional plans required for periodically unattended machinery spaces:

(b) Fire alarms system;

(c) ~~Table~~ List of automatic safety functions (e.g. ~~slackening, closing~~ slowdowns, shutdowns, etc.);

④ In addition to the items corresponding to ship's age and losing class status, the extent of surveys is to include the following:

b. Machinery (including electrical installations):

(a) A general examination of all essential machinery is to be held and is generally to include³:

Ⓞ compliance of all pressure vessels with submitted drawings and certificates is to be verified, and all pressure vessels are to be examined in working conditions;

Section 16 ADDITIONAL REQUIREMENTS FOR HULL AND EQUIPMENT SURVEYS OF LIQUEFIED GAS CARRIERS

5.16.1 General requirements

5.16.1.2 The requirements in this Section apply to surveys of hull structure and piping systems, except cargo piping covered, in way of pump rooms, compressor rooms, cofferdams, pipe tunnels, ~~and~~ void spaces and fuel oil tanks within the cargo area and all ballast tanks. The requirements are additional to the classification requirements applicable to the remainder of the ship, refer to Section 4 of this Chapter. The requirements for periodical surveys of cargo installations on ships carrying liquefied gases in bulk are given in CCS Rules for Construction and Equipment of Ships Carrying Liquefied Gases in Bulk.

³ For the transfer of class to CCS or adding CCS class at a ship's delivery, items Ⓞ and Ⓞ may be verified by reviewing the ship's record.

5.16.4.5 Extent of thickness measurement

**Minimum Requirements for the Thickness Measurement at Hull Special Survey
of Liquefied Gas Carriers**

Table 5.16.4.5(1)

Special Survey No.1 (Age ≤ 5)	Special Survey No.2 (5 < Age ≤ 10)	Special Survey No.3 (10 < Age ≤ 15)	Special Survey No.4 and subsequent (Age > 15)
One section of deck plating for the full beam of the ship within 0.5 L amidships in way of a ballast tank, if any	Within the cargo area: ① each deck plate ② one transverse section within 0.5 L amidships in way of a ballast tank, if any	Within the cargo area: ① each deck plate ② two transverse sections (1) ③ all wind and water strakes	Within the cargo area: ① each deck plate ② three transverse sections (1) ③ each bottom plate ④ duct keel plating and internals
	Selected wind and water strakes outside the cargo area		All wind and water strakes, full length
Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to Table 5.16.4.4(2)			
Suspect areas			
(1) At least one section is to include a ballast tank within 0.5L amidships, if any.			
Note 1: For ships having independent tanks of type C, with a midship section similar to that of a general cargo ship, the extent of thickness measurements may be specially considered <u>the extent of thickness measurements may be increased to include the tank top plating at the discretion of the Surveyor.</u>			
Note 2: For areas in spaces where coatings are found to be in GOOD condition, the extent of thickness measurements may be specially considered.			
Note 3: The Surveyor may extend the thickness measurements as deemed necessary. Where substantial corrosion is found, the extent of thickness measurements is to be increased to the satisfaction of the Surveyor.			

Appendix 1 CRITERIA FOR RENEWAL OF HULL STRUCTURAL MEMBERS

2.7 For the following bulk carriers of 150 m in length and upwards and carrying solid bulk cargoes having a density of 1.78 t/m³ and above, steel renewal is required where the gauged thickness of transverse watertight corrugated bulkheads between cargo holds Nos.1 and 2 is less than $t_{net} + 0.5$ mm and coating (applied in accordance with the coating manufacturer's requirements) or annual gauging may be adopted as an alternative to steel renewal where the gauged thickness is within the range $t_{net} + 0.5$ mm and $t_{net} + 1.0$ mm, with t_{net} being calculated in accordance with IACS UR S19:

- (1) bulk carriers contracted for construction before 1 July 1998 and not complying with IACS UR S18 ~~and S20~~;
- (2) bulk carriers the keels of which were laid or which were at a similar stage of construction before 1 July 1999 and not complying with IACS UR S18 ~~and S20~~.

**Appendix 2 CRITERIA FOR LONGITUDINAL STRENGTH OF HULL GIRDER
FOR OIL TANKERS**

Annex 3 Sampling Method of Thickness Measurements for Longitudinal Strength Evaluation
and Repair Methods

2 Sampling method of thickness measurement

2.4 Within 0.1D (where D is the ship's moulded depth) of the deck and bottom at each transverse section to be measured in accordance with the requirements of Table 5.6.4.4(1) of this Chapter, every longitudinal and girder are to be measured on the web and face plate, and every plate is to be measured at one point between longitudinals.

Appendix 8 PROCEDURAL REQUIREMENTS FOR SERVICE SUPPLIERS

ANNEX 1 Special Requirements for Various Categories of Service Suppliers

6. Firms engaged in the servicing and testing of radio communication equipment

6.6 Minimum required instruments:

- equipment for measuring output and reflect effect on VHF and MF/HF;
- acid tester for checking specific gravity of lead batteries;
- tester for checking of correct output from free-float satellite EPIRB.

Appendix 16

**GUIDELINES FOR SURVEY OF PLANNED MAINTENANCE SCHEME (PMS) FOR
MACHINERY**

Annex is replaced as follows:

Annex:

Items for Survey of PMS

PMS No.	CWBT code	Item	Details
1	MD-100-000-000	Diesel engine	
1.1	MD-101-000-000	Diesel engine	F ⁴ 1. General inspection
1.1.1	MD ⁵ -101-000-000 GD ⁶ -101-000-000	Cylinder cover	H ⁷ 1. Inspecting each connected flange around cylinder cover and valve hole for defects, e.g. crack, ablation, unevenness. 2. Inspecting cooling water jacket space for scale and corrosion. 3. 0.7 MPa hydraulic test of cooling water jacket space after repair or where necessary
1.1.2	MD-102-010-000 GD-102-010-000	Piston	H Trunk piston: 1. Inspecting piston head, suspension lug, piston ring groove, piston pin hole, piston skirt, etc. for crack and ablation, and repair or renewal to be made where necessary. 2. Measuring and recording. H Crosshead type engine piston:

⁴ F is the item of annual confirmatory survey.

⁵ M is the main diesel engine (main engine).

⁶ G is the prime motor of diesel generating set (auxiliary engine).

⁷ H is the item overhauled at least once within each period of survey of PMS and the test of some systems.

PMS No.	CWBT code	Item	Details
			<ol style="list-style-type: none"> 1. Inspecting piston head, suspension lug, piston ring groove and wear ring for crack, ablation, excessive wear, loosening, etc. 2. Inspecting water jacket space for scale and cleaning where necessary, hydraulic test. 3. Measuring and recording
1.1.3	MD-102-018-000 GD-102-018-000	Connecting rod	H <ol style="list-style-type: none"> 1. Inspecting the connecting rod for crack. 2. Inspecting bolts for crack, deformation, loosening, thread damage, and detection or renewal to be made where necessary
1.1.4	MD-102-011-000 MD-102-014-000	Piston rod Stuffing box	H <ol style="list-style-type: none"> 1. Cleaning, inspecting, measuring and recording. 2. Aligning the center and air clearance where necessary. 3. Disassembling, cleaning and inspecting the stuffing box, and renewing stuffing where necessary
1.1.5	MD-103-009-000 GD-103-009-000	Cylinder liner	H <ol style="list-style-type: none"> 1. Inspecting the cylinder liner for crack, scotch and excessive wear, etc. 2. Drawing out the liner for clean and inspection, and renewing the packing ring periodically in accordance with specifications. 3. Measuring and recording
1.1.6	MD.GD-101-002-000 MD.GD-101-003-000 MD.GD-101-005-000 MD.GD-101-006-000 MD.GD-101-007-000	Intake valve Exhaust valve Safety valve Indicator valve Starting valve	H <ol style="list-style-type: none"> 1. Inspecting casing, core and spring of each valve for crack, whether the working face between valve and valve seat is in normal order, and detection of valve rod to be made where necessary. 2. Checking the safety valve with opening pressure not exceeding 1.4 times the maximum combustion pressure
1.1.7	MD-102-015-000 MD-102-016-000	Crosshead pin & bearing Guide plate & sliding block	H <ol style="list-style-type: none"> 1. Inspecting the crosshead pin for crack and scotch, and detection to be made where necessary. 2. Inspecting crosshead pin, bearing and white metal of guide plate for crack, overheat, scotch, shelling, whether the connection is in order, and inspecting the connecting bolt. 3. Measuring the crosshead pin and recording. 4. Measuring the clearances of bearing, sliding block and guide plate and recording. 5. Correcting and adjusting where necessary
1.1.8	MD-102-018-000	Bearing of connecting rod	H <ol style="list-style-type: none"> 1. Inspecting the bearing for crack, shelling, overheat, scotch, breakaway and other contact, wear conditions. 2. Measuring crank pin and recording. 3. Measuring clearance of bearing and recording
1.1.9	MD-106-000-000 GD-105-000-000	Transmission mechanism of	H <ol style="list-style-type: none"> 1. Inspecting and measuring clearance of roller. 2. Inspecting the push rod and push rod seat

PMS No.	CWBT code	Item	Details
		intake valve Transmission mechanism of exhaust valve	
1.1.10	MD-103-055-000 GD-103-057-000	Frame & bedplate	H 1. Visual inspection for crack, deformation, damage, corrosion, etc. 2. Inspecting connection of frame, bedplate and cylinder block. 3. Hammering check of bolts and rivets for damage, fracture and tightening
1.1.11	MD-103-056-000 GD-103-056-000	Crankcase & safety device	H 1. Visual inspection. 2. The spring of explosion-proof door has no fracture and the valve is in order
1.1.12	MD-103-059-000 GD-103-055-000	Foundation bolts & packing blocks	H 1. Visual inspection. 2. Inspecting foundation bolts for loosening or fracture. 3. Inspecting the tightening of packing blocks and bolts
1.1.13	MD-104-020-000 GD-104-020-000	Main bearing & shaft journal	H 1. Inspecting the bearing for crack, shelling, overheat, scotch and contact, wear conditions. 2. Inspecting the shaft journal for scotch, pitting corrosion, and detection to be made where necessary. 3. Gauging the wear-down of crankshaft by bridge gauge, and where necessary, measuring and recording eccentric deviation. 4. Measuring thickness of bearing pillow, bearing clearance and recording. 5. Measuring the shaft journal and recording when the crankshaft is lift
1.1.14	MD-104-069-000 GD-104-168-000	Transmission mechanism of crankshaft	H 1. Tooth gear: inspecting the gear for crack, erosion, collapse, excessive wear, gear engagement and lubrication, measuring side clearance of the gear and recording. 2. Chain gear: inspecting links and rollers for crack, erosion, and wear, whether rollers are in order, and detection to be made and pre-tightening of chain adjusted where necessary
1.1.15	MD-105-000-000 GD-105-000-000	Camshaft Camshaft bearing	H 1. Inspecting the procedure for tightening cam on the shaft. 2. Inspecting the surface of cam for crack, pitting corrosion, scotch and excessive wear. 3. The bearing may not be dismantled where it has been in good operation with normal appearance and has not been repaired. 4. Overhauling, and measuring and recording the size and eccentric deviation of shaft journal and the clearance of bearing
1.1.16	MD-106-314-100	Scavenging fan	H 1. Inspecting the coupling and impeller. 2. Inspecting the automatic control device, and effectiveness test
1.1.17	MD-106-314-200	Emergency air blower	H 1. Inspecting the coupling and impeller. 2. Inspecting the automatic & manual control devices, and

PMS No.	CWBT code	Item	Details
			effectiveness test
1.1.18	MD-106-079-000	Scavenging pump	H 1. Piston-type scavenging pump: Inspecting piston, piston rod, cylinder liner, intake valve, exhaust valve for crack, scotch and excessive wear. Measuring the clearances of piston, piston ring, cylinder liner and bearing and recording. 2. Revolving scavenging pump: Inspecting pump case, impeller or gear, shaft, bearing and transmission gear components for crack, deformation, excessive wear, etc.
1.1.19	MD-107-029-000 GD-106-029-000	High-pressure oil pump	H 1. Overhauling the pump case and spring for defects, e.g. crack, deformation. 2. Inspecting the plunger, inlet valve and outlet valve for defects, e.g. crack, wear, scotch, pit corrosion, burr. 3. Check periodically
1.1.20	MD-109-051-000 GD-109-051-000	Exhaust-gas turbocharger	H 1. Inspecting the casing for crack, the cooling water jacket space for scale and the corrosion, and thickness measurement to be made where necessary. Hydraulic test with 1.5 times working pressure (not less than 0.4 MPa) for cooling water jacket space of the casing. 2. Lifting out and inspecting the rotor, blades, guide blade and diffuser for defects, e.g. crack, bending, deformation, collapse, corrosion, and dynamic balance test to be made and a report submitted where necessary. 3. Inspecting the bearing for defects and renewing it in accordance with the specifications
1.1.21	MD-109-052-000 GD-109-052-000	Air cooler	H 1. To inspect whether the pipe and tube plate have deformation, damage, scale, corrosion, etc. 2. To wash the air and water jacket space. 3. To renew corrosion-proof zinc block. 4. Hydraulic test with 1.5 times working pressure is made at the side of air cooler
1.1.22		Spare parts and stores	H 1. The number of main spare parts is not less than the requirements of CCS Rules
1.1.23	MD-103-058-000 GD-103-058-000	Through bolt	H 1. To check the pre-tightening of through bolt in accordance with the specifications
1.1.24	MD-104-021-000 GD-104-021-000	Vibration damper or antivibrator	H 1. Flexible base: Inspecting the vibration isolating rubber and spring for damage. 2. Back balance antivibrator: to inspect the tightening of back balance and bolt. 3. Hydraulic spring-type antivibrator: Opening the covers at both sides of antivibrator, inspecting whether the spring unit, locating pin and oil hole are in order and unblocked, inspecting oil quality
1.1.25	MD-106-000-000	Scavenging air	H 1. Opening scavenging receiver and cleaning manifold and the

PMS No.	CWBT code	Item	Details
		receiver & safety device	<p>internal of receiver.</p> <ol style="list-style-type: none"> Inspecting internal valves and fittings, and repairing or renewing components where necessary. Inspecting the passage of nozzles of emergency fire-extinguishing appliances. Inspecting the reliability of explosion-proof door of scavenging receiver and valves
1.1.26	MD-01-10-025-000	Reversing arrangement	<p>H</p> <ol style="list-style-type: none"> Inspecting components, e.g. reversing cam, reversing valve, reversing servo mechanism. Overhauling relevant components, valves, etc. periodically in accordance with the specifications. Effectiveness test
1.1.27	MD-109-061-000	Carriage turning gear (jacking engine)	<p>H</p> <ol style="list-style-type: none"> Inspecting wear of worm wheel and worm. Inspecting the reliability of carriage turning gear and interlocked valve. Inspecting the coupling of motor and carriage turning gear. Effectiveness test
1.1.28	MD-110-000-000 GD-108-152-000	Engine-driven air compressor	<p>H Where engine-driven pump is a reciprocating pump:</p> <ol style="list-style-type: none"> Inspecting the reliability of engine-driven transmission mechanism. Inspecting piston, piston rod, cylinder liner, air inlet valve, exhaust air (water, oil) valve and spring for crack, scotch and excessive wear. Lifting out the piston and connecting rod, measuring the clearance of bearing and recording. Effectiveness test and checking the safety valve <p>H Where engine-driven pump is a rotating-type pump:</p> <ol style="list-style-type: none"> Inspecting the reliability of engine-driven transmission mechanism. Inspecting the casing, impeller or gear or worm, bearing, shaft, shaft gland and components for crack, deformation, excessive wear, and renewal to be made where necessary. Effectiveness test <p>H Engine-driven air compressor:</p> <ol style="list-style-type: none"> Inspecting the items as shown in 5.1
1.1.29	MD-110-000-000	Engine-driven bilge pump	
1.1.30	MD-110-000-000 GD-106-141-000	Engine-driven diesel oil booster pump	
1.1.31	MD-110-000-000 GD-106-141-000	Engine-driven fuel oil booster pump	
1.1.32	MD-110-000-000 GD-106-141-000	Engine-driven diesel oil delivery pump	
1.1.33	MD-110-000-000 GD-106-141-000	Engine-driven fuel oil delivery pump	
1.1.34	MD-110-000-000 GD-107-142-000	Engine-driven freshwater pump	
1.1.35	MD-110-000-000 GD-107-142-000	Engine-driven cooling freshwater pump	
1.1.36	MD-110-000-000 GD-106-142-000	Engine-driven cooling pump of fuel injector	
1.1.37	MD-110-000-000	Engine-driven lub. oil pump	

PMS No.	CWBT code	Item	Details
1.1.38	MD-110-000-000	Engine-driven reduction gear lub. oil pump	
1.1.39	MD-110-000-000	Engine-driven seawater circulating pump	
1.1.40	MD-110-000-000	Engine-driven seawater cooling pump	
1.1.41	MD-110-000-000	Engine-driven freshwater cooler	H 1. Cleaning seawater jacket space, renewing corrosion-proof zinc block and inspecting end cover gasket. 2. Washing freshwater jacket space. 3. Hydraulic test
1.1.42	MD-110-000-000	Engine-driven lub. oil cooler	H 1. Cleaning seawater jacket space, renewing corrosion-proof zinc block and inspecting end cover gasket. 2. Washing freshwater jacket space. 3. Hydraulic test
1.2	MD-110-000-200 GD-108-148-000	Partial pipeline of starting air system	H 1. Visual inspection for corrosion, damage or leakage trace, and hydraulic test or thickness measurement to be made where necessary. 2. Disassembling some valves and pipeline lengths of starting air system for internal inspection. 3. Checking the safety valve of starting air manifold (if any) with the pressure not exceeding 1.1 times working pressure. 4. Inspecting the tightness
1.3	MD-104-019-000 GD-104-019-000	Crankshaft	H 1. Inspecting the shaft journal of crankshaft for scotch, pitting corrosion, mechanical damage and wear, inspecting the fillet and oil hole for crack. 2. Inspecting crankshaft cylinder liner or press fit or loosening or offset. 3. Inspecting the reliable tightening of flange connection for sectional crankshaft and of back balance for assembled crankshaft. 4. Measuring the shaft journal of crankshaft and recording. 5. Measuring the crankshaft deflection and recording
2	MT-000-000-000	Turbine	
2.1	MT-000-000-000	Steam turbine	F 1. General inspection
2.1.1	MT-101-000-000	Cylinder block & cylinder cover	H 1. Dismantling the cylinder block and bedplate and inspecting for crack or other defects. 2. Inspecting for the tight connection of cylinder block and bedplate and for fracture of bolts. 3. Inspecting the joint surface of cylinder for mechanical damage and leakage trace.

PMS No.	CWBT code	Item	Details
			<ol style="list-style-type: none"> 4. Inspecting the bolts connecting upper and lower cylinder blocks for damage or crack. 5. Measuring the axial clearance of heat-expansion-prevention separator of cylinder and recording. 6. Inspecting the separator for corrosion, loosening and crack. 7. Inspecting the steam seal for wear, deformation or leakage
2.1.2	MT-103-310-000 MT-103-310-200 MT-103-310-300	Rotor, blades	H <ol style="list-style-type: none"> 1. Inspecting the rotor for deformation, loosening and crack. 2. Inspecting, measuring the working shaft journal and recording. 3. Inspecting the blade for defects, e.g. crack or wear, and detection to be made as the circumstance dictates. 4. Inspecting the blades for loosening and for securing of final blade, locking block, bracing, skirt and blades. 5. Inspecting the installation of rotor, measuring axial/radial clearances between rotor and separator and recording
2.1.3	MT-103-171-000 MT-103-171-200 MT-103-171-300	Elastic coupling	H <ol style="list-style-type: none"> 1. Inspecting for the connection and for defects of bolts. 2. Alignment. 3. Inspecting the elastic elements for crack and damage
2.1.4	MT-107-000-000	Condenser and steam bleeder	H <ol style="list-style-type: none"> 1. Inspecting the tube plate, pipe head and end cover for leakage and corrosion. 2. Inspecting the effectiveness during operation
2.1.5	MT-102-000-000	Main bearing, thrust pad and oil seal	H <ol style="list-style-type: none"> 1. Inspecting the white metal and thrust face of bearing. 2. Inspecting, measuring axial/radial clearances and recording. 3. Gauging the wear-own of shaft journal by bridge gauge and recording. 4. Inspecting wear, deformation or leakage
2.1.6		Steam reheater	H <ol style="list-style-type: none"> 1. Inspecting the tube plate, pipe head and end cover for leakage and corrosion. 2. Inspecting the effectiveness during operation
2.1.7	TS-105-153-000	Steam superheater	
2.1.8		Heat reducer	
2.1.9	MT-108-073-300	Axial displacement protection	H <ol style="list-style-type: none"> 1. Inspecting for defects. 2. Effectiveness test and recording
2.1.10	MT-108-073-000	Overspeed protection	H <ol style="list-style-type: none"> 1. The same as 2.1.9
2.1.11	MT-108-070-200 MT-108-070-300	Ahead and astern steering gear and main control valve	H <ol style="list-style-type: none"> 1. Inspecting for connection and defects. 2. Effectiveness test and recording
2.1.12	MT-107-148-000	Main steam pipe between boiler and steam turbine	H <ol style="list-style-type: none"> 1. Inspecting the internal corrosion of some pipe lengths. 2. Thickness measurement for those suspect pipes and recording, or hydraulic test with 2 times working pressure
2.2	MG-100-000-000	Gas turbine	F <ol style="list-style-type: none"> 1. General inspection
2.2.1	MG-101-000-000	Rotor, impeller & blades	H <ol style="list-style-type: none"> 1. Refer to 2.1.2 as appropriate
2.2.2	MG-102-000-000	Casing of air	H <ol style="list-style-type: none"> 1. Refer to 2.1.1 as appropriate

PMS No.	CWBT code	Item	Details
		compressor	
2.2.3	MG-103-000-000	Combustion chamber	H 1. Inspecting for defects, e.g. crack, corrosion and sooting
2.2.4	MG-104-000-000	Burner	H 1. Inspecting for defects, e.g. crack, corrosion. 2. Inspecting nozzle and fuel injector
2.2.5	MG-105-000-000	Intercooler	H 1. Refer to 2.1.4 as appropriate
2.2.6	MG-106-000-000	Heat exchanger	H 1. Refer to 2.1.6 as appropriate
2.2.7	MG-107-000-000	Starting and reversing devices	H 1. Refer to 2.1.11 as appropriate
3	PM-100-000-000	Shafting	
3.1	PM-101-000-000	Intermediate shaft and bearing	F 1. General visual inspection of shafting and bearing seat for crack and tightening, etc. H 1. Opening the upper cover and inspecting the wear of shaft journal. 2. Measuring and recording eccentric deviation of shaft journal. 3. Inspecting for the tightening of bolts for coupling flange. 4. Inspecting the passage of cooling water pipe. 5. The lower half of bearing not to be dismantled for inspection where the shafting alignment found good
3.2	PM-105-000-000	Thrust shaft and bearing	F 1. Inspecting the bearing shell and oil seal for crack, etc. 2. Inspecting the white metal of thrust pad for wear and loosening. 3. Inspecting the operation of lub. oil system. 4. Inspecting the operation of cooling water. H 1. Measuring and recording the clearance of thrust bearing
4	PM-000-000-000	Propelling system	
4.1	PM-104-000-000	Reduction/increasing gear	F 1. General visual inspection of gear box for leakage, crack and tightening. H 1. Inspecting gear shaft for wear and shaft journal for scotch, measuring and recording eccentric deviation of shaft journal. 2. Inspecting engagement of each gear and pinion for crack of root. 3. Inspecting wear of tooth face and measuring and recording clearance. 4. Inspecting lub. oil system
4.2	PM-103-000-000	Clutch	F 1. Inspecting external condition for leakage and the tightening of hold-down bolts, etc. H 1. Inspecting the items in accordance with the specifications. 2. Effectiveness test
5		Essential auxiliary machinery	
5.1	AS-102-000-000 AS-103-000-000	Main air compressor	F 1. General visual inspection for leakage and operation. H 1. Dismantling the cylinder head and inspecting valve hole and

PMS No.	CWBT code	Item	Details
	AS-203-000-000	Auxiliary air compressor Accessory safety device	water hole. 2. Inspecting cooling water jacket space for scale and corrosion. 3. Inspecting, measuring the wear of crankshaft journal and bearing and recording. 4. Measuring and recording each grade of cylinder liners. 5. Lub. oil condition, and effectiveness test of safety valve. 6. Opening the end cover of intercooler and inspecting cooling pipeline and sealing condition
5.2	SE-508-000-000	Emergency air compressor and air bottle	F 1. Inspecting the external corrosion. H 1. Effectiveness test of emergency air compressor. 2. Airtightness test of outlet valve and drain valve of emergency small air bottle. 3. Check of safety valve
5.3		Essential pumps and motors	All kinds of pumps are disassembled in accordance with the specifications
5.3.1	BW-102-142-000 BW-102-301-000	Seawater pump & motor for main engine	F 1. General visual inspection of the pump group and flange connection, and the tightening of seat. H 1. Inspecting shaft gland for wear and leakage.
5.3.2	BW-104-142-000 BW-104-301-000	Seawater pump and motor for berthing	2. Inspecting the impeller for corrosion and dynamical balance. 3. Measuring and recording the clearance between impeller and pump case.
5.3.3	FW-203-000-000	Fresh water pump & motor for main engine	4. Inspecting the wear of blade and tooth face, measuring and recording the clearance. 5. Inspecting the shaft gland for wear.
5.3.4	FW-207-000-000	Fresh water pump & motor for berthing	6. Inspecting the bearing for wear. 7. Effectiveness test after assembly.
5.3.5	TS-605-000-000	Feed pump & motor for boiler	Key inspection in accordance with different types of pumps: Centrifugal pump: H 1. Inspecting suction pipeline for corrosion and self-priming capability.
5.3.6	TS-306-000-000	Circulating water pump & motor for boiler	2. Inspecting of impeller and blades for cavity corrosion. Gear pump: H 1. Measuring and recording the clearance between gear plane and end cover of pump case.
5.3.7	TS-404-000-000	Circulating water pump & motor for exhaust boiler	Reciprocating pump: H 1. Inspecting the wear and the opening of piston ring. 2. Measuring and recording the size of pump cylinder.
5.3.8	OS-502-000-000	Fuel pump & motor for boiler	Screw pump: H 1. Watching the noise and stability during operation. 2. Inspecting by-pass safety valve for reliability.
5.3.9	OS-302-000-000	Fuel pump & motor for main engine	Sled (vane) pump: H 1. Measuring and recording the clearance of vane in chute. 2. Measuring and recording the clearance of vane end surface.
5.3.10	OS-303-302-000	Fuel pressure pump & motor for main engine	

PMS No.	CWBT code	Item	Details
5.3.11	LO-302-000-000	Lub. oil pump & motor for main engine	Inspection of driving motors of various pumps: H 1. Measuring and recording insulation of motors. 2. Replacing the ball bearing or roller bearing and recording as the circumstance dictates and according to overhaul period. 3. Effectiveness test after assembly.
5.3.12	LO-304-000-000	Oil pump & motor for main engine camshaft	
5.3.13	SE-101-000-000	fire pump & motor	
5.3.14	SE-05-01-000-000	Emergency fire pump & driving device	
5.3.15	BW-202-000-000	Ballast pump & motor	
5.3.16	KP-102-142-000 KP-102-301-000	Bilge pump & motor	
5.3.17	BW-203-000-000	Equalizing pump & motor	
5.3.18	BW-204-000-000	General service pump & motor	
5.3.19	FW-402-000-000	Seawater pump and motor for fresh water generator	
5.3.20	FW-405-000-000	Condensate pump and motor for fresh water generator	
5.3.21	OS-102-141-000 OS-102-301-000	Fuel transfer pump and motor	
5.3.22	OS-104-141-000	Diesel oil transfer pump and motor	
5.3.23	KP-104-141-000 KP-104-301-000	Residual fuel pump & motor	
5.3.24	FW-302-000-000	Daily service fresh water pump & motor	
5.3.25	FW-303-000-000	Heat water circulating pump & motor	For various ejector pumps: H 1. Inspecting nozzle holes for wear. 2. Inspecting diffuser cone for erosion and corrosion. 3. Effectiveness test.
5.3.26	BW-402-000-000	Sanitary pump & motor	
5.3.27	FW-502-000-000	Drinking water pump & motor	

PMS No.	CWBT code	Item	Details
5.3.28	FW-205-142-000 FW-205-301-000	Cooling pump & motor of fuel injector for main engine	
5.3.29	FW-204-142-100 FW-204-301-100	Cooling pump & motor of piston for main engine	
5.3.30	FW-302-142-000 FW-302-301-000	Fresh water transfer pump and motor	
5.3.31	FW-403-000-000	Vacuum pump set of fresh water generator	
5.3.32	FW-404-000-000	Salt water pump & motor for fresh water generator	
5.3.33		Vacuum air pump	
5.3.34		Feed water jet pump	
5.3.35	BS-202-146-000	Bilge water jet pump	
5.3.36		All other engine-driven pumps	
5.3.37	DO-202-619-000 DO-202-313-000	Fuel oil separator & motor	H 1. Disassembling oil separator and inspecting each component. 2. Inspecting the vertical spindle for bending and wear. 3. Inspecting bearing for wear and measuring clearance. 4. Inspecting worm wheel and worm for engagement and wear of teeth. 5. Measuring insulation of motor and replacing ball bearing or roller bearing as the circumstance dictates and recording. 6. Effectiveness test after assembly
5.3.38	OS-204-151-000 OS-204-301-000	Diesel oil separator & motor	
5.3.39	LO-202-000-000	Lub. oil separator & motor	
6		Air bottles and various pressure vessels and accessories	
6.1	AS-104-155-000 AS-104-156-000 AS-105-156-000 AS-104-078-000 AS-105-078-000	Main & auxiliary air bottle, working air bottles and accessories such as safety valves	F 1. General visual inspection. H 1. Opening big and small manholes for internal cleaning. 2. Inspecting air bottle for internal corrosion. 3. Inspecting various valves for airtightness. 4. Checking safety valve. 5. Hydraulic test with 1.3 times working pressure for suspect air bottles

PMS No.	CWBT code	Item	Details
6.2	FW-300-000-000 BW-401-147-000 FW-500-000-000	Fresh water pressure tank, sanitary tank (seawater pressure tank) and potable fresh water tank	F 1. General visual inspection. H 1. Opening manholes for internal cleaning. 2. Inspecting internal corrosion, and hydraulic test to be made where necessary. 3. Effectiveness test of automatic control equipment
7	PM-400-000-000	Main & auxiliary steering gear and accessory equipment and control system	F 1. General visual inspection and effectiveness test. H 1. Inspecting each component of the main steering gear for flexibility and reliability of effective actions. 2. Inspecting auxiliary steering gear for flexible and reliable actions. 3. Inspecting whether various conversions of main steering gear are correct and flexible, and whether conversion between main and auxiliary steering gears is quick. 4. Inspecting each equipment of steering control system for flexible and reliable actions. 5. Inspecting feedback device, rudder indicator, etc. for accurate indication. 6. Inspecting whether communication between bridge and steering gear room is in order. 7. Inspecting whether various alarms of control system are in order. 8. Measuring the insulation of motor, replacing ball bearing or roller bearing as the circumstance dictates and recording. 9. Inspecting the operation of each component of steering gear
8	DO-201-000-000	Windlass	
8.1	DO-201-313-000 DO-201-628-000 DO-201-304-000 DO-201-070-000 DO-201-608-000	Prime motor, driving and control units, operating and braking devices of windlass	F 1. Visual inspection and effectiveness test for windlass. H 1. Inspecting gear, chain sprocket, bearing, brake ribbon (shoe), etc. 2. Inspecting hydraulic cylinder, rotor, blade, bearing, sealing device, etc. 3. Inspecting the tightening of windlass base. 4. Steam windlass: inspecting cylinder, piston, piston ring, crankshaft, bearing, etc. and recording. 5. Inspecting valves, safety valve, etc. on each pipeline. 6. Measuring the insulation of motor and inspect ball bearing or roller bearing
9	KP-101-000-000	Bilge pipe, strainer, bilge well suction, sludge pipe	F 1. Effectiveness test. 2. Visual inspection of bilge well. H 1. Effectiveness test. 2. Inspecting suction screen and mud box for cleanness. 3. Action test of operating valve of emergency bilge suction in engine room

PMS No.	CWBT code	Item	Details
10	BW-201-000-000 BW-205-313-000	Ballast pipe, valve and ballast operating system	F 1. Effectiveness test. H 1. Effectiveness test. 2. Operating test of remote control valve
11	OS-301-150-000 OS-401-150-000 LO-301-150-000 LO-401-150-000 and so on	Pressure strainers, heaters, coolers and various strainers of fuel oil, lub. oil, cooling water, boiler water	H 1. Disassembling, cleaning and inspecting screen, sealing, pipe, etc. 2. Tubular heater or cooler: Opening the cover for internal washing, and external chemical washing of cooler. Inspecting watertight riveting of tube plate of and internal erosion. 3. Plate-type heater or cooler: Opening and scouring clamp plate, and inspecting for corrosion and sealing strips. 4. Visual inspection and effectiveness test after assembly
12	MD-100-000-000	Main engine trial	F 1. Operating test in working condition, including ahead steering, astern steering and reversion tests, and recording main operation parameters of main engine. H 1. Operating test in working condition, including ahead steering, astern steering and reversion tests, and recording operation parameters and thermal parameters of main engine; re-starting test after failure of starting; audible and visual alarm to be given to block the starting function after 3 failures of starting or wrong direction, if fitted
13		Miscellaneous	
13.1	HS-600-000-000	Fuel oil tank separated from hull	H 1. Inspecting internal structure. 2. Inspecting heating pipe. 3. Hydraulic test after overhaul
13.2	SE-102-000-000 SE-103-000-000 SE-104-000-000 SE-200-000-000	Fixed fire - extinguishing system (foam, CO ₂ , halide and dry powder)	F 1. Inspecting piping, control system, marks and operational instructions. 2. Inspecting ventilation, illumination, communication, instrument, etc. in rooms/stations. 3. Visual inspection of fire-extinguishing agent containers, valves, etc. 4. Measurement of stored quantity of fire-extinguishing agents and passage test of pipeline to be made once two years. 5. Action test of quick-closing valve of oil tank
13.3	HS-400-000-000	Escape route in engine room and boiler room	F 1. Inspecting escape route for unobstructed passage, especially exits not to be locked. 2. Inspecting whether self-closing devices of exit of engine and boiler rooms are effective
13.4	TS-200-172-000	Steam boiler, hot oil heater, pressure vessel, including their safety devices	F 1. Visual inspection. 2. Checking safety valves

PMS No.	CWBT code	Item	Details
14		Additional requirements for oil tankers	
14.1	CG-700-000-000	Cargo oil pump, bilge pump, stripping pump, segregated ballast pump in pump room	F 1. General inspection of cargo oil pump, bilge pump, stripping pump and segregated ballast pump. 2. Inspecting the bases of cargo oil pump, bilge pump, stripping pump and segregated ballast pump, as well as the reliability of gaskets and binding bolts, corrosion of bedplate and condition of locating pins
14.1.1	CG-702-141-000 CG-703-141-000 CG-704-141-000	Cargo oil pump	H 1. Disassembling cargo oil pump and prime motor, inspecting each component for obvious corrosion, deformation, wear, measuring clearance of each component and recording. 2. Inspecting shaft gland for leakage. 3. Aligning the shafting and recording. 4. Functional test of automatic control system and alarm system of prime motor and recording of parameters. 5. Action test of emergency and remote shutdown
14.1.2	CG-702-141-000 CG-703-141-000 CG-704-141-000	Stripping pump	H 1. Disassembling stripping pump and prime motor, inspecting operation of each component, measuring clearance and recording. 2. Inspecting shaft gland for leakage. 3. Action test of emergency and remote shutdown
14.1.3	BW-202-000-000	Segregated ballast pump	H 1. Disassembling segregated ballast pump, inspecting operation of each component, measuring clearance and recording
14.1.4	KP-102-000-000	Bilge pump	H 1. Disassembling bilge pump, inspecting operation of each component, measuring clearance and recording. Action test of emergency and remote shutdown
14.1.5	CG-705-014-000	Sealing device for pump drive assembly	H 1. Disassembling, inspecting and testing sealing device for pump drive assembly penetrating bulkhead
14.1.6	CG-701-000-000	Piping and fittings	H 1. Disassembling, inspecting, hydraulically testing piping and fittings of cargo oil and ballast pumps and recording
14.2	HS-302-000-000	Venting system of cargo oil tank	F 1. General inspection of venting system (including breathing valve) in cargo oil tank and slop tank. H 1. Disassembling and inspecting partial venting pipe in cargo oil tank. 2. Disassembling and inspecting the breathing valve in cargo oil tank, checking pressure and inspecting flame screen. 3. Disassembling and inspecting the quick venting valve in cargo oil tank fitted with IGS, checking pressure and inspecting flame screen
14.3	CG-708-506-000	Crude oil washing machine	F 1. Visual inspection of crude oil washing system. 2. Visual inspection for washing heater

PMS No.	CWBT code	Item	Details
		Washing heater	
14.3.1	CG-708-506-000	Crude oil washing machine	H 1. Disassembling and inspecting crude oil washing machine and action test
14.3.2	CG-708-153-000	Washing heater	H 1. Disassembling washing heater, inspecting tube plate for corrosion, inspecting zinc plate, pipe and hydraulic test. 2. Disassembling, inspecting and testing the safety valve of washing heater, testing automatic temperature control system and automatic level control system. 3. Inspecting the valve or other mechanisms separating the heater from crude oil washing piping
14.4	CG-701-153-000	Cargo oil heating system	H 1. Inspecting cargo oil heating system and accessories (safety valve, reducing valve, automatic pressure regulator valve, regulator, etc. of pipeline). 2. Internal inspection, thickness measurement, hydraulic test of partial cargo oil heating pipe and recording. 3. Inspecting the fixing of heating pipes in cargo oil tank
14.5	CG-706-560-000	Ventilation system of cargo oil pump tank	F 1. General inspection for ventilation system of cargo oil pump tank. H 1. Disassembling and inspecting the ventilator in cargo oil pump tank. 2. Disassembling, inspecting and testing the sealing device of shaft drive assembly for ventilator in cargo oil pump tank that penetrates bulkhead. 3. Emergency shutdown of ventilator and effectiveness test of emergency vent. 4. Visual inspection of ventilator and inspecting the fixing of ventilator. 5. Inspecting the interlock of ventilator and illumination of pump room
14.6	CG-708-000-000	Relevant instruments of cargo oil & ballast control stations	F 1. General inspection of cargo oil and ballast control stations and relevant equipment. H 1. Checking relevant instruments of cargo oil and ballast control stations by contrast, e.g.: Steam inlet pressure gauge of steam turbine, tachometer of cargo oil pump, cargo outlet pressure gauge, cargo outlet thermometer, seawater outlet thermometer of washing heater, outlet pressure gauge of ballast pump, hydro-oil outlet pressure gauge of hydraulic pump station, and voltmeter, ammeter and control air pressure gauge of control station. 2. Inspecting the remote control valve and valve position indicator of cargo oil system for hydro-oil leakage and correct indication. 3. Test of high level alarm for pump room bilge.

PMS No.	CWBT code	Item	Details
			4. Effectiveness test of alarming for combustible gas concentration
14.7	SE-701-000-000	Inert gas system	
14.7.1	SE-701-000-000	Inert gas system	<p>Inspection of inert gas system (IGS)</p> <p>F</p> <ol style="list-style-type: none"> 1. General inspection of pipeline and components, serious corrosion, water and oil leakage to be dealt with if found. 2. Action test of remote control, automatic control, soot blower, etc., as far as possible. 3. Alarm test by simulation for key alarming points of IGS. 4. Checking oxygen content meter
14.7.1.1	SE-702-315-000	Monitoring device of inert gas system	<p>H</p> <ol style="list-style-type: none"> 1. Checking the accuracy of oxygen content meter by Standard N2. 2. Inspecting the operation of audible and visual alarm, main control board and area control board. 3. Checking the parameters of primary alarming points and inspecting safety device for: <ol style="list-style-type: none"> a. excessive oxygen content in IGS manifold; b. excessively low gas pressure in IGS manifold; c. excessively low feed pressure of deck water seal; d. excessively high gas temperature in IGS manifold; e. excessively low feed pressure of scrubber; f. accuracy of portable oxygen content analyzer; g. interlocking with outlet pressure parameters of cargo oil pump
14.7.1.2	SE-702-307-000	Automatic control for inert gas system	<p>H</p> <ol style="list-style-type: none"> 1. Inspecting the action and delay time of automatic control regulating valve under different alarm levels and recording. 2. Inspecting the quality performance parameters (set and measured values of outlet pressure of inert gas), reaction sensitivity and accuracy of automatic control for the system
14.7.1.3	SE-701-709-000 SE-701-710-000 SE-701-711-000	Inert gas generator, scrubber, fan, deck water seal	<p>H</p> <ol style="list-style-type: none"> 1. Disassembling and inspecting inert gas generator, and effectiveness test to be made. 2. Disassembling scrubber and inspecting nozzle, screen, case, protective coating, discharging pipe. 3. Disassembling fan and inspecting impeller, shaft, case, and shaft seal, and test conversion with stand-by fan. 4. Disassembling deck water seal and inspecting internal coating, case, damper, passage of discharging pipe and operation of overboard discharging valve. 5. Disassembling pressure vacuum breaker and inspecting internal corrosion
14.7.1.4	SE-701-142-000	Cooling pump	<p>H</p> <ol style="list-style-type: none"> 1. Disassembling and inspecting the cooling pump of scrubber, measuring and recording clearance, and test conversion with stand-by pump.

PMS No.	CWBT code	Item	Details
			2. Disassembling and inspecting deck water seal, measuring and recording clearance, and test conversion with stand-by pump
15	ES-000-000-000	Electrical installations	
15.1	SE-000-000-000	Emergency equipment	
15.1.1	SE-305-305-000 SE-304-000-000	General alarm system Alarm system for releasing fire-extinguishing agent	F 1. Effectiveness test for inspecting the operation of each switch, button, alarm bell. H 1. Effectiveness test for inspecting the operation of each switch, button, alarm bell. Recording details of test, repair, renewal, etc.
15.1.2	SE-301-000-000	Fire detection & alarm system	F 1. Effectiveness test of fire detection & alarm system in accommodation space & engine room, and of smoke detection system & combustible gas monitoring system (if any) in cargo hold. H 1. Simulation test of fire detection & alarm system; the number of sampled fire detectors to be not less than 5% of the total, including those in boiler space, oil separator space and centralized control room. Recording the test of each space and details of repair, component renewal, etc.
15.1.3	SE-101-166-000	Automatic fire-extinguishing sprinkler system (if fitted)	F 1. Effectiveness test of control system. H 1. Effectiveness test of the system and recording details of repair, component renewal, etc.
15.1.4	SE-507-000-000	Emergency cut-off device for fan and oil pump	F 1. Effectiveness test as practicable as possible. H 1. Effectiveness test of each emergency cut-off device and recording details of test, repair, etc.
15.2	SE-502-000-000	Emergency electric network	
15.2.1	SE-502-000-000	Emergency generating set, emergency storage batteries	F 1. Emergency generating set: Power supply test by manual & automatic (if any) starting and automatic switching on, and recording time of automatic starting & automatic switching on for power supply. Manual starting to be tested three times if a secondary starting source is provided. 2. Emergency storage batteries: discharge test for automatic operation after simulated cutoff of main power source. H 1. Operation test of overhauled or repaired generating set under working load, recording details of overhaul and test. 2. Charging and discharging test of emergency storage batteries in rated condition and recording
15.2.2	SE-504-000-000	Emergency switchboard &	F 1. Inspecting the working condition under operation. H 1. Measuring the insulation of each branch.

PMS No.	CWBT code	Item	Details
		emergency battery charging and discharging panel	<ol style="list-style-type: none"> 2. Effectiveness test of power distribution and supply, and recording indicated values of each instrument and working conditions. 3. Testing the interlock of main switchboard and shore power switch (if any)
15.2.3	SE-502-325-000	Emergency lighting, temporary emergency lighting, additional emergency lighting (if any)	<p>F</p> <ol style="list-style-type: none"> 1. Measuring the insulation of each branch. 2. Effectiveness test: Each light is in order with a distinct mark of emergency light
15.3	ES-300-000-000	Main electric network	
15.3.1	ES-101-000-000	Main generator (main engine – driven generating set)	<p>H</p> <ol style="list-style-type: none"> 1. Operation test of generator under working load and inspection of working condition. 2. Measuring and recording the clearance of rotor and stator of each generator or dismantling, inspecting the bearing and measuring the wear-down. 3. Single and parallel operation test of overhauled or repaired generators under working load, inspecting speed governing of prime motors and load distribution function of generators, and recording the details
15.3.2	ES-300-000-000	Main switchboard and accessories	<p>H</p> <ol style="list-style-type: none"> 1. Measuring the insulation of each branch. 2. Inspecting the working condition under operation and recording the indicated values of each instrument and working conditions. 3. Testing the interlock of shore power switch and main switch of each generator. 4. Primary instruments to be sent for calibration in accordance with the metering requirements
15.3.3	ES-303-000-000 SE-503-000-000	Protective systems of main and emergency power stations	<p>H</p> <ol style="list-style-type: none"> 1. Checking the overload and delay protection, under-voltage protection, reverse power protection (or reverse current protection), automatic unloading protection, etc. of each motor, recording protective setting and delay time in detail
15.3.4	GD-109-073-000	Safety and protective devices of auxiliary diesel engines	<p>H</p> <ol style="list-style-type: none"> 1. To test the protective functions such as inlet pressure of lub. oil for diesel engine is overdue low, outlet temperature of cooling fresh water is overdue high, etc. and to record each protective action value in detail
15.4	SE-500-000-000	Distributors, cables & others	

PMS No.	CWBT code	Item	Details
15.4.1	ES-508-000-000	Insulance of power system on board	<p>F 1. Testing and recording the insulance of installations, such as generators, motors.</p> <p>H Measuring and recording the insulance of the following equipment under hot condition:</p> <ol style="list-style-type: none"> 1. Each generator, motor, main lighting transformer and emergency lighting transformer (if any). 2. Main switchboard, emergency switchboard, emergency battery charging and discharging panel, power distributor. 3. Each power supply branch switch and cable for the items in subparagraph 2 above. 4. Various electrical heaters
15.4.2	ES-504-000-000 至 ES-507-000-000	Insulance of lighting system on board	<p>F 1. Testing and recording insulance of each lighting system.</p> <p>H Measuring and recording insulance of the following equipment in hot condition:</p> <ol style="list-style-type: none"> 1. Each lighting distributor, power supply branch switch and cable. 2. Each navigation light, signal light and explosion-proof light
15.4.3	ES-50X-335-000	Cables	<p>F 1. Inspecting cables for damage.</p> <p>H 1. Renewed and added cables to be in compliance with existing rules and detailed data of cable specifications, current-carrying capacity, etc. to be provided</p>
15.4.4	ES-50X-302-000	Distributor & accessories	<p>F 1. Inspecting whether each distributor is in order.</p> <p>H 1. Inspecting each branch switch, internal wiring, safety earthing, etc. and recording damage and repair</p>
15.4.5	NC-802-374-200 NC-801-374-100	Navigation light, signal light	F 1. Effectiveness test of alarming for navigation light and duplicate supply failures and recording
15.4.6		Motors of essential equipment (see pump units for machinery installations)	<p>F 1. Inspecting each motor in normal working condition. 2. Operational test of steering gear.</p> <p>H 1. Operational test of overhauled or repaired motors in working condition and recording details</p>
15.4.7	NC-300-000-000	Internal communications (telegraph, sound-powered telephone)	<p>F 1. Testing all communications between bridge and engine or centralized control room (including telegraph and sound-powered telephone).</p> <p>2. Testing communications between bridge and steering gear room</p>
15.4.8	PM-402-301-000 PM-403-301-000 PM-402-302-000 PM-403-302-000 PM-402-304-000 PM-403-304-000	Steering gear (electric) Main & auxiliary motors Main & auxiliary motor controllers	F <ol style="list-style-type: none"> 1. Steering test of main & auxiliary steering gears and recording each parameter (steering time, maximum rudder angle, etc.). 2. Checking rudder indicator by actual rudder angle. 3. Effectiveness test of emergency steering. 4. Effectiveness test of power supply from duplicate sources

PMS No.	CWBT code	Item	Details
	PM-405-000-000 PM-406-331-000	Main & auxiliary motor automatic controlling devices Maneuvering part Rudder indicator	
15.4.9	RA-502-000-000 RA-404-000-400 TS-104-314-200 TS-204-314-200 TS-304-314-200 RA-406-000-600 RA-405-000-500	Ventilator set Ventilator in cargo hold Ventilator in engine room (including ventilators for auxiliary engine room and oil separator room) Forced ventilation for boiler Ventilator in pump room Ventilator in CO ₂ room	F 1. Effectiveness test of each ventilator set. 2. Effectiveness test of emergency shutdown of ventilator sets. H 1. For ventilators having operated for a long time, operational test to be made after dismantling, replacing or repairing the bearing of motor, and maintenance and operational parameters to be recorded
15.5	UA-000-000-000	Survey items to be added for ships having the class notation AUTO-0, MCC or BRC	
15.5.1	UA-100-000-000	Remote control system for main engine	F 1. Control position conversion test for remote control system of main engine. H 1. Testing the functions of emergency stopping button and override button (if any) for main engine on the control console of bridge, such buttons being independent from automatic system. 2. Testing the functions of emergency stopping button and override button (if any) for main engine on the centralized control console of engine room. 3. Testing conversion of control position for main engine between bridge, centralized control room in engine room and control console at engine, and inspecting visual and audible alarm and telegraph function. 4. Testing whether the revolution speed and direction of main engine are kept at the original condition when the power source of remote control system for main engine is interrupted
15.5.2	UA-200-000-000	Automatic control system of power plant	F 1. Effectiveness test of automatic control system of power plant. H 1. Inspecting the standby generating set for starting and being switched on automatically to supply power within the required time in a simulated condition of failure and stopping of the

PMS No.	CWBT code	Item	Details
			<p>generating set in operation.</p> <ol style="list-style-type: none"> 2. Inspecting primary pumps serving main and auxiliary engines for starting automatically in sequence after restoring power supply. 3. For two or more generators operating parallel, simulating failure and stopping of one generator, inspecting the actions of automatic unloading device and the standby generator for starting, being switched on and distributing load automatically within the required time, and recording details of such tests
15.5.3	UA-300-000-000	Automatic control system of boiler	<p>F 1. Effectiveness test of automatic control system of boiler.</p> <p>H 1. Testing protective function for automatically stopping the operation of boiler in case of limited low water level, flame failure, excessive steam pressure, etc., inspecting visual and audible alarm and recording test process and data.</p> <ol style="list-style-type: none"> 2. Testing automatic control procedure of boiler, especially conditions prior to scavenging. 3. Testing function of emergency stopping buttons for boilers in centralized control room
15.5.4	UA-501-000-000	Safety and protective devices of main engine	<p>F 1. Simulating automatic stopping and reduction conditions of main engine and inspecting protective functions of safety system.</p> <p>H 1. Cutting off main power source of safety system, inspecting the system for being capable of automatically converting power source to independent standby storage batteries and giving visual and audible alarm.</p> <ol style="list-style-type: none"> 2. Simulation test of automatic reduction and stopping functions of main engine in case of excessively low lub. oil inlet pressure, excessively high temperature of cooling water, excessive concentration of oil fog in crankcase, etc., checking the setting of each sensor and recording the details
15.5.5	UA-500-000-000	Alarm system of engine room	<p>F 1. Effectiveness test of alarm system for normal operation of each visual and audible alarm unit. When main alarms are given, e.g. alarms for main engine, generating set, boiler, primary auxiliary machinery, high level of bilge well in engine room and fire in engine room, the failure logging device (if any) is to be capable of printing and recording correctly.</p> <p>H 1. Cutting off main power source of alarm system, inspecting the system for being capable of automatically converting power source to independent standby storage batteries and giving visual and audible alarm.</p> <ol style="list-style-type: none"> 2. Testing at least the following alarm items (simulation test may be made): <ol style="list-style-type: none"> a. excessively low starting air pressure and failure of third

PMS No.	CWBT code	Item	Details
			<p>automatic starting of main engine;</p> <p>b. low lub. oil inlet pressure of both main engine and auxiliary engine;</p> <p>c. low water level of boiler;</p> <p>d. power failure, loss of A.C. phase, etc of steering gear;</p> <p>e. high level of bilge well and long operation (or excessively frequent starting) of bilge pump in engine room.</p> <p>3. Inspecting alarm system for extended alarming function (if any) and automatically starting engineers' alarm in case of no response within the set time, and inspecting engineers' alarm signal for being clearly audible in engineers' accommodation</p>
15.5.6	UA-703-000-000	Condition monitoring system (if any)	<p>F 1. Effectiveness test of condition monitoring equipment.</p> <p>H 1. Baseline data and measurement data of condition monitoring equipment kept on board.</p> <p>2. Checking measured data of condition monitoring equipment with baseline data to ensure reliability of equipment when overhauling the equipment.</p> <p>3. Overhaul and maintenance of monitored machinery and electrical installations may be carried out in accordance with the specifications of condition monitoring equipment provided that the condition monitoring techniques are proper and reliable</p>
15.5.7	LO-302-304-000 OS-302-304-000 OS-303-304-000 FW-202-304-100 FW-203-304-000 BW-102-304-000 FW-204-304-000 LO-303-304-000 FW-205-304-000 TS-605-304-000 LO-502-304-000	Automatic switching of main pump sets Lub.oil pump of main engine Fuel pump of main engine Fresh water cooling pump Seawater cooling pump Cooling pump of piston (if provided independently) Cooling pump of fuel injector (if provided independently) Feedwater pump of boiler Fuel pump of	<p>F 1. Effectiveness test of automatic switching of main pump sets, recording automatic switch setting, adjustment and maintenance of each pump</p>

PMS No.	CWBT code	Item	Details
		boiler, etc.	

Appendix 21

GUIDELINES FOR PILOT SCHEMES OF EXTENDED INTERVAL BETWEEN SURVEYS IN DRY-DOCK – EXTENDED DRY-DOCKING (EDD) SCHEME

1.2 Application

1.2.3 The following ships and ship types are not eligible for the extended dry-docking scheme described in this Guidelines:

- passenger ships;
- ships subject to the Enhanced Survey Program (ESP);
- ships subject to requirements of sections 5 and 16 of Chapter 5 of this PART;
- ships fitted with propulsion thrusters;
- ships where the propeller connection to the shaft is by means of a keyed taper;
- high speed craft (HSC).



CHINA CLASSIFICATION SOCIETY

**CCS Rule Change Notice For:
RULES FOR CLASSIFICATION OF SEA-GOING
STEEL SHIPS**

PART TWO HULL

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- Section 9 ADDITIONAL REQUIREMENTS FOR LARGE CONTAINER SHIPS
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CHAPTER 1 GENERAL

Section 9 INTACT STABILITY

1.9.4.5 The intact stability of polar ships having class notation PC and ships intended for navigation in ice and having class notation B1* or B1 are also to comply with the relevant requirements of ~~A.1024(26) — Guidelines for Ships Operating in Polar Waters~~ MSC.385(94) International Code for Ships Operating in Polar Waters (Polar Code).

Section 10 DAMAGE STABILITY

In the existing Table 1.10.3.1, "~~A.1024(26) — MSC.385(94)~~".

CHAPTER 7 CONTAINER SHIPS

Section 1 GENERAL PROVISIONS

7.1.1 Application

7.1.1.3 Where the hull structural higher tensile steels of more than 50 mm and up to 100 mm in thickness with the minimum yield strength ~~460-355~~ N/mm² are used on board container ships, the requirements of CCS Guidelines for Inspection of Thick Higher Strength Steel Plates for Ships are to be complied with.

7.1.1.4 Where the hull structural higher tensile steels with the yield strength 390 N/mm² are used for strength deck and coaming plating on board container ships, the material factor *K* for longitudinal strength calculation may be taken as 0.66, provided that:

(1) the plating thickness is to be more than 50 mm;

(2) the areas of higher tensile steels with 390 N/mm² is to be evaluated by means of fatigue spectrum analysis, the positions under evaluation are to include the connection between hatch coamings and supporting members, and the key positions with a more bending moment and torque response by hull girders, in addition to those as required in 4.1.5, Appendix 2 of this Chapter;

(3) the key positions of deck and hatch coaming are to be subject to construction monitoring in accordance with the requirements of CCS Guidelines for Construction Monitoring of Hull Structures.

Section 5 SIDE FRAMING

7.5.2 Double side skin framing

7.5.2.1 The minimum plate thickness *t* of transverse frames and horizontal flats (including perforated flats) within the double side skin construction is not to be less than that obtained from the following formula, but need not to be greater than ~~40~~ mm:

$$t = 7.5 + 0.015L \quad \text{mm}$$

where: *L* — length of ship, in m.

Section 6 DOUBLE BOTTOM

7.6.1 General requirements

7.6.1.3 For container ships of 150 metres and above in length, the double bottom structure may comply with the requirements of 7.9.10 of this chapter.

Section 9 ADDITIONAL REQUIREMENTS FOR LARGE CONTAINER SHIPS

7.9.9 Scantling of double side skin construction

7.9.9.2 The inner skin plating is to comply with the following requirements:

(1) The minimum thickness *t* of inner skin plating is to be calculated by the following formula:

$$t = 7 + 0.02(L, 300)_{\min} \sqrt{K} \quad \text{mm}$$
$$t = 7 + 0.02L \sqrt{K} \quad \text{mm}$$

where: *L* — length of ship, in m, not have to be greater than 300m when calculating ;

K — material factor.

(2) The inner skin plating is to comply with the requirements ~~for watertight bulkheads of Section 12, Chapter 2 of this PART~~ of 7.9.11.4 of this Section.

(3) The thickness *t* of inner skin plating forming boundary of tanks within 0.4 *L* amidships is to comply

with the requirement of (4) and in addition, not to be less than:

$$t = \left(4 + 0.6 \frac{Z - z_n}{D - z_n}\right) s \sqrt{hK} + 2.5 \quad \text{mm, above the horizontal neutral axis}$$

$$t = \left(4 + 0.2 \frac{z_n - Z}{z_n}\right) s \sqrt{hK} + 2.5 \quad \text{mm, below the horizontal neutral axis}$$

where: s — spacing of stiffeners, in m;

h — vertical distance, in m, measured from a third of the height from the lower edge of the plate in a strake to the top of the tank, or half the distance to the top of overflow, whichever is the greater;

D — moulded depth, in m;

Z_n — the height of horizontal neutral axis, from base line, of hull cross section, in m;

Z — the height of calculation point from base line, in m;

F_b — reduction factor, see 2.2.5.6, Chapter 2 of this PART;

K — material factor.

(4) The thickness t of inner skin plating forming boundary of tanks ~~outside 0.4 L amidships~~ is not to be less than:

$$t = 4s\sqrt{hK} + 2.5 \quad \text{mm}$$

where: s — spacing of stiffeners, in m;

h — vertical distance, in m, measured from a third of the height from the lower edge of the plate in a strake to the top of the tank, or half the distance to the top of overflow, whichever is the greater;

K — material factor.

(5) The difference in thickness between the top strake of inner skin and the strake below is in general not to exceed 25 mm, and the maximum difference in thickness is not to exceed 35 mm. In general the higher edge of the thicker plate is tapered in way of connections with a ratio not more than 1:4.

7.9.9.3 Longitudinals (ship's side, inner skin) are to comply with relevant requirements of Chapter 2 of this PART. The minimum thickness of webs of longitudinals is 10 mm. Longitudinals are to penetrate continuously vertical transverse webs. When side longitudinals are determined according to 2.7.5.1, Chapter 2 of this PART, calculated pressure head h is to be obtained from following formula:

$$h = 0.26C + d - \frac{Z}{D_f} d \quad \text{if } Z < D_f;$$

$$h = 0.2C + 0.06C \frac{D - Z}{D - D_f} \quad \text{if } Z \geq D_f$$

where: D —moulded depth, in m;

D_f —minimum moulded depth, in m, in the middle of ship length, vertical distance from upper edge of flat keel to upper edge of side freeboard deck beam;

d —draught, in m;

C —coefficient, see 2.2.3.1, Chapter 2 of this PART;

Z —height of longitudinal to baseline, in m.

7.9.9.4 The thickness t of vertical or horizontal transverse diaphragm plate forming boundary of tanks is not to be less than:

$$t = 4s\sqrt{hK} + 2.5 \quad \text{mm}$$

where: s — spacing of stiffeners, in m;

h — vertical distance, in m, measured from a third of the height from the lower edge of the plate in a strake to the top of the tank, or half the distance to the top of overflow, whichever is the greater;

K — material factor.

The minimum thickness of vertical or horizontal transverse diaphragm plate is 10 mm, and the minimum thickness of watertight diaphragm plate is 11 mm.

Appendix 1 CONTAINER SECURING

1 GENERAL REQUIREMENTS

1.1 Application

1.1.1 This Appendix applies to containers manufactured in compliance with ISO 1496-1:1990 and its amendment Nos. 1, 2 and 3. Containers of higher allowable loads manufactured in accordance with ISO 1496-1:1990 amendment No.4, 2006 will be specially considered.

1.1.1 Container stowage and securing requirements in this Appendix are based on containers manufactured in compliance with ISO 1496-1:2013.

1.1.2 External dimensions, rated weights and corner fitting locations for common freight containers are given in Table 1.1.2.

External Dimensions, Rated Weights and Corner Fitting Locations for Common Freight Containers^①

Table 1.1.2

Nominal Size	Container Designation	Length (mm)	Width (mm)	Height (mm)	Dimensions Center to Center of Corner Fittings(longitudinal) (mm)	Dimensions Center to Center of Corner Fittings(transverse)(mm)	Rated Weight (kg)
20 ft ISO668	ICC	6058	2438	2591	5853	2259	24000
	1C			2438			(30480) ^②
	1CX			<2438			30480 (24000) ^②
40 ft ISO668	1AAA	12192	2438	2896	11985	2259	30480
	1AA			2591			
	1A			2438			
	1AX			<2438			
45 ft ISO668	1EEE	13716	2438	2896	11985 13509	2259	30480
	1EE			2591			
43 ft		13103	2438	2591	11985	2259	30480
48 ft		14630	2591	2908	11985 14422	2259	30480
53 ft		16154	2591	2908	11985 15947	2259	30480

Notes: ① The statistics of containers of ISO standard in the Table are determined according to ISO 668:1995 and its amendments 2013.

② The rated weight for containers of 20 ft manufactured according to previous version of Amd 1:2005 of ISO 668:1995, the rated weight for containers of 20 ft is 30480/24000 kg. In the design of securing system, the recommended weights of empty containers are as follows:

20 ft container	2.5 t
40 ft container	3.5 t
43 ft and 45 ft container	4.0 t
48 ft and 53 ft container	4.5 t

1.2 Class notation

1.2.1 Ships other than container ships, fitted with container securing arrangements complying with the requirements of 1 to 5 of this Appendix, will be assigned the class notation “Equipped with Container Securing Arrangements”.

1.2.2 Where the ship has an approved onboard container lashing program which has the ability to evaluate the safety of container stowage and lashing arrangement according to the requirements of 1 to 4 of this Appendix, and the lashing program is installed and maintained in accordance with the requirements of 6 of this Appendix, the notation CLC may be assigned upon application by the shipowner.

1.2.3 In addition to the requirements for CLC, the notation CLC(V) may be assigned, taking into account of the requirements for specific routes in 7.1 of this Appendix.

1.2.4 In addition to the requirements for CLC(V), the notation CLC(V,W) may be assigned, taking into account of the seasons and weather factors of specific routes in 7.2 of this Appendix.

1.3 Plans and documents

1.3.1 The following plans and documents are to be submitted for approval:

- (1) General arrangement plan showing the disposition and design weights of the containers;
- (2) Details of the cell guide structure, where fitted;

- (3) Plans of lashing bridges, where fitted;
- (4) Plans of stanchions on the deck, where fitted;
- (5) Plans of securing arrangements of containers not associated with cell guides, where fitted;
- (6) Details of securing devices (fixed and portable equipment, including safe working load);
- (7) ~~Container securing manual, which is to be approved by CCS and kept on board. Arrangement plan of fixed securing devices and plan of hull supporting structure;~~
- (8) Container securing manual/arrangement plan (container securing manual/arrangement plan approved by CCS is to be kept on board ship).

1.5 Definitions

1.5.8 **Design GM Value:** The *GM* values used in the lashing calculations of containers are determined by the designer and specified in the container securing manual/arrangement plan. At least the minimum value and the maximum value are to be included. The minimum value is not to be less than the *GM* value in the condition where the maximum number of containers is loaded and the maximum value is not to be less than the maximum value of all expected container loading conditions. In the initial design, the minimum design *GM* value may be taken as $0.025B$, and the maximum design *GM* value may be taken as $0.075B$, where *B* is the breadth of the ship.



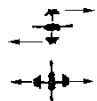


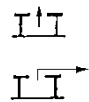



1.6 Special Requirements

1.6.1 For containers not covered by ISO Standard 668/1496-1 as well as special ways of containers arrangement, the securing of such containers is to be considered according to the parameters and allowable loads as specified in 4.8 of this Appendix.

2 MATERIALS AND TESTING

2.2 Prototype testing

2.2.3 Securing devices may be tested in accordance with Table 2.2.3.

Securing device	Test mode	Recommended minimum value (kN)		
		SWL	Proof load	Breaking load
Lashing rod (higher tensile steel)		180	270	360
Lashing rod		250	375	360 500
Lashing chain (higher tensile steel)		80	—	200
Lashing chain		100	—	300
Lashing wire		120	—	360
Turnbuckle		250	375	500
Twist lock		200	300	400
		250	375	500
Cone		200	300	400
Embedded stacking device		250	375	500
Stacking device		250	375	500
		200	300	400
D-ring		250	375	500
Lashing eye plate		250	375	500
Buttress		SWL is to be the individual calculation result of the stowage arrangement and test load is to be determined according to Table 2.2.1.		

3 STOWAGE AND SECURING OF CONTAINERS

3.2 Arrangements for stowage and securing on exposed decks

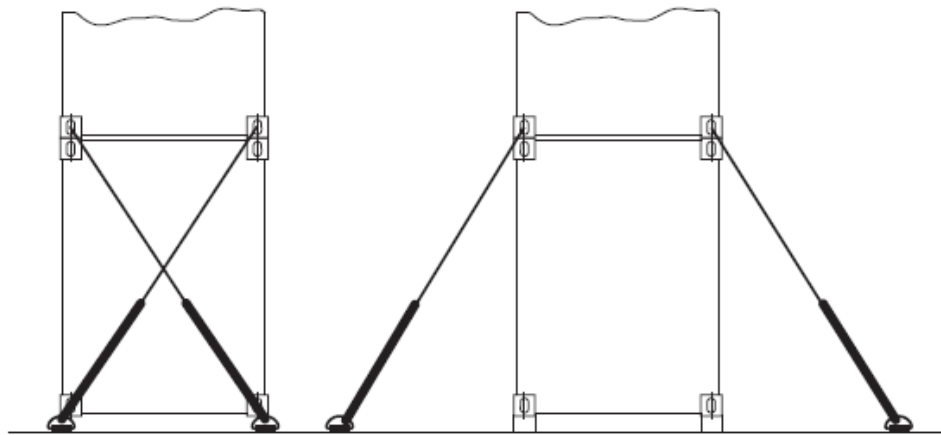
3.2.2 Twist locks and (or) lashings are to be used for securing containers.

3.2.2 The securing for containers stowed on the exposed deck is to comply with the following requirements:

(1) Twist locks and (or) lashing arrangements are to be used for securing containers.

(2) To improve the lashing efficiency, the fixed lashing points can be arranged on the lashing bridge. In such case, the relative displacement between the lashing bridge and the container is to be considered for calculating lashing force.

(3) Normally, internal lashing type is to be used for securing, as shown in Figure 3.2.2(a). And external lashing type is shown in Figure 3.2.2(b). When the lashing element connected to the corner fitting of container is being pulled, the twist locks will not bear the pull force until the vertical clearance between the twist lock and corner fitting of container is closed. In such case, the lashing element may be broken as a result of too much pull force. When external lashing type is selected, this situation is to be considered in securing calculation. If there is no actual data, 12 mm vertical clearance is to be used for semi-automatic twist lock and 20 mm vertical clearance for automatic twist lock.



(a) Internal lashing (b) External lashing

Figure 3.2.2 Internal lashing and external lashing

3.4 Mixed stacks of 20 ft and 40 ft containers

3.4.3 Where it is desired to stow 20 ft containers in the lower tiers without external support at the mid-bay location, the following requirements are to be complied with.

(1) ~~Average~~Overall stacked container weights allowed for 20 ft containers stowed in cell guides with no 40 ft container overstowed can be derived from Tables 3.4.3(1) depending on the acceleration and the number of tiers in the stack.

(2) ~~Average~~Overall stacked container weights allowed for 20 ft containers stowed in cell guides with at least one 40 ft container overstowed can be derived from Table 3.4.3(2) depending on the acceleration and the number of tiers in the stack.

(3) Racking forces acting on end walls of 20 ft containers stowed in the lowest tier at the mid-length of a cell arranged for 40 ft containers are not to exceed ~~the requirements specified in 4.7 of this Appendix~~ 185 kN. The orientation of the containers is to ~~be such~~ ensure as far as possible that all door ends or closed ends are facing in one direction. Weights listed in Table 3.4.3(1) and Table 3.4.3(2) apply to ISO1496-1:1990 20 ft containers the maximum rated weight of which is 24+30480 kg.

The existing Tables 3.4.3(1) and 3.4.3(2) are replaced by the following:

Stowage Weights of 20 ft Container(t) Table 3.4.3(1)

a_r (g)	0.30	0.31	0.32	0.33	0.34	0.35	0.36	0.37	0.38	0.39	0.40
12	168.9	163.5	158.4	153.6	149.1	144.8	140.8	137.0	133.4	129.9	126.7
11	168.8	163.4	158.2	153.5	148.9	144.7	140.7	136.9	133.3	129.8	126.6
10	168.4	163.0	157.9	153.1	148.6	144.3	140.3	136.5	133.0	129.5	126.3
9	167.4	162.0	156.9	152.2	147.7	143.5	139.5	135.7	132.1	128.8	125.5
8	166.7	161.3	156.3	151.5	147.1	142.9	138.9	135.1	131.6	128.2	125.0

7	166.4	161.0	156.0	151.3	146.8	142.6	138.7	134.9	131.4	128.0	124.8
6	164.8	159.5	154.5	149.8	145.4	141.2	137.3	133.6	130.1	126.7	123.6
5	152.5	152.5	152.5	149.3	144.9	140.8	136.9	133.2	129.7	126.4	123.2
4	122.0	122.0	122.0	122.0	122.0	122.0	122.0	122.0	122.0	122.0	121.5
3	91.5	91.5	91.5	91.5	91.5	91.5	91.5	91.5	91.5	91.5	91.5
2	61.0	61.0	61.0	61.0	61.0	61.0	61.0	61.0	61.0	61.0	61.0
a_t (g)	0.41	0.42	0.43	0.44	0.45	0.46	0.47	0.48	0.49	0.50	0.51
12	123.6	120.7	117.9	115.2	112.6	110.2	107.8	105.6	103.4	101.4	99.4
11	123.5	120.6	117.8	115.1	112.5	110.1	107.7	105.5	103.3	101.3	99.3
10	123.2	120.3	117.5	114.8	112.3	109.8	107.5	105.3	103.1	101.0	99.1
9	122.5	119.6	116.8	114.1	111.6	109.2	106.8	104.6	102.5	100.4	98.5
8	122.0	119.1	116.3	113.6	111.1	108.7	106.4	104.2	102.0	100.0	98.0
7	121.8	118.9	116.1	113.5	110.9	108.5	106.2	104.0	101.9	99.8	97.9
6	120.6	117.7	115.0	112.3	109.8	107.5	105.2	103.0	100.9	98.9	96.9
5	120.2	117.3	114.6	112.0	109.5	107.1	104.8	102.7	100.6	98.6	96.6
4	118.5	115.7	113.0	110.4	108.0	105.6	103.4	101.2	99.2	97.2	95.3
3	91.5	91.5	91.5	91.5	91.5	91.5	91.5	91.5	91.5	91.5	91.5
2	61.0	61.0	61.0	61.0	61.0	61.0	61.0	61.0	61.0	61.0	61.0
a_t (g)	0.52	0.53	0.54	0.55	0.56	0.57	0.58	0.59	0.60	0.61	0.62
12	97.5	95.6	93.8	92.1	90.5	88.9	87.4	85.9	84.5	83.1	81.7
11	97.4	95.5	93.8	92.1	90.4	88.8	87.3	85.8	84.4	83.0	81.7
10	97.2	95.3	93.6	91.9	90.2	88.6	87.1	85.6	84.2	82.8	81.5
9	96.6	94.7	93.0	91.3	89.7	88.1	86.6	85.1	83.7	82.3	81.0
8	96.2	94.3	92.6	90.9	89.3	87.7	86.2	84.7	83.3	82.0	80.6
7	96.0	94.2	92.4	90.8	89.1	87.6	86.1	84.6	83.2	81.8	80.5
6	95.1	93.3	91.5	89.9	88.3	86.7	85.2	83.8	82.4	81.0	79.7
5	94.8	93.0	91.3	89.6	88.0	86.5	85.0	83.5	82.1	80.8	79.5
4	93.4	91.7	90.0	88.3	86.8	85.2	83.8	82.4	81.0	79.7	78.4
3	91.5	89.8	88.2	86.6	85.0	83.5	82.1	80.7	79.4	78.1	76.8
2	61.0	61.0	61.0	61.0	61.0	61.0	61.0	61.0	61.0	61.0	61.0
a_t (g)	0.63	0.64	0.65	0.66	0.67	0.68	0.69	0.70	0.71	0.72	0.73
12	80.4	79.2	78.0	76.8	75.6	74.5	73.4	72.4	71.4	70.4	69.4
11	80.4	79.1	77.9	76.7	75.6	74.5	73.4	72.3	71.3	70.3	69.4
10	80.2	78.9	77.7	76.5	75.4	74.3	73.2	72.2	71.2	70.2	69.2
9	79.7	78.5	77.3	76.1	74.9	73.8	72.8	71.7	70.7	69.7	68.8
8	79.4	78.1	76.9	75.8	74.6	73.5	72.5	71.4	70.4	69.4	68.5
7	79.2	78.0	76.8	75.6	74.5	73.4	72.3	71.3	70.3	69.3	68.4
6	78.5	77.2	76.0	74.9	73.8	72.7	71.6	70.6	69.6	68.7	67.7
5	78.2	77.0	75.8	74.7	73.5	72.5	71.4	70.4	69.4	68.4	67.5
4	77.1	75.9	74.8	73.6	72.5	71.5	70.4	69.4	68.4	67.5	66.6
3	75.6	74.4	73.2	72.1	71.1	70.0	69.0	68.0	67.1	66.1	65.2
2	61.0	61.0	61.0	61.0	61.0	61.0	61.0	61.0	61.0	61.0	61.0
a_t (g)	0.74	0.75	0.76	0.77	0.78	0.79	0.80	0.81	0.82	0.83	0.84
12	68.5	67.6	66.7	65.8	65.0	64.1	63.3	62.6	61.8	61.1	60.3
11	68.4	67.5	66.6	65.8	64.9	64.1	63.3	62.5	61.8	61.0	60.3
10	68.3	67.4	66.5	65.6	64.8	64.0	63.2	62.4	61.6	60.9	60.1
9	67.9	67.0	66.1	65.2	64.4	63.6	62.8	62.0	61.2	60.5	59.8
8	67.6	66.7	65.8	64.9	64.1	63.3	62.5	61.7	61.0	60.2	59.5
7	67.5	66.6	65.7	64.8	64.0	63.2	62.4	61.6	60.9	60.1	59.4
6	66.8	65.9	65.0	64.2	63.4	62.6	61.8	61.0	60.3	59.6	58.8
5	66.6	65.7	64.8	64.0	63.2	62.4	61.6	60.8	60.1	59.4	58.7
4	65.7	64.8	63.9	63.1	62.3	61.5	60.7	60.0	59.3	58.5	57.8
3	64.3	63.5	62.6	61.8	61.0	60.3	59.5	58.8	58.1	57.4	56.7
2	61.0	61.0	60.3	59.5	58.7	58.0	57.2	56.5	55.8	55.2	54.5

Note: In the above table, “tiers” is the number of tiers of 20 ft containers and “ a_t ” the transverse acceleration of the stack in the intermediate tier. For example, where 7 tiers of 20 ft containers are stacked with no 40 ft containers overstacked, if the transverse acceleration of the stack in the intermediate tier a_t is 0.45g, then the overall weight of the stack is not to exceed 110.9 t, but the weight of container of each tier of stack may be different.

At least One Tier of 40 ft Containers Stowed above 20 ft Containers(t) Table 3.4.3(2)

a_t (g)	0.30	0.31	0.32	0.33	0.34	0.35	0.36	0.37	0.38	0.39	0.40
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<u>tiers</u>												
<u>12</u>	<u>210.8</u>	<u>209.9</u>	<u>209.2</u>	<u>208.4</u>	<u>207.6</u>	<u>206.8</u>	<u>205.9</u>	<u>205.3</u>	<u>204.5</u>	<u>203.6</u>	<u>203.5</u>	
<u>11</u>	<u>218.4</u>	<u>217.6</u>	<u>216.8</u>	<u>216.1</u>	<u>215.3</u>	<u>214.6</u>	<u>213.9</u>	<u>213.0</u>	<u>209.8</u>	<u>204.5</u>	<u>200.4</u>	
<u>10</u>	<u>227.4</u>	<u>226.7</u>	<u>225.9</u>	<u>225.3</u>	<u>224.7</u>	<u>223.5</u>	<u>217.4</u>	<u>211.5</u>	<u>206.0</u>	<u>200.8</u>	<u>197.0</u>	
<u>9</u>	<u>238.6</u>	<u>237.9</u>	<u>237.2</u>	<u>232.1</u>	<u>225.3</u>	<u>218.9</u>	<u>212.8</u>	<u>207.1</u>	<u>201.7</u>	<u>196.5</u>	<u>193.1</u>	
<u>8</u>	<u>244.0</u>	<u>243.1</u>	<u>235.5</u>	<u>228.4</u>	<u>221.7</u>	<u>215.3</u>	<u>209.3</u>	<u>203.7</u>	<u>198.3</u>	<u>193.2</u>	<u>188.4</u>	
<u>7</u>	<u>213.5</u>	<u>213.5</u>	<u>213.5</u>	<u>213.5</u>	<u>213.5</u>	<u>209.1</u>	<u>203.3</u>	<u>197.8</u>	<u>192.6</u>	<u>187.7</u>	<u>183.0</u>	
<u>6</u>	<u>183.0</u>	<u>183.0</u>	<u>183.0</u>	<u>183.0</u>	<u>183.0</u>	<u>183.0</u>	<u>183.0</u>	<u>183.0</u>	<u>183.0</u>	<u>181.4</u>	<u>176.8</u>	
<u>5</u>	<u>152.5</u>	<u>152.5</u>	<u>152.5</u>	<u>152.5</u>	<u>152.5</u>	<u>152.5</u>	<u>152.5</u>	<u>152.5</u>	<u>152.5</u>	<u>152.5</u>	<u>152.5</u>	
<u>4</u>	<u>122.0</u>	<u>122.0</u>	<u>122.0</u>	<u>122.0</u>	<u>122.0</u>	<u>122.0</u>	<u>122.0</u>	<u>122.0</u>	<u>122.0</u>	<u>122.0</u>	<u>122.0</u>	
<u>3</u>	<u>91.5</u>	<u>91.5</u>	<u>91.5</u>	<u>91.5</u>	<u>91.5</u>	<u>91.5</u>	<u>91.5</u>	<u>91.5</u>	<u>91.5</u>	<u>91.5</u>	<u>91.5</u>	
<u>2</u>	<u>61.0</u>	<u>61.0</u>	<u>61.0</u>	<u>61.0</u>	<u>61.0</u>	<u>61.0</u>	<u>61.0</u>	<u>61.0</u>	<u>61.0</u>	<u>61.0</u>	<u>61.0</u>	
<u>tiers</u>	<u>a_r (g)</u>											
<u>12</u>	<u>0.41</u>	<u>0.42</u>	<u>0.43</u>	<u>0.44</u>	<u>0.45</u>	<u>0.46</u>	<u>0.47</u>	<u>0.48</u>	<u>0.49</u>	<u>0.50</u>	<u>0.51</u>	
<u>11</u>	<u>198.5</u>	<u>193.8</u>	<u>189.3</u>	<u>185.0</u>	<u>180.9</u>	<u>177.0</u>	<u>173.2</u>	<u>169.6</u>	<u>166.1</u>	<u>162.8</u>	<u>159.6</u>	
<u>10</u>	<u>195.5</u>	<u>190.8</u>	<u>186.4</u>	<u>182.1</u>	<u>178.1</u>	<u>174.2</u>	<u>170.5</u>	<u>167.0</u>	<u>163.6</u>	<u>160.3</u>	<u>157.1</u>	
<u>9</u>	<u>192.2</u>	<u>187.6</u>	<u>183.2</u>	<u>179.1</u>	<u>175.1</u>	<u>171.3</u>	<u>167.6</u>	<u>164.1</u>	<u>160.8</u>	<u>157.6</u>	<u>154.5</u>	
<u>8</u>	<u>188.3</u>	<u>183.9</u>	<u>179.6</u>	<u>175.5</u>	<u>171.6</u>	<u>167.9</u>	<u>164.3</u>	<u>160.9</u>	<u>157.6</u>	<u>154.4</u>	<u>151.4</u>	
<u>7</u>	<u>183.8</u>	<u>179.4</u>	<u>175.3</u>	<u>171.3</u>	<u>167.5</u>	<u>163.8</u>	<u>160.4</u>	<u>157.0</u>	<u>153.8</u>	<u>150.7</u>	<u>147.8</u>	
<u>6</u>	<u>178.5</u>	<u>174.3</u>	<u>170.2</u>	<u>166.4</u>	<u>162.7</u>	<u>159.1</u>	<u>155.7</u>	<u>152.5</u>	<u>149.4</u>	<u>146.4</u>	<u>143.5</u>	
<u>5</u>	<u>172.5</u>	<u>168.4</u>	<u>164.5</u>	<u>160.8</u>	<u>157.2</u>	<u>153.8</u>	<u>150.5</u>	<u>147.4</u>	<u>144.4</u>	<u>141.5</u>	<u>138.7</u>	
<u>4</u>	<u>152.5</u>	<u>152.5</u>	<u>152.5</u>	<u>152.5</u>	<u>150.5</u>	<u>147.3</u>	<u>144.1</u>	<u>141.1</u>	<u>138.2</u>	<u>135.5</u>	<u>132.8</u>	
<u>3</u>	<u>122.0</u>	<u>122.0</u>	<u>122.0</u>	<u>122.0</u>	<u>122.0</u>	<u>122.0</u>	<u>122.0</u>	<u>122.0</u>	<u>122.0</u>	<u>122.0</u>	<u>122.0</u>	
<u>2</u>	<u>91.5</u>	<u>91.5</u>	<u>91.5</u>	<u>91.5</u>	<u>91.5</u>	<u>91.5</u>	<u>91.5</u>	<u>91.5</u>	<u>91.5</u>	<u>91.5</u>	<u>91.5</u>	
<u>2</u>	<u>61.0</u>	<u>61.0</u>	<u>61.0</u>	<u>61.0</u>	<u>61.0</u>	<u>61.0</u>	<u>61.0</u>	<u>61.0</u>	<u>61.0</u>	<u>61.0</u>	<u>61.0</u>	
<u>tiers</u>	<u>a_r (g)</u>											
<u>12</u>	<u>0.52</u>	<u>0.53</u>	<u>0.54</u>	<u>0.55</u>	<u>0.56</u>	<u>0.57</u>	<u>0.58</u>	<u>0.59</u>	<u>0.60</u>	<u>0.61</u>	<u>0.62</u>	
<u>11</u>	<u>156.5</u>	<u>153.6</u>	<u>150.7</u>	<u>148.0</u>	<u>145.4</u>	<u>142.8</u>	<u>140.3</u>	<u>138.0</u>	<u>135.7</u>	<u>133.4</u>	<u>131.3</u>	
<u>10</u>	<u>154.1</u>	<u>151.2</u>	<u>148.4</u>	<u>145.7</u>	<u>143.1</u>	<u>140.6</u>	<u>138.2</u>	<u>135.8</u>	<u>133.6</u>	<u>131.4</u>	<u>129.3</u>	
<u>9</u>	<u>151.5</u>	<u>148.6</u>	<u>145.9</u>	<u>143.2</u>	<u>140.7</u>	<u>138.2</u>	<u>135.8</u>	<u>133.5</u>	<u>131.3</u>	<u>129.2</u>	<u>127.1</u>	
<u>8</u>	<u>148.5</u>	<u>145.7</u>	<u>143.0</u>	<u>140.4</u>	<u>137.9</u>	<u>135.5</u>	<u>133.1</u>	<u>130.9</u>	<u>128.7</u>	<u>126.6</u>	<u>124.6</u>	
<u>7</u>	<u>144.9</u>	<u>142.2</u>	<u>139.6</u>	<u>137.0</u>	<u>134.6</u>	<u>132.2</u>	<u>129.9</u>	<u>127.7</u>	<u>125.6</u>	<u>123.5</u>	<u>121.6</u>	
<u>6</u>	<u>140.8</u>	<u>138.1</u>	<u>135.6</u>	<u>133.1</u>	<u>130.7</u>	<u>128.4</u>	<u>126.2</u>	<u>124.1</u>	<u>122.0</u>	<u>120.0</u>	<u>118.1</u>	
<u>5</u>	<u>136.0</u>	<u>133.5</u>	<u>131.0</u>	<u>128.6</u>	<u>126.3</u>	<u>124.1</u>	<u>122.0</u>	<u>119.9</u>	<u>117.9</u>	<u>116.0</u>	<u>114.1</u>	
<u>4</u>	<u>130.3</u>	<u>127.8</u>	<u>125.4</u>	<u>123.2</u>	<u>121.0</u>	<u>118.8</u>	<u>116.8</u>	<u>114.8</u>	<u>112.9</u>	<u>111.0</u>	<u>109.3</u>	
<u>3</u>	<u>122.0</u>	<u>121.1</u>	<u>118.9</u>	<u>116.7</u>	<u>114.6</u>	<u>112.6</u>	<u>110.7</u>	<u>108.8</u>	<u>107.0</u>	<u>105.2</u>	<u>103.5</u>	
<u>2</u>	<u>91.5</u>	<u>91.5</u>	<u>91.5</u>	<u>91.5</u>	<u>91.5</u>	<u>91.5</u>	<u>91.5</u>	<u>91.5</u>	<u>91.5</u>	<u>91.5</u>	<u>91.5</u>	
<u>2</u>	<u>61.0</u>	<u>61.0</u>	<u>61.0</u>	<u>61.0</u>	<u>61.0</u>	<u>61.0</u>	<u>61.0</u>	<u>61.0</u>	<u>61.0</u>	<u>61.0</u>	<u>61.0</u>	
<u>tiers</u>	<u>a_r (g)</u>											
<u>12</u>	<u>0.63</u>	<u>0.64</u>	<u>0.65</u>	<u>0.66</u>	<u>0.67</u>	<u>0.68</u>	<u>0.69</u>	<u>0.70</u>	<u>0.71</u>	<u>0.72</u>	<u>0.73</u>	
<u>11</u>	<u>129.2</u>	<u>127.2</u>	<u>125.2</u>	<u>123.3</u>	<u>121.5</u>	<u>119.7</u>	<u>118.0</u>	<u>116.3</u>	<u>114.6</u>	<u>113.1</u>	<u>111.5</u>	
<u>10</u>	<u>127.2</u>	<u>125.2</u>	<u>123.3</u>	<u>121.4</u>	<u>119.6</u>	<u>117.9</u>	<u>116.1</u>	<u>114.5</u>	<u>112.9</u>	<u>111.3</u>	<u>109.8</u>	
<u>9</u>	<u>125.1</u>	<u>123.1</u>	<u>121.2</u>	<u>119.4</u>	<u>117.6</u>	<u>115.9</u>	<u>114.2</u>	<u>112.5</u>	<u>111.0</u>	<u>109.4</u>	<u>107.9</u>	
<u>8</u>	<u>122.6</u>	<u>120.7</u>	<u>118.8</u>	<u>117.0</u>	<u>115.3</u>	<u>113.6</u>	<u>111.9</u>	<u>110.3</u>	<u>108.8</u>	<u>107.3</u>	<u>105.8</u>	
<u>7</u>	<u>119.6</u>	<u>117.8</u>	<u>115.9</u>	<u>114.2</u>	<u>112.5</u>	<u>110.8</u>	<u>109.2</u>	<u>107.7</u>	<u>106.1</u>	<u>104.7</u>	<u>103.2</u>	
<u>6</u>	<u>116.2</u>	<u>114.4</u>	<u>112.6</u>	<u>110.9</u>	<u>109.3</u>	<u>107.6</u>	<u>106.1</u>	<u>104.6</u>	<u>103.1</u>	<u>101.7</u>	<u>100.3</u>	
<u>5</u>	<u>112.3</u>	<u>110.5</u>	<u>108.8</u>	<u>107.2</u>	<u>105.6</u>	<u>104.0</u>	<u>102.5</u>	<u>101.1</u>	<u>99.6</u>	<u>98.2</u>	<u>96.9</u>	
<u>4</u>	<u>107.5</u>	<u>105.8</u>	<u>104.2</u>	<u>102.6</u>	<u>101.1</u>	<u>99.6</u>	<u>98.2</u>	<u>96.8</u>	<u>95.4</u>	<u>94.1</u>	<u>92.8</u>	
<u>3</u>	<u>101.9</u>	<u>100.3</u>	<u>98.8</u>	<u>97.3</u>	<u>95.8</u>	<u>94.4</u>	<u>93.0</u>	<u>91.7</u>	<u>90.4</u>	<u>89.2</u>	<u>87.9</u>	
<u>2</u>	<u>91.5</u>	<u>91.5</u>	<u>91.5</u>	<u>90.4</u>	<u>89.0</u>	<u>87.7</u>	<u>86.4</u>	<u>85.2</u>	<u>84.0</u>	<u>82.8</u>	<u>81.7</u>	
<u>2</u>	<u>61.0</u>	<u>61.0</u>	<u>61.0</u>	<u>61.0</u>	<u>61.0</u>	<u>61.0</u>	<u>61.0</u>	<u>61.0</u>	<u>61.0</u>	<u>61.0</u>	<u>61.0</u>	
<u>tiers</u>	<u>a_r (g)</u>											
<u>12</u>	<u>0.74</u>	<u>0.75</u>	<u>0.76</u>	<u>0.77</u>	<u>0.78</u>	<u>0.79</u>	<u>0.80</u>	<u>0.81</u>	<u>0.82</u>	<u>0.83</u>	<u>0.84</u>	
<u>11</u>	<u>110.0</u>	<u>108.5</u>	<u>107.1</u>	<u>105.7</u>	<u>104.4</u>	<u>103.0</u>	<u>101.8</u>	<u>100.5</u>	<u>99.3</u>	<u>98.1</u>	<u>96.9</u>	
<u>10</u>	<u>108.3</u>	<u>106.9</u>	<u>105.4</u>	<u>104.1</u>	<u>102.7</u>	<u>101.4</u>	<u>100.2</u>	<u>98.9</u>	<u>97.7</u>	<u>96.6</u>	<u>95.4</u>	
<u>9</u>	<u>106.5</u>	<u>105.0</u>	<u>103.7</u>	<u>102.3</u>	<u>101.0</u>	<u>99.7</u>	<u>98.5</u>	<u>97.3</u>	<u>96.1</u>	<u>94.9</u>	<u>93.8</u>	
<u>8</u>	<u>104.4</u>	<u>103.0</u>	<u>101.6</u>	<u>100.3</u>	<u>99.0</u>	<u>97.8</u>	<u>96.5</u>	<u>95.3</u>	<u>94.2</u>	<u>93.0</u>	<u>91.9</u>	
<u>7</u>	<u>101.8</u>	<u>100.5</u>	<u>99.2</u>	<u>97.9</u>	<u>96.6</u>	<u>95.4</u>	<u>94.2</u>	<u>93.0</u>	<u>91.9</u>	<u>90.8</u>	<u>89.7</u>	
<u>6</u>	<u>98.9</u>	<u>97.6</u>	<u>96.3</u>	<u>95.1</u>	<u>93.8</u>	<u>92.7</u>	<u>91.5</u>	<u>90.4</u>	<u>89.3</u>	<u>88.2</u>	<u>87.1</u>	
<u>5</u>	<u>95.6</u>	<u>94.3</u>	<u>93.1</u>	<u>91.9</u>	<u>90.7</u>	<u>89.5</u>	<u>88.4</u>	<u>87.3</u>	<u>86.3</u>	<u>85.2</u>	<u>84.2</u>	
<u>4</u>	<u>91.5</u>	<u>90.3</u>	<u>89.1</u>	<u>88.0</u>	<u>86.8</u>	<u>85.7</u>	<u>84.7</u>	<u>83.6</u>	<u>82.6</u>	<u>81.6</u>	<u>80.6</u>	
<u>3</u>	<u>86.7</u>	<u>85.6</u>	<u>84.5</u>	<u>83.4</u>	<u>82.3</u>	<u>81.3</u>	<u>80.2</u>	<u>79.3</u>	<u>78.3</u>	<u>77.3</u>	<u>76.4</u>	
<u>2</u>	<u>80.6</u>	<u>79.5</u>	<u>78.5</u>	<u>77.5</u>	<u>76.5</u>	<u>75.5</u>	<u>74.5</u>	<u>73.6</u>	<u>72.7</u>	<u>71.9</u>	<u>71.0</u>	
<u>2</u>	<u>61.0</u>	<u>61.0</u>	<u>61.0</u>	<u>61.0</u>	<u>61.0</u>	<u>61.0</u>	<u>61.0</u>	<u>61.0</u>	<u>61.0</u>	<u>61.0</u>	<u>61.0</u>	

Note: In the above table, "tiers" is the number of tiers of 20 ft containers, excluding the number of 40 ft containers stacked on

the top, and “ a_t ” the transverse acceleration of the stack in the intermediate tier. For example, where 7 tiers of 20 ft containers are stacked with at least a tier of 40 ft containers overstowed, if the transverse acceleration of the stack in the intermediate tier a_t is 0.45g, then the overall weight of the stack is not to exceed 162.7t, excluding the number of 40 ft containers stacked on the top, but the weight of container of each tier of stack may be different.

4 DETERMINATION OF FORCES ACTING ON CONTAINERS AND STRENGTH OF SECURING ARRANGEMENTS

4.1 General requirements

4.1.2—The resultant force acting on the containers can be divided into three components as F_x , F_y and F_z , as shown in Figure 4.1.2, where ox is the central axis of roll and F_x , F_y and F_z act on the centre of the container, which means that the centre of gravity of the container is assumed to be at the centre of the container. If the center of gravity is assumed not to be in the center of the container in the design, the center of gravity of the container is to be provided together with the center of buoyance, transverse initial metacentric height, draught as well as vertical center of gravity of the ship.

4.1.2 The resultant force acting on the containers can be divided into three components as F_x , F_y and F_z , as shown in Figure 4.1.2, where ox is the central axis of roll and F_x , F_y and F_z act on the centre of the container, which means that the centre of gravity of the container is assumed to be at the centre of the container. In securing calculation, it may be accepted that the centre of gravity of the container is at 45% of container height.

4.2 Container securing acceleration

4.2.1—For containers above the deck, the transverse acceleration a_t is calculated as follows and is not to be less than the resultant transverse acceleration calculated according to 1.5.2.2(6) of Section 5, Chapter 1 of this PART:

$$a_t = \frac{9}{B^{0.16}} k_{GM} k_x \text{ m/s}^2$$

where: k_{GM} —coefficient, $k_{GM} = 1 + \frac{GM - 0.055B}{0.165B}$, when $GM \leq 0.05B$ and $B \geq 40$ m, k_{GM} is not to be less

than 0.9; other conditions, k_{GM} is not to be less than 1;

B —breadth of the ship, in m;

GM —design metacentric height, determined in accordance with 1.5.8 of the Appendix;

k_x —longitudinal distribution coefficient calculated as follows:

$$k_x = 1 + 0.1 \frac{(0.2L - x)}{0.2L} \text{ when } x < 0.2L$$

$$= 1 \text{ when } 0.2L \leq x \leq 0.7L$$

$$= 1 + 0.2 \frac{(x - 0.7L)}{0.3L} \text{ when } x > 0.7L$$

where: L —length of the ship, in m;

x —longitudinal distance from the calculating point to the aft perpendicular, in m.

4.2.2—For containers below the deck, the transverse acceleration a_t is calculated as follows and is not to be less than the resultant transverse acceleration calculated according to 1.5.2.2(6) of Section 5, Chapter 1 of this PART:

$$a_t = \frac{9}{B^{0.23}} k_{GM} k_x \text{ m/s}^2$$

where: k_{GM} —coefficient, $k_{GM} = 1 + \frac{GM - 0.055B}{0.165B}$, k_{GM} is not to be less than 1;

—For GM , B and k_x , see 4.2.1 of this Appendix.

4.2.3—The longitudinal acceleration a_l is calculated according to 1.5.2.2(7) of Section 5, Chapter 1 of this PART and is not to be less than 1.5 m/s^2 . In the calculation, speed is taken as half of the maximum service speed and the maximum rolling angle ψ_m is to comply with the following requirements:

$$\psi_m \leq 0.122 \text{ rad, when } L \leq 120 \text{ m}$$

$$\leq 0.105 \text{ rad, when } 120 \text{ m} < L < 275 \text{ m}$$

$$\leq 0.0873 \text{ rad, when } 275 \text{ m} \leq L$$

4.2.4—The vertical acceleration a_v is calculated according to 1.5.2.2(8) of Section 5, Chapter 1 of this

PART. In the calculation, the maximum rolling angle φ_m is to comply with the requirements specified in 4.2.3 of this Appendix.

4.2 Container securing acceleration

4.2.1 The transverse acceleration a_t for container securing calculation is calculated as follows:

$$a_t = (g + b_v) \sin \varphi_m + b_h \cos \varphi_m + \left(\frac{2\pi}{T_R}\right)^2 \cdot \varphi_m \cdot (z - z_{ROLL}) \quad \text{m/s}^2$$

where: g —gravity acceleration, to be taken as 9.81 m/s²;

b_v —acceleration of vertical motion due to pitch and heaving, in m/s²;

b_h —acceleration of transverse motion due to yawing and swaying, in m/s²;

φ_m —rolling angle of ship, in rad;

T_R —rolling period of ship, in s;

z —height from container gravity center position to baseline, in m;

z_{ROLL} —height from ship rolling centerline to baseline, in m;

In above calculation formula of transverse acceleration, b_v and b_h are determined by main dimension, block coefficient and speed of ship, and rolling angle and rolling period are determined by main dimension and metacentric height of ship. Transverse acceleration a_t may be determined through CCS ship calculation system.

4.2.2 The vertical acceleration a_v for container securing calculation is calculated as follows:

$$a_v = 0.866 k_x \cdot g \quad \text{m/s}^2$$

where: g —gravity acceleration, to be taken as 9.81 m/s²;

k_x —longitudinal distribution coefficient which can be determined through CCS ship calculation systems.

4.2.3 The longitudinal acceleration a_l for container securing calculation is calculated as follows:

$$a_l = g \cdot (0.4 - 0.001 L_{BP}), \text{ but need not be less than } 1.5 \text{ m/s}^2$$

where: g —gravity acceleration, to be taken as 9.81 m/s²;

L_{BP} —length between perpendiculars, in m.

4.3 Forces acting on containers

4.3.1 The transverse force component F_y parallel to deck is to be calculated as follows:

$$F_y = G a_t + Q \quad \text{kN}$$

where: G —gross weight of the container, in t;

a_t —transverse acceleration, in m/s², see 4.2.1 and 4.2.2 of this Appendix;

$Q = qA$, in kN, where q is the wind pressure, to be taken as 1.00.95 kPa for outermost containers at side (for containers at bottom, a splash force of 1.00.95 kPa is also to be taken into consideration), and as zero for others; A is the projected side area of containers bearing the wind pressure, in m². If the distance between adjacent container stacks is not more than 1 m, the wind load at containers inside can be omitted. If the distance between adjacent container stacks is 5 m or over, the wind load at containers inside is to be included in its entirety. If the distance is between 1 m and 5 m, linear interpolation is needed. If the exposed area is less than 1/3 of the side area, the wind load can be omitted.

4.3.2 The vertical force component F_z normal to deck is to be calculated as follows:

When checking the strength of the vertical supporting structure of containers:

$$F_z = 9.81 G \cos \varphi_m + G a_v \quad \text{kN}$$

$$F_z = G a_v \quad \text{kN}$$

When checking the vertical compressive force at corner posts and the vertical tensile force at corner fittings:

$$F_z = 9.81 G \cos \varphi_m k_x k_L \quad \text{kN}$$

where: G —gross weight of the container, in t (see 4.3.1 of this Appendix);

φ_m —maximum rolling angle, in rad, see 1.5.2.1(2) of Section 5, Chapter 1 of this PART;

a_v —vertical acceleration, in m/s², see 4.2.2 of this Appendix.

k_x —longitudinal distribution coefficient, see 4.2.1 of this Appendix;

k_L —coefficient, to be calculated according to the following formula:

$$k_L = 4.35 L^{-0.24}$$

where: L —length of ship, in m.

4.4 Distribution and combination of forces acting on containers

4.4.1 The forces acting on each container are distributed as follows.

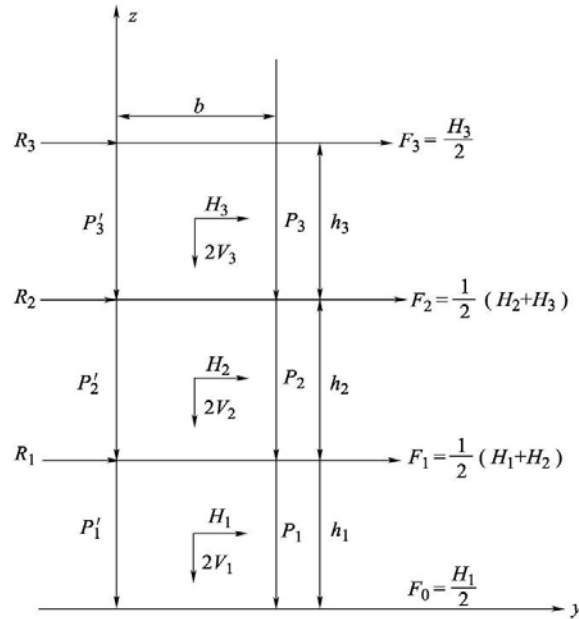
(1) The transverse component F_y of force is transmitted to the supporting point x from fore and after end walls of the container. The transverse force H_i transmitted from each end wall of the no. i container is to be obtained from the following formula:

$$H_i = F_{yi}/2 \quad \text{kN}$$

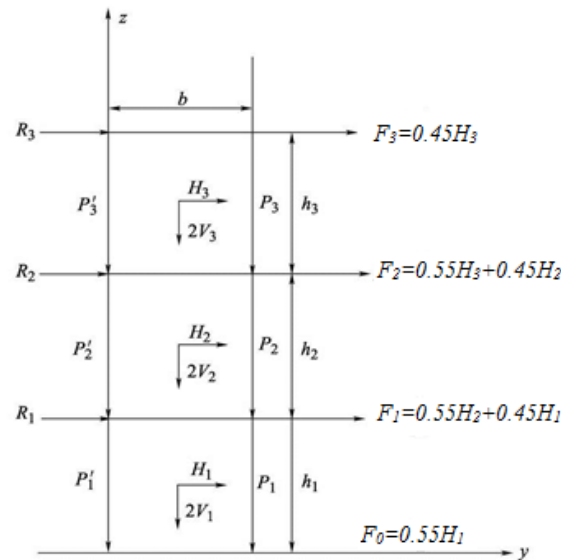
The distribution of force H_i : if the center of gravity of the container is assumed to be the center of the container, $H_i/2$ acting on top of end wall and $H_i/2$ on bottom of end wall of the container; If the center of gravity of the container is assumed to be 45% height of the container, $0.45 H_i$ acting on top of end wall and $0.55 H_i$ on bottom of end wall of the container.

where: F_{yi} — transverse component of force, see 4.3.1 of this Appendix.

The existing Figure 4.4.2 is replaced by:



(a) Gravity center at container center



(b) Gravity center at 45% height of container

Figure 4.4.2 Distribution of Force at Closed Ends of Containers

4.5 Calculation for lashings

4.5.2 Figure 4.5.2 shows a two tier stack of containers, in which the internal lashing is arranged diagonally to the second tier. If the center of gravity of the container is assumed to be the center of the container, for the selection of the effective sectional area A of the lashing, the residual racking force T (T being as required in 4.7.2 (2) of this Appendix) acting on the containers may be calculated in accordance with the following formula:

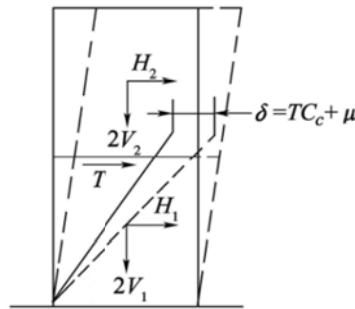


Figure 4.5.2 Two-Tier Stack

$$T = \frac{\frac{1}{2}H_1 + H_2 - \frac{AEI_y^2}{l^3}\mu}{\frac{AEI_y^2}{l^3}C_c + 1} \quad \text{kN}$$

where:

- H_1, H_2 — see 4.4.1 (1) of this Appendix;
- l — overall length of lashing assembly, which is to include torsion element, turnbuckle and eye plate. l can be obtained as follows: $l = \sqrt{l_x^2 + l_y^2 + l_z^2}$, in mm;
- l_x — longitudinal length component of lashing assembly, in mm;
- l_y — transverse length component of assembly, in mm;
- l_z — vertical length component of lashing assembly, in mm;
- E — elastic modulus of lashings, to be taken as 10,000 kN/cm² for steel wire rope, 4,000 kN/cm² for steel chain based on its nominal diameter, 14,000 kN/cm² for steel rod (lashed to top of 1st tier containers or bottom of 2nd tier containers), or 17,500 kN/cm² for steel rod (lashed to top of 2nd tier containers or bottom of 3rd tier containers) or 19,000 kN/cm² for steel rod (lashed to top of 3rd tier containers or bottom of 4th tier containers);
- A — effective sectional area of lashings, in cm²;
- μ — sliding at lower corners of container, in mm, ~~to be taken as zero in general for 1st and 2nd tier of container door end, to be taken as 4 mm, for closed end, to be taken as 0;~~
- c — spring constant for container transverse frame, ~~to be taken from Table 4.5.2 if no actual information available, 0.27 mm/kN for door end, 0.06 mm/kN for closed end and 0.168 mm/kN for side wall.~~

Spring Constant C_c for Container Transverse Frame (mm/kN) — Table 4.5.2

Height of containers (m)	Door end	Closed end	Side wall
2.438	0.275	0.061	0.168
2.591	0.291	0.066	0.178
2.896	0.325	0.073	0.199

4.6 Shoring forces

4.6.1 Where rigid shoring is used for the stowage of containers in holds without cell guide systems, the shoring forces may be determined by the following calculation.

The shoring forces Q_3 and Q_5 as shown in Figure 4.6.1 are to be calculated as follows:

$$Q_3 = \frac{1}{h_1}[H_4(h_1 - Z_4) + H_5(h_1 - Z_5)] + \frac{1}{h_2}[H_1Z_1 + H_2Z_2 + H_3Z_3] \quad \text{kN}$$

$$Q_5 = \frac{1}{h_1}(H_4Z_4 + H_5Z_5) \quad \text{kN}$$

where: for H_1, H_2, H_3, H_4 and H_5 , see 4.4.1(1) of this Appendix.

Q_i is the shoring force for a stack of containers. Where there are n stacks of containers arranged in the transverse direction and the number n does not exceed 4, the shoring force is to be nQ_i ; where n exceeds 4, the shoring force $Q_i(n)$ may be calculated as follows:

$$Q_i(n) = Q_i [n - 0.015(n-4)^3]$$

$$\text{If } n-m \leq 4, \quad Q_i(n) = Q_i \left[1 - \frac{(n-4)^2}{2nm} \right]$$

$$\text{If } n-m > 4, \quad Q_i(n) = Q_i \left(\frac{8+m}{2n} \right)$$

where: n —number of stacks using the same transverse support;
 m —maximum tiers of all container stacks.

5—Strength of Lashing Bridges of Containers

5 Strength Evaluation of Container Securing Structure

5.1 General requirements

~~5.1.1 These requirements apply to the lashing bridge structure and supporting structure of fixed securing devices on the deck of container ships.~~

5.1.1 These requirements apply to the lashing bridge and stanchion structure and supporting structure of fixed securing devices (lashing eye plate, deck ring, etc.) on the deck of container ships.

5.2 Design loads Lashing bridge

5.2.2 To check the strength of a lashing bridge, loads are to be applied according to the condition where the maximum lashing force may occur in the container securing manual/arrangement plan, and the lashing force is to be obtained by calculating according to the container securing manual/arrangement plan. The lashing force is to be applied in line with the lashing rods (or other securing devices) and can be decomposed into force components in longitudinal, transverse and vertical direction. The lashing force is applied to the securing eye plate of the lashing bridge. ~~To take into account the relative movement between the hatch cover and the hull structure, additional lashing forces are to be applied according to Table 5.2.2~~ In calculating lashing forces, relative displacement between the lashing bridge and the container stacks are to be taken into account, which is not to exceed the values given in Table 5.2.2.

The existing Table 5.2.2 is replaced by:

Relative displacement between lashing bridge and container stacks **Table 5.2.2**

<u>Lashing bridge of 1-tier container</u>	<u>Lashing bridge of 2-tier container</u>	<u>Lashing bridge of 3-tier container</u>
<u>height</u>	<u>height</u>	<u>height</u>
<u>10 mm</u>	<u>25 mm</u>	<u>35 mm</u>

5.2.3 In the initial design, forces may be applied according to the condition where the maximum lashing force may occur in reality. The lashing force for each lashing rod is taken as 175 kN/60% safe working load.

5.2.4 When checking the strength of lashing bridges, conditions where lashing forces are applied to forward and aft part lashing bridges together as well as respectively are to be calculated. ~~All expected operation directions need to be considered.~~

~~5.2.5 The SWL is to be the design load of the support structure of fixed securing devices.~~

5.2.5 To better describe the force distribution of each structural part in each direction, strength checking of lashing bridge is to adopt 3-dimensional finite element structural analysis. The extent of the model, the elements and the boundary conditions are based on the following principles:

(1) The finite element model is to include all lashing bridges and stanchions above the deck or hatch cover. The boundary conditions are to restrict all translations between elements and deck or hatch cover.

(2) The mesh size of the plate element is generally 100 mm × 100 mm, and triangle elements are to be avoided as far as possible in high stress areas and high stress changing areas.

~~5.2.6 In the design of stanchions on the deck, vertical design loads used to check the strength of the vertical support structure of containers in 4.3.2 of this Appendix are to be taken into account.~~

5.3 Direct analysis of calculation

~~5.3.1 To better describe the force distribution of each structural part in each direction, strength checking is~~

to adopt 3-dimensional finite element structural analysis.

5.3.2 The extent of the model, the elements and the boundary conditions are based on the following principles:

(1) The finite element model is to include all lashing bridges and stanchions above the deck or hatch cover. The boundary conditions are to restrict all translations between elements and deck or hatch cover.

(2) The mesh size of the plate element is generally 100 mm × 100 mm, and triangle elements are to be avoided as far as possible in high stress areas and high stress changing areas.

5.3 Deck box column

5.3.1 During design of deck box column, most dangerous condition as well as transverse load and vertical load acting on the stanchion are to be taken into account.

5.3.2 If some lashing points are arranged on the box column, horizontal and vertical components of lashing forces are also to be taken into account at the same time.

5.4 Criteria for strength

5.4.1 Allowable stresses for lashing bridges and supporting structures of fixed cargo securing devices under various conditions are as follows:

Allowable shear stress: $[\tau] = 0.4 R_{eH}$

Allowable equivalent stress: $[\sigma] = 0.88 R_{eH}$

where R_{eH} is the yield stress of the material, in N/mm^2 .

5.4 Fixed securing device

5.4.1 SWL of connecting securing device is to be treated as design load of supporting structure of fixed securing device.

5.5 Strength criteria

5.5.1 Allowable stresses for lashing bridge structures, deck stanchion structures and supporting structures of fixed cargo securing devices under various conditions are as follows:

Allowable shear stress: $[\tau] = 0.4 R_{eH}$

Allowable equivalent stress: $[\sigma] = 0.88 R_{eH}$

where R_{eH} is the yield stress of the material, in N/mm^2 .

6 Lashing Calculation Procedure

6.1 General requirements

6.1.1 The lashing calculation procedure is the software procedure for computer on board ship, which can carry out container securing strength calculation according to the requirements of this Appendix.

6.1.2 It is recommended that lashing calculation procedure include procedure approval and actual installation survey.

6.2 Requirements for specific approval of lashing calculation procedure

6.2.1 The specific approval of lashing calculation procedure means, for the purpose of a specific ship, the approval of the procedure installed on board, i.e. the approval of the design method, calculation functions and principles, input data, output data, operation manual and test report and other documents.

6.2.2 The specific approval of lashing calculation procedure may specifically include the following:

(1) Design method, calculation functions and principles of the procedure are to be in conformity with the requirements and comply with the functional requirements of 6.2.3 of this Appendix.

(2) All input data of the procedure are to be consistent with those of the actual ship.

(3) The error of calculation results for test conditions selected according to 6.4 of this Appendix is, by comparison with those of CCS plan approval software, to be controlled within $\pm 5\%$.

(4) Operation manual of the lashing calculation procedure is to comply with the requirements of 6.5 of this Appendix.

6.2.3 Lashing calculation procedure is to have following functional requirements:

(1) The procedure is to be such that a common user can not alter the inputted data of the actual ship such as the geometric characteristics and permissible values.

(2) The procedure is to be such that any user can not alter the inputted calculation procedure.

(3) The procedure is to, as far as possible, reduce significant or illogical input errors.

(4) The procedure is to be capable of clearly judging whether a calculation condition complies with the relevant requirements, i.e. calculating for a certain condition. Where the calculation results exceed permissible values, the user is to be alerted by distinct means such as prominent display, special markings or visible and audible alarms, screen display or printout.

(5) The procedure interface is to be fully user-friendly and to alert the user to any operational error. Data loss or dead stop of the computer caused by the user's error is to be minimized.

(6) The procedure is to be provided with passwords so that the computer will refuse to work and alert the user where any illegal password is input.

(7) The procedure is to be capable of calculating the container securing strength under any condition, and display and print out date and time of the calculation and the calculation results stored. The screen display and printout are to include the following information under any condition:

initial metacentric height;

position of container stack;

actual weight of stacked container;

maximum permissible stack weight;

lashing arrangement of stacked containers;

transverse acceleration of each tier of container;

racking force of each tier of container;

vertical tension and compressive force between each tier of container;

stack bottom compressive force;

lashing force;

transverse horizontal pressure and tension;

warnings (if any of strength criteria is exceeded).

6.3 Steps for implementing approval of lashing calculation procedure

6.3.1 The applicant is to submit the following plans and information to CCS for approval:

(1) Instructions for lashing calculation procedure, which is to include procedure design method, calculation function and data structure;

(2) Operation manual of lashing calculation procedure;

(3) Test report of lashing calculation procedure.

6.3.2 The applicant is to provide relevant plan or data of particular ship (e.g. general arrangement of ship, container securing manual/arrangement plan) for information or check calculation.

6.3.3 On completion of approving above plans and information, cover pages of operation manual of lashing calculation procedure and test report are to stamped with approval stamp, and it is to be indicated in the issued plan approval comment that class notation CLC or class notations CLC(V) and CLC(V,W) are recommended.

6.4 Test condition

6.4.1 Test condition is to be selected from container securing manual/arrangement plan of the ship.

6.4.2 Test condition is at least to include:

(1) Container lashing arrangement condition corresponding to minimum and maximum initial metacentric height;

(2) For ships granted with class notation CLC(V) or CLC(V,W), corresponding additional condition is to be supplemented.

6.4.3 Test condition is to include all functions of procedure as far as possible.

6.4.4 Approved test condition is to be kept as input data to ensure that they can not be revised by the user. A copy of approved test condition is to be kept on board ship.

6.5 Operation manual

6.5.1 At least one copy of operation manual of lashing calculation procedure approved by CCS is to be kept on board ship.

6.5.2 The operation manual of lashing calculation procedure is to be written by a language used by the user on board, and the language is to be the same as that for screen display, printout and the approved container securing manual/arrangement plan kept on board. Where the language is not English, an English translation is to be available.

6.5.3 The operation manual is to be written in a clear and unambiguous manner. The use of flowcharts is recommended for illustrating operational processes.

6.5.4 The operation manual is to include the following:

(1) particulars and version number of the lashing calculation procedure;

(2) specification of hardware needed to run the lashing calculation procedure and guidance for procedure installation;

(3) procedure running steps shown in menus and dialogues, description of error messages and warnings likely to be encountered and unambiguous instructions for subsequent actions to be taken by the user in

each case;

(4) description of test conditions;

(5) operation procedure shown by calculation cases;

(6) input and output data, calculation results shown by screen display, necessary explanatory text;

(7) explanation for function keys.

6.6 Actual installation survey

6.6.1 The shipowner or the entrusting party is to submit application to CCS survey unit of port of call of ship.

6.6.2 The crew may grasp operation and calculation of lashing calculation procedure of the ship by means of study or training, and installation survey is to be carried out by crew of the ship.

6.6.3 Actual installation survey is to be carried out with the presence of CCS surveyor. Installation survey is generally to include following items:

(1) Checking that the user's operation manual and test report approved by CCS are kept on board the ship.

(2) Examining the environment and position for installing the procedure: confirming that the position and method for installing the procedure are as required in the specification.

(3) Procedure stability test: the procedure is to be capable of working normally after a continuous running period of one hour.

(4) Procedure security test: where an illegal password is inputted (or in case of human maloperation), the procedure should refuse to work.

(5) Procedure safety test: a common user is not to be capable of changing the application program and the input ship's data such as geometrical characteristics, tank capacity table, curve of permissible values.

(6) Procedure performance test: the calculation results from the procedure operated by the crew of the ship based upon the conditions as stated in the approved test report, the calculations are to be the same as those in the approved test report.

6.6.4 During installation survey, test report printed by lashing calculation procedure is to be confirmed and endorsed by site surveyor. On completion of satisfactory installation survey, site surveyor is to issue report and CCS is to grant relevant class notation.

6.6.5 For ships provided with lashing calculation procedure approved by other IACS member societies, the operation manual and test report approved by these Societies may be reviewed and installation inspections are to be carried out in accordance with 6.6.3 of this Appendix.

6.6.6 For ships provided with lashing calculation procedure not complying with the relevant requirements of CCS or approved by a party which is not a member of IACS, installation inspections are to be carried out once again.

7 Specific route and season

7.1 Transverse acceleration for specific route

7.1.1 For container securing of specific route, transverse acceleration a_{vt} is to be calculated according to following formula:

$$a_{vt} = a_t \cdot f_{route} \text{ m/s}^2$$

where: a_{vt} — transverse acceleration calculated according to 4.2.1 of this Appendix, in m/s^2 ;

f_{route} — specific route factor.

7.1.2 For each specific route, CCS will determine route factor f_{route} by statistical calculation of ship motion. CCS will generate specific wave distribution figure based on approved wave statistical data to obtain f_{route} . For this purpose, each specific route is to be provided by the shipowner with a series of latitude and longitude coordinates on the route or information on sea area involved by the route. Division of sea area and statistical data of wave in sea area are to be agreed by CCS. For each involved sea area, at least one point is to be specified. If possible, time percentage for each sea area is to be provided.

7.2 Transverse acceleration for specific season

7.2.1 For container securing of specific season, transverse acceleration a_{wt} is to be calculated according to following formula:

$$a_{wt} = a_{vt} \cdot f_{season} \text{ m/s}^2$$

where: a_{wt} — transverse acceleration of specific route which is calculated according to 7.1.1 of this

Appendix, in m/s^2 ;

f_{route} —specific season factor.

7.2.2 Specific season factor f_{route} is the ratio of transverse acceleration based on the wave statistical data of specific route and different season to transverse acceleration based on the wave statistical data of the whole year.

Appendix 2 DIRECT STRENGTH CALCULATION OF CONTAINER SHIPS

2 DIRECT CALCULATIONS OF STRENGTH OF PRIMARY STRUCTURES OF CARGO AREA

2.1 General requirements

2.1.1 The direct strength calculations for cargo holds are applicable to the evaluation of the strength of the following primary ~~structures~~ structural members within cargo area in ~~typical loading conditions~~ loading conditions given in 2.3:

- (1) double bottom structure (bottom plating, inner bottom plating, longitudinal girders, floors);
- (2) ~~transverse (transverse bulkhead, transverse web frame) structure~~ double side skin structure (shell plating, inner hull plate, side tank longitudinal platform stringers and transverse web frames);
- (3) ~~side (longitudinal bulkhead) structure~~ transverse bulkhead structure;
- (4) ~~deck and deck between hatchways~~ cross deck structure.

2.2 Design loads

~~2.2.3 The forces arising from acceleration of the longitudinal motion of each container within hold is to be distributed from corresponding corners of the container to primary members of the transverse bulkhead (or the transverse open bulkhead) in way of cell guides.~~

~~2.2.3 In addition to the loads above, conditions 1, 1G, 2, 2G, 3, 3G, 7G, 8G and 9G are to include the mass of hull structure and inertia forces load of containers; conditions 4 and 5 are to include the mass of hull structure and containers; condition 6 is to include the longitudinal load due to hull ship longitudinal acceleration.~~

~~2.2.4 Determination of load due to containers on hatch cover:~~

- (1) ~~The longitudinal forces from containers on each hatch cover are to be calculated at mid height of the stack. The moment about stack base caused by longitudinal forces may be ignored.~~
- (2) ~~The number of tiers of containers is the maximum one of loaded containers, and the maximum stack weight and the number of tiers are to be those permitted in the loading manual or the cargo handling manual.~~
- (3) ~~The longitudinal forces from containers sited between the ship's side and the longitudinal hatch coamings may be ignored.~~

~~2.2.5 In addition to the loads above, the mass of hull structure and inertial forces of the containers are to be taken into consideration.~~

2.3 Loading conditions

2.3.1 The ~~applicable~~ loading conditions are to be checked according to Table 2.3.1. For more severe loading conditions in the loading manual not covered by the Table, direct strength calculation is to be carried out.

In the existing Table 2.3.1, Note (6) is amended as follows:

“(6) for condition 6, loads within hold and on hatch cover to be determined as specified in ~~2.2.3 and 2.2.4~~ 2.3.5 of this Appendix;”

2.3.2 For checking the local strength of deck plating, bottom plating, inner bottom plating, side shell plating, longitudinal bulkheads and double bottom girders under loading conditions 1, 2, 3, 4, 5 and 6, consideration is to be given to the stress composition resulting from the stress due to the overall longitudinal bending moment acting on hull girders and the stress ~~along ship's length~~ due to local loads (conditions 1G, 2G, 3G, 7G, 8G and 9G), the assessment criteria are given in 2.6.2 and 2.6.1 respectively. The stress response under the hull girder longitudinal bending moment is to be calculated by means of the FE model as specified in 2.4, and the boundary conditions for the global load are given in 2.5.3 of this Appendix.

~~2.3.5 In the case of condition 6, load on hatch cover is to be calculated as follows:~~

- (1) ~~15% of the total longitudinal force acting on hatch covers is to be distributed on nodes at top of longitudinal and transverse hatch coamings to simulate the friction force to which the bearing pads at hatch coamings are subjected due to longitudinal motion.~~
- (2) ~~The remaining 85% of the longitudinal forces on hatch covers are to act on nodes corresponding to the longitudinal stop positions at one end of the hatch cover (top of the transverse hatch coaming). If the stop~~

positions are unknown, they are assumed to be located at the mid-breadth of the aft end of the hatch cover. Three covers are to be assumed if the number of hatch covers is unknown.

2.3.5 Under surging condition (condition 6), the forces arising from acceleration of the longitudinal motion of each container within hold is to be distributed from corresponding corners of the container to primary members of the transverse bulkhead (or the transverse open bulkhead) in way of cell guides. The longitudinal acceleration is calculated according to 1.5.2.2.(7), Section 5, Chapter 1 of this PART (In calculating a_0 , V is taken as half of the maximum service speed). Determination of loads due to containers on hatch cover is as follows:

(1) The longitudinal forces from containers on each hatch cover are to be calculated at mid-height of the stack. The moment about stack base caused by longitudinal forces may be ignored.

(2) The number of tiers of containers is the maximum one of loaded containers, and the maximum stack weight and the number of tiers are to be those permitted in the loading manual or the cargo handling manual.

(3) The longitudinal forces from containers sited between the ship's side and the longitudinal hatch coamings may be ignored.

(4) 15% of the total longitudinal force acting on hatch covers is to be distributed on nodes at top of longitudinal and transverse hatch coamings to simulate the friction force to which the bearing pads at hatch coamings are subjected due to longitudinal motion.

(5) The remaining 85% of the longitudinal forces on hatch covers are to act on nodes corresponding to the longitudinal stopper positions at one end of the hatch cover (top of the transverse hatch coaming). If the stopper positions are unknown, they are assumed to be located at the mid-breadth of the aft end of the hatch cover. Three covers are to be assumed if the number of hatch covers is unknown.

3 DIRECT CALCULATION OF GLOBAL STRENGTH OF SHIP

3.3 Finite element model for whole global ship

3.3.2 Selection of elements

3.3.2.2 Secondary members on plating may be lumped as an equivalent beam element into mesh boundaries of plate elements, its sectional area is the sum of respective areas of the lumped members and its sectional properties are to be considered for eccentric setting of connection of the equivalent beam with plating.

3.3.3 Meshing

3.3.3.1 Normally for meshing of the FE model of the whole ship, one element is used for each spacing of double bottom floors in longitudinal direction, one element for each spacing of girders in transverse direction and one element for each spacing of vertical girders or decks in vertical direction. Unless otherwise specified in this Appendix, the requirements for structural modeling are given in Section 5, Chapter 1 of this PART.

4 FATIGUE STRENGTH EVALUATION FOR DECK HATCH CORNERS

4.2 Loads

4.2.3.3 The range of dynamic stresses at the edge of hatch corners is to be based on the calculation results of each loading condition stipulated in 4.2.3.1 of this Appendix and combined as follows:

$$\Delta\sigma_{12} = \sigma_{LC1} - \sigma_{LC2}$$

$$\Delta\sigma_{34} = \sigma_{LC3} - \sigma_{LC4}$$

$$\Delta\sigma_{56} = \sigma_{LC5} - \sigma_{LC6}$$

$$\Delta\sigma_{78} = \sigma_{LC7} - \sigma_{LC8}$$

$$\Delta\sigma_{910} = \sigma_{LC9} - \sigma_{LC10}$$

where: $\Delta\sigma_{ij}$ — range of tangential dynamic stresses at corner edge under the combined load cases i and j , in N/mm^2 ;

σ_{LCi} — value of tangential stress at corner edge in load case i , in N/mm^2 .

CHAPTER 9 ROLL ON-ROLL OFF SHIPS, PASSENGER SHIPS, RO-RO PASSENGER SHIPS AND FERRIES

Section 6 VEHICLE RAMPS

9.6.2 Framing of vehicle ramps

(3) allowable bending stress $[\sigma] = 141/K$, in N/mm^2 , with K being the material factor; allowable deflection ~~$[f] = 1/400$ mm~~ $[f] = l/200$ mm, with l being the distance between the supporting points of ~~stiffeners~~ primary members of vehicle ramps, in mm.

CHAPTER 16 ORE CARRIERS

Section 1 GENERAL PROVISIONS

16.1.4 Direct strength calculation and fatigue strength assessment for hull structure

16.1.4.2 For ore carriers of 150 m in length and above, fatigue strength assessment in respect to structures following locations within the cargo region is to be carried out and the assessment results are to be submitted to CCS:

- (1) connection of longitudinal (bottom, side, deck and inner hull) and transverse strength frame;
- (2) connection of longitudinal (bottom, side, deck and inner hull) and transverse bulkhead;
- (3) connection of inner hull longitudinal bulkhead and inner bottom plate;
- (4) connection of inner bottom plate and lower stool;
- (5) inner hull longitudinal bulkhead knuckle (if any).

Section 3 HULL FRAMING

16.3.2 Single bottom

~~16.3.2.1 The section modulus W of bottom longitudinals is not to be less than that obtained by the following formula:~~

$$W = 10sDl^2K \text{ cm}^3$$

~~where: s — spacing of longitudinals, in m;
 D — moulded depth, in m;
 l — span of longitudinal, in m;
 K — material factor.~~

16.3.2.1 The section modulus W of bottom longitudinals is not to be less than that obtained by the following formula:

$$W = 11.5sdl^2K \text{ cm}^3$$

where: s — spacing of longitudinals, in m;
 d — draught, in m;
 l — span of longitudinal, in m;
 K — material factor.

16.3.4 Side framing

16.3.4.1 The ship's sides are normally longitudinally framed, and the side longitudinals within $0.1D$ from bottom and deck are to continuously pass through transverse bulkheads. The section modulus W of side longitudinals is not to be less than that obtained by the following formula:

$$W = 8.4s(h+1.2)l^2K \text{ cm}^3$$
$$W = 7.2s(h+1.2)l^2K \text{ cm}^3$$

where: s — spacing of longitudinals, in m;
 h — vertical distance measured from the longitudinal under consideration to deck line at side amidships, in m, but not less than 2.5 m;
 l — span of longitudinal, in m;
 K — material factor.

16.3.6 Cargo hold boundary

16.3.6.1 Cargo hold boundary means longitudinal bulkhead, corrugated transverse bulkhead as well as upper and lower wall stool (if any), plane transverse bulkhead, upper deck and hatch coaming in the cargo hold (except for inner bottom) which are in contact with cargo.

16.3.6.2 Thickness t of cargo hold boundary plate is not to be less than the value obtained from following formula:

$$t = 4.65C_1s \sqrt{\frac{K_c HK}{\gamma}} \text{ mm}$$

where: s — length of shorter side of plate panel, in m;
 γ — loading rate, in m^3/t , not to be more than 0.833;
 H — vertical distance measured from lower edge of panel to deck in way of midship side, in m;

$C_1 = 1.2 - \frac{s}{2l}$, where l is length of longer side of plate panel, C_1 is to be taken as 0 if C_1 is more than 1;

K_C — cargo pressure coefficient, to be taken as:

$K_C = \cos^2 \alpha + (1 - \sin \psi) \sin^2 \alpha$ for transverse bulkhead and longitudinal bulkhead, lower stool, vertical upper stool and hatch coaming;

$K_C = 0$ for upper deck and inclined upper stool;

α — included angle between considered plate and horizontal plane, in degree;

ψ — angle of repose assumed for cargo in bulk, in degree, to be taken as 35° for carriage of ore.

K — material factor.

16.3.6.3 Section modulus W of cargo hold boundary stiffener is not to be less than the value obtained from following formula:

$$W = \frac{8.5}{\gamma} K_C H s l^2 K \quad \text{cm}^3$$

where: γ and K_C are the same as those in 16.3.6.2;

l — span of stiffener, in m;

s — spacing of stiffeners, in m;

H — vertical distance measured from stiffener span midpoint to deck in way of midship side, in m;

K — material factor.

Section 4 BULKHEADS

16.4.1 Transverse watertight bulkheads

16.4.1.2 The scantlings of upper and lower stools of transverse watertight bulkheads are, if fitted, to comply with the requirements of this Section and in addition, the relevant requirements of Section 12, Chapter 2 and Section 4, Chapter 8 of this PART.

16.4.2.8 Horizontal stiffeners

(1) The section modulus W of horizontal stiffeners is not to be less than that obtained by the following formula:

$$W = 8.4s(h+1.2)l^2K \quad \text{cm}^3$$

$$W = 7.2s(h+1.2)l^2K \quad \text{cm}^3$$

where: s — spacing of horizontal stiffeners, in m;

h — vertical distance, in m, measured from horizontal stiffener to tank top on the centreline, but not less than $0.25D$ 2.5 m;

l — span of horizontal stiffener, in m;

K — material factor.

(2) The section modulus of horizontal stiffeners within $0.10(D - h_o)$ above the inner bottom is not to be less than that of adjacent inner bottom longitudinals with the same spacing and is to be gradually tapered to that of horizontal stiffeners, where h_o is the depth of double bottom.

(3)(2) Horizontal stiffeners are to continuously pass through transverse bulkheads within $0.1D$ from deck and inner bottom.

Section 5 EASY LOADING REQUIREMENTS

16.5.1 General requirements

16.5.1.1 This section applies to ore carriers with 100% loading (easy loading) condition for all cargo holds.

16.5.1.2 Average loading speed during easy loading is not to exceed the provisions in Table 16.5.1.1. For higher average loading speed, further consideration is to be given.

Average loading speed Table 16.5.1.1

Deadweight tonnage (t)	Average loading speed (t/h)
------------------------	-----------------------------

<u>220000~250000</u>	<u>14000</u>
<u>>250000</u>	<u>16000</u>

16.5.2 Class notation

16.5.2.1 Ore carriers complying with the provisions of this Section are to be granted with class notation EL100.

16.5.3 Hull structure strength

16.5.3.1 In the whole process of easy loading, actual still water bending moment and still water shearing force of hull girder are not to exceed permissible still water bending moment and permissible still water shearing force under port condition.

16.5.3.2 In the whole process of easy loading, it is to ensure that double bottom and transverse bulkhead have sufficient local strength, and direct calculation of structural strength is to be carried out in accordance with CCS Guidelines for Direct Strength Analysis of Hull Structure of Ore Carriers.

16.5.4 Equipment provision and requirements

16.5.4.1 If ballast adjustment is required to control that actual still water bending moment and still water shearing force of hull girder do not exceed permissible still water bending moment and still water shearing force under port condition, requirements of 16.5.4.2 and 16.5.4.3 are to be complied with.

16.5.4.2 The ballast system is to be able to match the requirements of mean loading speed in 16.5.1.2, including ballast tank arrangement, capacity of ballast pump and arrangement of ballast piping system.

16.5.4.3 The ship is to be provided with tank (e.g. ballast tank, fuel oil tank, etc.) remote control sounder and ship draught reading system, which are synchronous with loading instrument on board ship. It is not necessary to consider fuel oil tanks without level change during loading.

16.5.5 Requirements of easy loading manual

16.5.5.1 Easy loading manual which is approved by CCS is to be provided on board ship or may be included in other approved loading manual.

16.5.5.2 Easy loading sequence is to include operation sequence of each stop of loading from the beginning of loading to the end of loading as well as synchronous ballast adjustment, so as to ensure that the requirements of 16.5.3.1 are complied with during loading (including each cargo hold from empty load to full load).

16.5.5.3 Easy loading manual is at least to include following:

- (1) Loading of each hold at each step;
- (2) Ballast water adjustment of each hold at each step;
- (3) Maximum still water bending moment and shearing force at the end of each step;
- (4) Ship draught and trim at the end of each step.



CHINA CLASSIFICATION SOCIETY

CCS Rule Change Notice For:
RULES FOR CLASSIFICATION OF SEA-GOING
STEEL SHIPS

PART THREE
MACHINERY INSTALLATIONS

CONTENTS

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CHAPTER 2 PUMPING AND PIPING SYSTEMS

Section 5 CONNECTION OF PIPE LENGTHS, HEAT TREATMENT AND NON-DESTRUCTIVE TESTING

2.5.3 Mechanical joints^①

2.5.3.1 The different mechanical joints applicable to this paragraph are indicated in Table 2.5.3.1(1). ~~Their application is to be in compliance with those specified in Table 2.5.3.1(2) and Table 2.5.3.1(3).~~ The mechanical joints are to be subject to type approval based on different usage and location in accordance with the requirements of Appendix 3 of this Chapter.

~~2.5.3.2 Construction of mechanical joints is to prevent the possibility of tightness failure affected by pressure pulsation, piping vibration, temperature variation and other similar adverse effects occurring during operation on board.~~

2.5.3.2 Where appropriate, mechanical joints are to be of fire resistant type as required by Table 2.5.3.1(2).

~~2.5.3.4 The mechanical joints are to be designed to withstand internal and external pressure as applicable and where used in suction lines are to be capable of operating under vacuum.~~

2.5.3.4 Application of mechanical joints and their acceptable use for each service is indicated in Table 2.5.3.1(2); dependence upon the Class of piping and pipe dimensions is indicated in Table 2.5.3.1(3).

In particular cases, sizes in excess of those mentioned above may be accepted if in compliance with a recognized national and/or international standard.

2.5.3.6 Mechanical joints, which in the event of damage could cause fire or flooding, are not to be used in piping sections directly connected to the ~~sea openings~~ ship's side below the bulkhead deck of passenger ships (or freeboard deck of cargo ships) or tanks containing flammable fluids. The number of mechanical joints in ~~oil~~ flammable fluid systems is to be kept to a minimum. In general, flanged joints conforming to recognized standards are to be used.

2.5.3.10 Slip-on joints are not to be used in pipelines in cargo holds, tanks and other spaces which are not easily accessible. Application of these joints inside tanks may be permitted only for the same media that is in the tanks.

~~Unrestrained slip on joints are to be used only in cases where compensation of lateral pipe deformation is necessary. Usage of these joints as the main means of pipe connection is not permitted.~~ Usage of slip type slip-on joints as the main means of pipe connection is not permitted except for cases where compensation of axial pipe deformation is necessary.

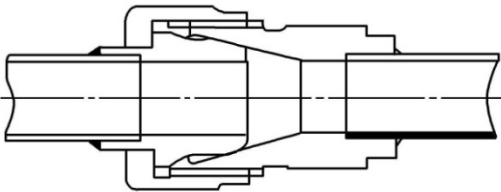
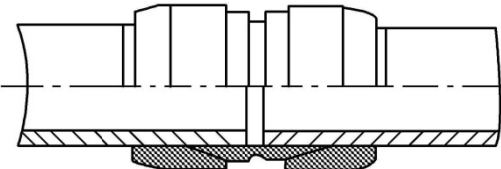
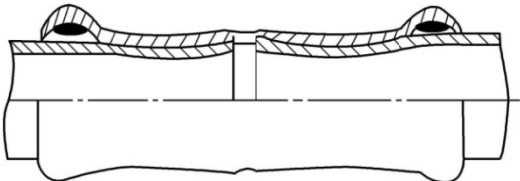
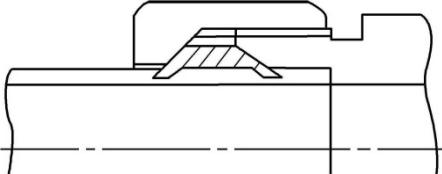
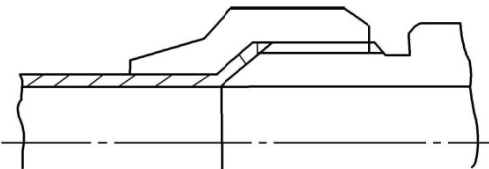
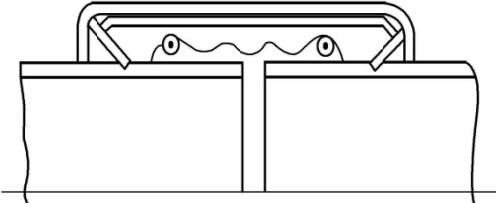
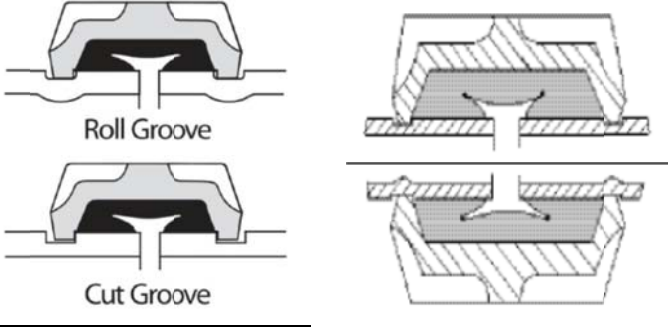
Examples of mechanical joints

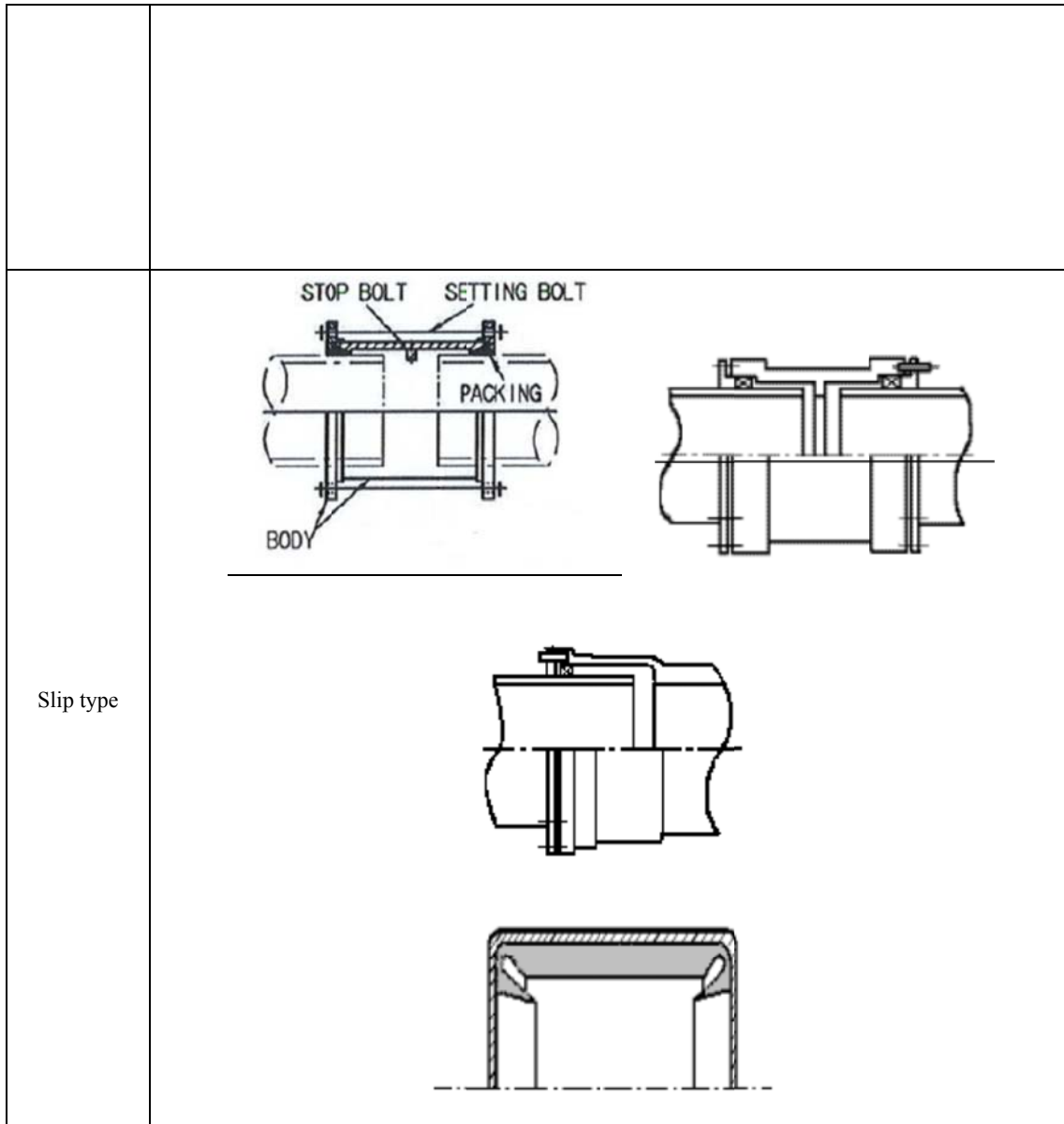
Table

2.5.3.1(1)

Pipe unions

^① This revision is applicable to any mechanical pipe joints submitted for approval from 1 January 2017 and to any renewal of type approval of existing design of mechanical pipe joint after 1 January 2017.

Welded and brazed types	
Compression	
Swage type	
Press type	
Bite type	
Flared type	
Slip-on joints	
Grip type	
Machine grooved type	 <p style="text-align: center;">Roll Groove</p> <p style="text-align: center;">Cut Groove</p>



Slip type

Application of mechanical joints

Table

2.5.3.1(2)

Systems	Kind of connections			
	Pipe unions	Compression couplings ^④	Slip-on joints	
Flammable fluids (flash point ≤ 60°C)				
1	Cargo oil lines ^④	×	×	× ^④
2	Crude oil washing lines ^④	×	×	× ^④
3	Vent lines ^④	×	×	× ^④
Inert gas				
4	Water seal effluent lines	×	×	×
5	Scrubber effluent lines	×	×	×
6	Main lines ^{②④}	×	×	× ^{②④}
7	Distribution lines ^②	×	×	× ^②

Flammable fluids (flash point > 60°C)				
8	Cargo oil lines ^①	×	×	× ^④
9	Fuel oil lines ^{③②}	×	×	× ^{③④}
10	Lubricating oil lines ^{②③}	×	×	× ^{③④}
11	Hydraulic oil ^{②③}	×	×	× ^{③④}
12	Thermal oil ^{②③}	×	×	× ^{③④}
Sea water				
13	Bilge lines ^①	×	×	× ^④
14	Fire main and water spray Water filled fire extinguishing systems, e.g. sprinkler systems ^③	×	×	× ^④
15	Foam system Non water filled fire extinguishing systems, e.g. foam drencher systems ^③	×	×	× ^④
16	Sprinkler system Fire main (not permanently filled) ^③	×	×	× ^④
17	Ballast system ^①	×	×	× ^④
18	Cooling water system ^①	×	×	× ^④
19	Tank cleaning services	×	×	×
20	Non-essential systems	×	×	×
Fresh water				
21	Cooling water system ^①	×	×	× ^④
22	Condensate return ^①	×	×	× ^④
23	Non-essential system	×	×	×
Sanitary/drains/scuppers				
24	Deck drains (internal) ^②	×	×	× ^④
25	Sanitary drains	×	×	×
26	Scuppers and discharge (overboard)	×	×	—
Sounding/vent				
27	Water tanks / Dry spaces	×	×	×
28	Oil tanks (f.p. >60°C) ^{②③}	×	×	× ^{③④}
Miscellaneous				
29	Starting/control air ^①	×	×	—
30	Service air (non-essential)	×	×	×
31	Brine	×	×	×
32	CO ₂ system ^①	×	×	—
33	Steam	×	×	× ^{④⑤}

Notes:

× Application is allowed.

— Application is not allowed.

* Fire resistance capability:

If mechanical joints include any components which readily deteriorate in case of fire, they are to be of an approved fire resistant type under consideration of the following footnotes:

- ① Inside machinery spaces of category A – only approved fire resistant types.
 - ② Not inside machinery spaces of category A or accommodation spaces. May be accepted in other machinery spaces provided the joints are located in easily visible and accessible positions.
 - ③ Approved fire resistant types except in cases where such mechanical joints are installed on exposed open decks, as defined in SOLAS II-2/Reg. 9.2.3.3.2.2(10) and not used for fuel oil lines.
 - ~~④ Above free board deck only.~~
 - ~~⑤~~④ Only in pump rooms and open decks – only approved fire resistant types.
- * General:
- ~~⑥ If compression couplings include any components which readily deteriorate in case of fire, they are to be of approved fire resistant type as required for slip on joints.~~
 - ~~⑦~~⑤ Slip type slip-on joints as shown in Table 2.5.3.1(1), ~~provided that they are restrained on the pipes,~~ may be used for pipes on deck with a design pressure of 10 bar or less.
 - ⑥ Only above bulkhead deck of passenger ships (or freeboard deck of cargo ships).

Appendix 2 FLEXIBLE HOSES

1.3 Design and construction^①

1.3.5 Following flexible hose assemblies constructed of non-metallic materials are to be of fire-resistant type^② except in cases where such hoses are installed on open decks, as defined in SOLAS II-2/Reg. 9.2.3.3.2.2(10) and not used for fuel oil lines:

- (1) used for flammable media;
- (2) used for sea water systems where failure may result in flooding.

^① This revision is to be uniformly implemented from 1 January 2017.

Appendix 3 TYPE APPROVAL OF MECHANICAL JOINTS

1.5 Testing, procedures and requirements^①

1.5.2 Selection of test specimen

Test specimens are to be selected from production line or at random from stock.

~~Where there are various sizes from type of joints requiring approval, minimum of three separate sizes representative of the range, from each type of joints are to be subject to the tests listed in Table 1.5.1.~~

Where there is a variety of size of joints requiring approval, a minimum of three separate sizes, representative of the range, from each type of joint to be tested in accordance with Table 1.5.1 are to be selected.

1.5.5 Methods of tests

(1) Tightness test

In order to ensure correct assembly and tightness of the joints, all mechanical joints are to be subject to a tightness test, as follows:

- ① Mechanical joint assembly test specimen is to be connected to the pipe or tubing in accordance with the requirements of 1.5.3 and the manufacturers instructions, filled with test fluid and de-aerated.

Mechanical joints assemblies intended for use in rigid connections of pipe lengths, are not to be longitudinally restrained.

Pressure inside the joint assembly is to be slowly increased to 1.5 times of design pressure. This test pressure is to be retained for a minimum period of 5 min.

In the event where there is a drop in pressure or there is visual indication of leakage, the test (including fire test) is to be repeated for two test pieces. If during the repeat test one test piece fails, the ~~testing~~ coupling is regarded as having failed.

(2) Vibration (fatigue) test

In order to establish the capability of the mechanical joint assembly to withstand fatigue, which is likely to occur due to vibrations under service conditions, mechanical joints assemblies ~~is~~ are to be subject to the following vibration test.

Conclusions of the vibration tests should show no leakage or damage, ~~which could subsequently lead to a failure.~~

- ① Testing of compression couplings and pipe unions

~~Compression couplings, pipe unions or other similar joints intended for use in rigid connections of pipe~~ Compression couplings and pipe unions intended for use in rigid pipe connections are to be tested ~~in accordance with this method described~~ as follows.

Rigid connections are joints, connecting pipe length without free angular or axial movement.

.....

Pressure during the test is to be monitored. In the event of drop in the pressure and ~~visual signs of visible~~ leakage, the test is to be repeated as described in 1.5.4 of this Appendix.

^① This revision is applicable to any mechanical pipe joints submitted for approval from 1 January 2017 and to any renewal of type approval of existing design of mechanical pipe joint after 1 January 2017.

Visual examination of the joint assembly is to be carried out ~~for signs of damage which may eventually lead to joint leakage.~~

.....

(5) Pull-out test

In order to determine the ability of a mechanical joint assembly to withstand axial load likely to be encountered in service without the connecting pipe from becoming detached, following pull-out test is to be carried out.

~~Pipes length~~ of suitable ~~size~~length ~~are~~ is to be fitted to each end of the mechanical joints assembly test specimen. The test specimen is to be pressurized to design pressure. When pressure is attained, an external axial load is to be imposed with a value calculated ~~by~~ using the following formula^①:

.....

(6) Fire endurance test

In order to establish capability of the mechanical joints to withstand effects of fire which may be encountered in service, mechanical joints are to be subjected to a fire endurance test. The fire endurance test is to be conducted on the selected test specimens as per the following standards.

① ISO 19921: 2005(E): Ships and marine technology – Fire resistance of metallic pipe components with resilient and elastomeric seals – Test methods.

② ISO 19922: 2005(E): Ships and marine technology – Fire resistance of metallic pipe components with resilient and elastomeric seals – Requirements imposed on the test bench.

Clarifications to the standard requirements:

① If the fire test is conducted with circulating water at a pressure different from the design pressure of the joint (however of at least 5 bar), the subsequent pressure test is to be carried out to twice the design pressure.

② A selection of representative nominal bores may be tested in order to evaluate the fire resistance of a series or range of mechanical joints of the same design. When a mechanical joint of a given nominal bore (D_n) is so tested then other mechanical joints falling in the range D_n to $2 \times D_n$ (both inclusive) are considered accepted.

③ Alternative test methods and/or test procedures considered to be at least equivalent may be accepted in cases where the test pieces are too large for the test bench and cannot be completely enclosed by the flames.

④ Thermal insulation materials applied on couplings are to be non-combustible in dry condition and when subjected to oil spray. A non-combustibility test according to ISO 1182 is to be carried out.

(7) Vacuum test

In order to establish the capability of the mechanical joint assembly to withstand internal pressures below ~~atmosphere~~ atmospheric, similar to the conditions likely to be encountered under service conditions, the following vacuum test is to be carried out.

~~The m~~Mechanical joint assembly is to be connected to a vacuum pump and subjected to a pressure of 0.0170 MPa absolute. Once this pressure is stabilized, ~~the mechanical joint assembly test specimens under test~~ are is to be isolated from the vacuum pump and ~~this~~ the pressure is to be maintained ~~retained~~ for a period of 5 min.

~~Pressure is to be monitored during the test.~~

No internal pressure rise is permitted.

Appendix 4 AIR PIPE CLOSING DEVICES^①

1.2 Design

1.2.9 The inner and the outer chambers of an automatic air pipe head is to be of a minimum thickness of 6 mm. Where side covers are provided and their function is integral to providing functions of the closing device as outlined in 1.2.6 of this Appendix, they are to have a minimum wall thickness of 6 mm. If the air pipe head can meet the tightness test in 1.4.1(2) of this Appendix without the side covers attached, then the side covers are not considered to be integral to the closing device, in which case a wall less than 6 mm can be acceptable for side covers.^①

^① This revision is applicable to any air pipe closing device submitted for new or revised approval from 1 January 2017.

CHAPTER 3 SHIP'S PIPING AND VENTILATING SYSTEMS

Section 11 VENTILATION

3.11.4 Ventilation of emergency generator rooms^①

3.11.4.1 Emergency generator rooms are to be provided with ventilation openings for the admission of combustion air to engines and the removal of heat. These openings are usually provided with louvers which can be closed from the outside of the emergency generator rooms (when fire breaks out in emergency generator rooms). The louvers may be hand-operated or power-operated. Alternatively, the louvers may be of fixed type with a closing door which may be hand-operated or automatic.

3.11.4.2 The following requirements apply to ventilation louvers for emergency generator rooms and to closing appliances where fitted to ventilators serving emergency generator rooms:

(1) Ventilation louvers and closing appliances may either be hand-operated or power-operated (hydraulic / pneumatic / electric) and are to be operable under a fire condition.

(2) Hand-operated ventilation louvers and closing appliances are to be kept open during normal operation of the vessel. Corresponding instruction plates are to be provided at the location where hand-operation is provided.

(3) Power-operated ventilation louvers and closing appliances are to be of a fail-to-open type. Closed ventilation louvers and closing appliances are acceptable during normal operation of the vessel. Power-operated ventilation louvers and closing appliances are to open automatically whenever the emergency generator is starting / in operation.

(4) It is to be possible to close ventilation openings by a manual operation from a clearly marked safe position outside the space where the closing operation can be easily confirmed. The louver status (open / closed) is to be indicated at this position. Such closing is not to be possible from any other remote position.

^① The newly-added contents are applicable to ships contracted for construction on and after 1 January 2017.



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PART FOUR
ELECTRICAL INSTALLATIONS

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CHAPTER 2 ELECTRICAL INSTALLATIONS IN SHIPS

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CHAPTER 2 ELECTRICAL INSTALLATIONS IN SHIPS

Section 18 ADDITIONAL REQUIREMENTS FOR SHIPS CARRYING DANGEROUS GOODS

~~2.18.1.5 When carrying flammable liquids having flashpoints less than 23°C as Class 3.1, 3.2, 6.1 or 8 in cargo spaces, aluminium smelting by products or aluminium remelting by products (UN 3170), aluminium smelting or remelting by products processed (MHB), ferrosilicon (MHB) and ferrosilicon (UN 1408), the bilge pipes with flanges, valves, pumps, etc., constitute a source of release and the enclosing spaces (e.g. pipe tunnels, bilge pump rooms, etc.) are to be classified as an extended hazardous area (comparable with Zone 2).~~

A new paragraph 2.18.10 is added as follows:

“2.18.10 Carriage of flammable liquids having a flashpoint below 23°C in packaged form (classes 3, 6.1 and 8), aluminium smelting by-products or aluminium remelting by-products (UN 3170), aluminium smelting or remelting by-products processed (MHB), ferrosilicon (MHB) and ferrosilicon (UN 1408)

2.18.10.1 The bilge pipes with flanges, valves, pumps, etc., constitute a source of release and the enclosing spaces (e.g. pipe tunnels, bilge pump rooms, etc.) are to be classified as an extended hazardous area (comparable with Zone 2) unless these spaces are continuously mechanically ventilated with a capacity for at least six air changes per hour.

2.18.10.2 Except where the space is protected with redundant mechanical ventilation capable of starting automatically, equipment not certified for Zone 2 are to be automatically disconnected following loss of ventilation while essential systems such as bilge and ballast systems are to be certified for Zone 2.

2.18.10.3 Where redundant mechanical ventilation is employed, equipment and essential systems not certified for Zone 2 are to be interlocked so as to prevent inadvertent operation if the ventilation is not operational. Audible and visual alarms are to be provided at a manned station if failure occurs.”



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PART EIGHT

ADDITIONAL REQUIREMENTS

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CHAPTER 4 ADDITIONAL REQUIREMENTS FOR ONE MAN BRIDGE OPERATED (OMBO) SHIPS

Section 1 GENERAL PROVISIONS

4.1.3.1 The following plans and documents are to be submitted for approval:

- (1) Bridge visibility calculations, including scantlings of bridge, inclination and dimensions of windows and dimensions of consoles;
- (2) Arrangement of bridge, including positions of workstations, navigational equipment and consoles etc.;
- (3) Arrangement of console panels;
- (4) Diagram of power supply system for navigational equipment, internal communication equipment etc.;
- ~~(5) Procedures for single man watch-keeping and safety manual.~~

~~4.1.3.2 A list of navigational equipment showing manufacturers, types, models and type approval etc is to be submitted for information.~~

A new paragraph 4.1.3.2 is added as follows:

4.1.3.2 Procedures for single-man watch-keeping and safety manual are to be kept on board.

CHAPTER 8 ADDITIONAL REQUIREMENTS FOR SHIPS WITH REGARD TO ENVIRONMENTAL PROTECTION

Section 1 GENERAL PROVISIONS

8.1.5.1 The following operational procedural documents are to be submitted for approval, and where they have been approved by the flag State Administration, one copy each thereof are to be provided for reference:

- (1) Ballast water management plan;
- (2) Garbage management plan;
- ~~(3) Sewage management plan;~~
- (34) NO_x emission control/measurement procedures;
- (45) Fuel oil management procedure (including SO_x emission control and bunker delivery);
- (56) Refrigerant management plan;
- (67) Volatile Organism Compounds (VOCs) Management Plan (only applicable to crude oil tankers);
- (78) Biofouling management plan (for Biofouling-C notation only).

Section 2 CONDITIONS FOR ASSIGNING CLEAN CLASS NOTATION

8.2.5.1 Ships are to comply with the following requirements of 8.2.5.2 to 8.2.5.6~~5~~ of this Section in addition to the requirements of MARPOL Annex IV, as applicable.

~~8.2.5.6 The ship is to keep on board a sewage management plan approved by CCS. The plan is to provide guidance to the crew on management of sewage treatment and discharge of sewage, and is to include the following as a minimum:~~

- ~~(1) name and identification number of the ship;~~
- ~~(2) diagrams of the sewage treatment system and sewage holding tanks as well as all relevant piping arrangement;~~
- ~~(3) management and operational procedures of sewage;~~
- ~~(4) means and method of recording all sewage discharges to shore reception facilities or to the sea. The recorded data is to include the date, place and quantity of such discharges; the speed of the ship and its nearest distance to shore are also to be recorded for discharges to the sea. For discharges from the sewage treatment system, the time of activating and stopping the system is to be recorded in lieu of the quantity discharged. The discharge of untreated sewage in emergency is also to be recorded.~~

A new Chapter 26 is added as follows:

**Chapter 26 ADDITIONAL REQUIREMENTS FOR INSTALLATION OF BALLAST
WATER MANAGEMENT SYSTEMS**

Section 1 GENERAL PROVISIONS

26.1.1 Application

26.1.1.1 This Chapter applies to ballast water management systems (BWMSs):

- (1) where an application for approval for the plans of BWMS is made on or after 1 January 2017;
- (2) which is installed in ships contracted for construction on or after 1 January 2017 .

26.1.1.2 In addition to the requirements contained in 2004 International Convention for the Control and Management of Ships' Ballast Water and Sediments (hereinafter referred to as the BWM Convention), the requirements of this Chapter are to be satisfied for the installation of Ballast Water Management Systems above.

26.1.2 Definitions

26.1.2.1 For the purpose of this Chapter:

- (1) Ballast Water Management System (hereinafter referred to as 'BWMS') means any system which processes ballast water such that it meets or exceeds the Ballast Water Performance Standard in Regulation D-2 of the BWM Convention. The BWMS includes ballast water management equipment, all associated control equipment, monitoring equipment and sampling facilities.
- (2) Dangerous gas means any gas which may develop an explosive and/or toxic atmosphere being hazardous to the crew and/or the ship, e.g. hydrogen (H₂), hydrocarbon gas, ozone (O₃), chlorine (Cl₂) and chlorine dioxide (ClO₂), etc.
- (3) Hazardous area means an area in which an explosive gas atmosphere is or may be expected to be present, in quantities such as to require special precautions for the construction, installation and use of equipment. When a gas atmosphere is present, the following hazards may also be present: toxicity, asphyxiation, corrosivity and reactivity.
- (4) Dangerous liquid means any liquid that is identified as hazardous in the Material Safety Data Sheet or other documentation relating to this liquid.

Section 2 INSTALLATION

26.2.1 General requirements

26.2.1.1 All valves, piping fittings and flanges are to comply with the relevant requirements of Chapter 2, PART THREE of the Rules. In addition, special consideration can be given to the material used for this service with the agreement of CCS.

26.2.1.2 The BWMS is to be provided with by-pass or override arrangement to effectively isolate it from any essential ship system to which it is connected.

26.2.1.3 The BWMS is to be operated at a flow rate within the Treatment Rated Capacity (TRC) range specified in the Type Approval Certificate (TAC) issued by the Flag Administration.

26.2.1.4 Where a vacuum may occur in the ballast line due to the height difference, a suitable protection means is to be provided, e.g. P/V valves or breather valves, and their outlets are to be led to safe area on open deck.

26.2.1.5 Electric and electronic components are not to be installed in a hazardous area unless they are of certified safe type for use in the area. Cable penetrations of decks and bulkheads are to be sealed when a pressure difference between the areas is to be maintained.

26.2.1.6 Where the operating principle of the BWMS involves the generation of a dangerous gas, the following requirements are to be satisfied:

(1) Gas detection equipment is to be fitted in the spaces where dangerous gas could be present, and an audible and visual alarm is to be activated both locally and at the BWMS control station in the event of leakage. The gas detection device is to be designed and tested in accordance with IEC 60079-29-1.

(2) The ventilation line of a space where dangerous gas could be present is to be led to a safe area on open deck.

(3) The arrangements used for gas relieving, i.e. degas equipment or equivalent, are to be provided with monitoring measures with independent shutdown. The open end of the gas relieving device is to be led to a safe area on open deck.

26.2.1.7 Ballast piping, including sampling lines from ballast tanks considered as hazardous areas, is not to be led to an enclosed space regarded as a safe area, without any appropriate measures, except ships carrying liquefied gases in bulk. However, a sampling point for checking the performance of BWMS, for ballast water containing dangerous gas, may be located in a safe area provided the following requirements are fulfilled:

(1) The sampling facility (for BWMS monitoring/control) is to be located within a gas tight enclosure (hereinafter, referred to as a 'cabinet'), and the followings are to be complied.

① In the cabinet, a stop valve is to be installed in each sample pipe.

② Gas detection equipment is to be installed in the cabinet and the valves specified in ① above are to be automatically closed upon activation of the gas detection equipment.

③ Audible and visual alarm signals are to be activated both locally and at the BWMS control station when the concentration of explosive gases reaches a pre-set value, which should not be higher than 30% of the lower flammable limit (LFL) of the concerned product.

(2) The standard internal diameter of sampling pipes is to be the minimum necessary in order to achieve the functional requirements of the sampling system.

(3) The measuring system is to be installed as close to the bulkhead as possible, and the length of measuring pipe in any safe area is to be as short as possible.

(4) Stop valves are to be located in the safe area, in both the suction and return pipes close to the bulkhead penetrations. A warning plate stating "Keep valve closed when not performing measurements" is to be posted near the valves. Furthermore, in order to prevent backflow, a water seal or equivalent arrangement is to be installed on the hazardous area side of the return pipe.

(5) A safety valve is to be installed on the hazardous area side of each sampling pipe.

26.2.1.8 For the spaces, including hazardous areas, where toxicity, asphyxiation, corrosivity or reactivity is present, these hazards are to be taken into account and additional precautions for the ventilation of the spaces and protection of the crew are to be considered.

26.2.2 Additional requirements for tankers:

26.2.2.1 Hazardous area classification is to be in accordance with IEC 60092-502.

26.2.2.2 For tankers carrying the following cargoes, in general, two independent BWMS may be required – i.e. one for ballast tanks in hazardous areas and the other for ballast tanks in non-hazardous areas:

- (1) flammable liquids having a flashpoint not exceeding 60°C; or
- (2) products listed in the IBC Code having a flashpoint not exceeding 60°C; or
- (3) cargoes heated to temperature above their flashpoint and cargoes heated to temperature within 15°C of their flashpoint.

26.2.2.3 The interconnection of ballast piping between hazardous areas and in nonhazardous areas may be accepted if an appropriate isolation arrangement is applied. Means of appropriate isolation are as follows:

- (1) Two screw down check valves in series with a spool piece, as indicated in Figure 26.2.2.3(1):



Figure 26.2.2.3(1) Two screw down check valves in series with a spool piece

or:

- (2) Two screw down check valves in series with a liquid seal at least 1.5 m in depth, as indicated in Figure 26.2.2.3(2):

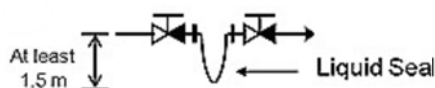


Figure 26.2.2.3(2) Two screw down check valves in series with a liquid seal at least 1.5 m in depth

or:

- (3) Automatic double block and bleed valves and a non-return valve, as indicated in Figure 26.2.2.3(3):

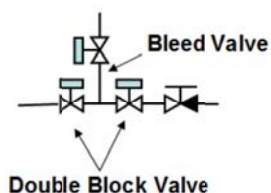


Figure 26.2.2.3(3) Automatic double block and bleed valves and a non-return valve

Examples of appropriate isolation arrangements are shown in Appendix 1. Isolation arrangements are to be fitted on the exposed deck in the hazardous area. Also, ballast water originating from a hazardous area is not to discharge into a non-hazardous area, except as given by 26.2.1.7.

26.2.3 Ventilation

26.2.3.1 BWMS not in hazardous areas:

- (1) A BWMS that does not generate dangerous gas is to be located in an adequately ventilated area.
- (2) A BWMS that generates dangerous gas is to be located in a space fitted with a mechanical ventilation system providing at least 6 air changes per hour or as specified by the BWMS manufacturer, whichever is greater.

26.2.3.2 BWMS in hazardous areas:

(1) A BWMS, regardless of whether or not it generates dangerous gas, is to be located in a space fitted with mechanical ventilation complying with relevant requirements, e.g. IEC60092-502, IBC Code, IGC Code, etc.

26.2.4 Special requirements

26.2.4.1 The length of pipe and the number of connections are to be minimised in piping systems containing dangerous gases/liquids in high concentration. The following requirements are also to be satisfied:

(1) Pipe joints are to be of welded type except for connections to shut off valves, double walled pipes or pipes in ducts equipped with mechanical exhaust ventilation. Alternatively it is to be demonstrated that risk of leakage is minimized and the formation of toxic or flammable atmosphere is prevented.

(2) Location of the piping system is to be away from heat sources and protected from mechanical damage.

26.2.4.2 For BWMS using chemical substances, handling procedures are to be in accordance with the Material Safety Data Sheet and BWM.2/Circ.20, and the following measures are to be taken as appropriate:

(1) The materials used for the chemical storage tanks, piping and fittings are to be resistant to such chemicals.

(2) Chemical storage tanks are to have sufficient strength and be constructed such that maintenance and inspection can be easily performed.

(3) Chemical storage tank air pipes are to be led to a safe area on open deck.

(4) An operation manual containing chemical injection procedures, alarm systems, measures in case of emergency, etc., is to be kept onboard.

26.2.4.3 Where the BWMS is installed in an independent compartment, the compartment is to be:

(1) Provided with fire integrity equivalent to other machinery spaces.

(2) Positioned outside of any combustible, corrosive, toxic, or hazardous areas unless otherwise specifically approved.

26.2.4.4 A risk assessment may be conducted to ensure that risks, including but not limited to those arising from the use of dangerous gas affecting persons on board, the environment, the structural strength or the integrity of the ship are addressed.

26.2.5 Automation

26.2.5.1 In case of any by-pass or override operation of BWMS, an audible and visual alarm is to be given and these events are to be automatically recorded in control equipment. The valves in the by-pass line which trigger the by-pass operation are to be remote-controllable by control equipment or fitted with open/close indicator for automatic detection of the by-pass event.

Appendix 1

1.1 BWMS which does not require after-treatment (Figure 1)

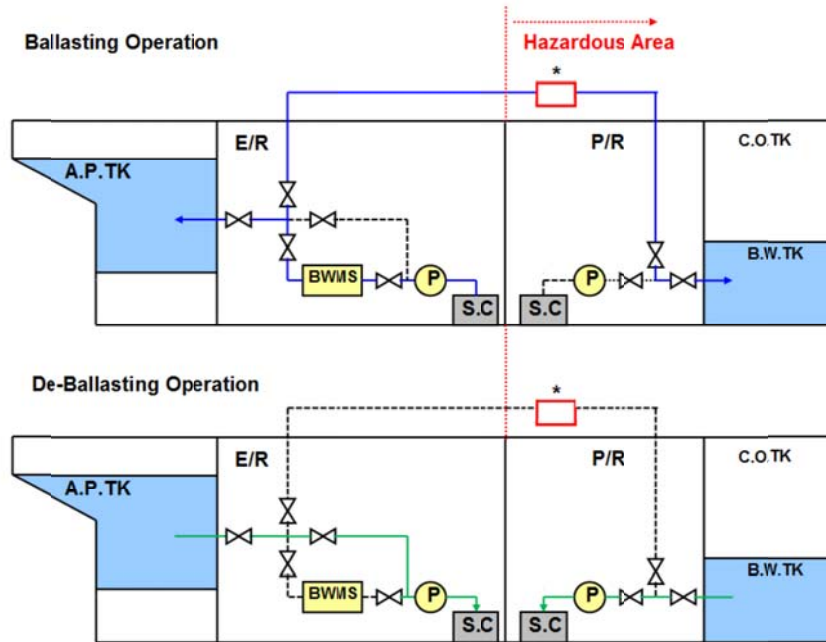


Figure 1

1.2 BWMS which requires after-treatment (Injection type)(Figure 2)

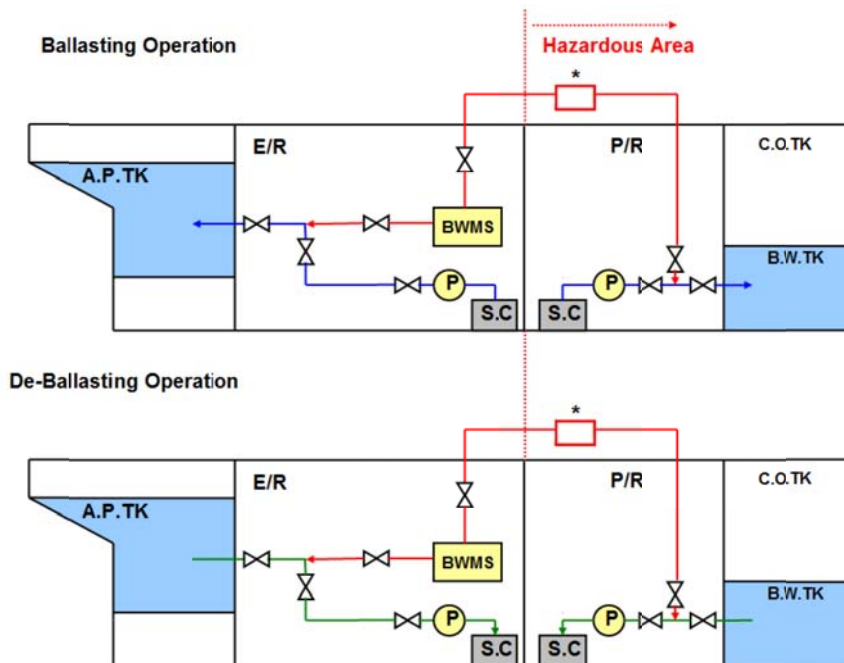


Figure 2

1.3 Appropriate Isolation Means (as indicated in Figures 1 and 2):

Two (2) screw down check valves in series with a spool piece or a liquid seal, or automatic double block and bleed valves+ screw down check valves, see Figure 3.

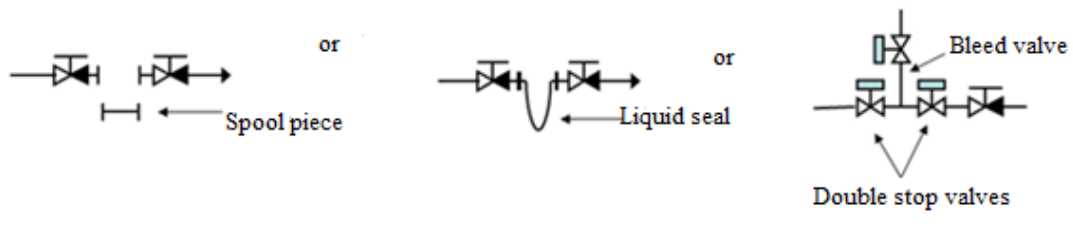


Figure 3