

CANADA SHIPPING ACT

Grain Cargo Regulations

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CANADA SHIPPING ACT

Grain Cargo Regulations

REGULATIONS RESPECTING GRAIN CARGOES

Short Title

1. These Regulations may be cited as the Grain Cargo Regulations.

Interpretation

2. (1) In these Regulations,

"Administration" means, in respect of a ship, the government of the country in which the ship is registered; (Administration)

"angle of flooding" means that angle of heel at which openings in the hull, superstructures or deckhouses that cannot be closed weathertight immerse; (angle d'envahissement)

"compartment" means a compartment of a ship; (compartment)

"contracting government" means the government of a country that is a party to

(a) the International Convention for the Safety of Life at Sea, 1960, or

(b) the International Convention for the Safety of Life at Sea, 1974;

(gouvernement contractant)

"existing ship" means

(a) a ship registered in Canada or in a country the government of which is not a contracting government whose keel was laid before March 4, 1977,

(b) a ship, other than a Canadian ship, registered in a country the Administration of which has accepted or is a party to Chapter VI of the International Convention for the Safety of Life at Sea, 1960, (as amended in accordance with Resolution A.264 (VIII) adopted on November 20, 1973 by the Inter-Governmental Maritime Consultative Organization) whose keel was laid before the date on which that amendment was implemented or came into force, whichever was the earlier date, and

(c) a ship, other than a Canadian ship, registered in a country the Administration of which is a party to the International Convention for the Safety of Life at Sea, 1974, whose keel was laid before the coming into force of the Convention in respect of that Administration;

(navire existant)

"filled compartment" means a compartment in which, after loading with bulk grain and trimming as required by section 5, the grain is at its highest possible level; (compartment rempli)

"grain" includes corn, wheat, rye, barley, oats, peas and all other grain; (grain)

"grain loading stability information" means information provided in accordance with section 14; (renseignements sur la stabilité du chargement de grains)

"Minister" means the Minister of Transport; (Ministre)

"new ship" means a ship that is not an existing ship; (nouveau navire)

"partly filled compartment" means a compartment that contains bulk grain and is not a filled compartment; (compartment partiellement rempli)

"void" means a space in a compartment into which grain has been poured, which space is between the surface of the grain and the crown of the compartment. (vide)

(2) For the purposes of the definition "angle of flooding", small openings through which progressive flooding cannot take place shall not be considered open.

Application

3. (1) Subject to subsection (2), these Regulations apply to all ships loading grain consigned to any place that is outside Canada and is not a place within the limits of an inland voyage.

(2) These Regulations apply to vessels of less than 500 tons gross tonnage only to the extent that is reasonably practicable.

Responsibility

4. The master, owner and agent of every ship shall ensure that the ship satisfies the requirements of these Regulations.

Trimming Grain

5. (1) In every filled compartment, bulk grain shall be trimmed in such a manner that all spaces under the decks and hatch covers are filled to the greatest possible extent.

(2) In every partly filled compartment, all free grain surfaces shall be levelled after loading.

(3) Subsection (1) does not apply where the compartments in ships are provided with feeding ducts, perforated decks or other similar arrangements for stowing grain and the administration that issued the document of authorization in respect of that ship is satisfied that the underdeck void configuration, resulting from free flowing grain in such compartments, is taken into account in calculating the void depths.

Intact Stability Requirements

6. (1) Subject to section 12, the intact stability characteristics of every ship loaded with bulk grain shall, after taking into account in the manner described in Schedule I the heeling moments due to grain shift, be shown to meet throughout the voyage the following criteria:

(a) the angle of heel due to grain shift shall not exceed 12 degrees or such lesser angle as is permitted by the government or organization that issued the document of authorization;

(b) if shown by a statical stability diagram as described in Figure 1 of Schedule I, the net or residual area between the heeling arm curve and the righting arm curve, as shown in that figure, up to

(i) the angle of heel of maximum difference between the ordinates of those curves,

(ii) an angle of 40 degrees, or

(iii) the angle of flooding,

whichever is the least, shall, in all conditions of loading, be not less than 0.075 metre-radians; and

(c) the initial metacentric height, after correction for the free surface effect of liquids in tanks, shall be not less than 0.3 m.

(2) Subject to subsection (3), no ship shall be loaded with grain in Canada until the master has demonstrated to the port warden, using the grain loading stability information, the ability of the ship throughout the voyage to meet the requirements of subsection (1).

(3) Subsection (2) does not apply to a ship described in subsection 12(2), (4) or (5) that demonstrates to the port warden that the ship is loaded in accordance with subsection 12(2), (4) or (5), whichever is applicable.

(4) The master of a Canadian ship loading bulk grain in a country other than Canada shall at all times ensure that the ship

(a) meets the requirements of subsection (1), or

(b) is loaded in accordance with subsection 12(2), (4) or (5),

whichever is applicable.

(5) The master of a ship that is loaded with bulk grain shall, before proceeding to sea, ensure that the ship is upright.

Longitudinal Divisions and Saucers

7. (1) For the purpose of reducing the adverse heeling effect of grain shift or of limiting the depth of the cargo used for securing grain, compartments may be fitted with longitudinal divisions that are grain-tight and constructed in accordance with Part I of Schedule II.

(2) Every division fitted pursuant to subsection (1) to reduce the adverse effects of grain shift in a filled compartment shall,

(a) if fitted in a 'tween-deck compartment, extend from deck to deck; and

(b) if fitted in a hold, extend downwards from the underside of the deck or hatch covers in the manner described in Part II of Schedule I.

(3) Notwithstanding subsection (1), in a filled compartment containing grain other than linseed or seeds having properties similar to linseed, a saucer formed as described in Part I of Schedule II may be used, in lieu of a longitudinal division beneath a hatchway, for the purposes described in subsection (1).

(4) Every division fitted pursuant to subsection (1) in a partly-filled compartment shall extend from a distance equal to one-eighth of the maximum breadth of the compartment above the level of the grain surface to an equal distance below the level of the grain surface.

(5) Where a division referred to in subsection (4) is fitted for the purpose of limiting the depth of overstowing, the height above the grain surface of the centreline division shall be at least

0.6 m.

(6) Notwithstanding subsection (1), in order to reduce the adverse heeling effect of grain shift in a filled compartment, the wings and ends of the compartment may be tightly stowed with bagged grain or other suitable cargo if such bagged grain or cargo is adequately restrained from shifting.

Securing Grain in a Partly Filled Compartment

8. (1) Subject to subsection (2), the surface of grain in a partly filled compartment shall be secured by

(a) levelling the grain surface and topping it off with bagged grain or other suitable cargo exerting at least as much pressure as bagged grain which bagged grain or cargo

(i) is tightly stowed,

(ii) has a depth that is not less than one-sixteenth of the maximum breadth of the free grain surface or 1.2 m, whichever is the greater, and

(iii) is supported in the manner described in Part II of Schedule II; or

(b) strapping or lashing in the manner described in Part II of Schedule II.

(2) Subsection (1) does not apply where the heeling effect due to grain shift has been taken into account in accordance with section 6.

Feeders and Trunks

9. (1) If feeders or trunks are fitted on a ship, account shall be taken of their effects on the calculation of heeling moments in accordance with Part III of Schedule I.

(2) The strength of the divisions forming the boundaries of feeders shall meet the requirements of Part I of Schedule II.

Combination Arrangements

10. Lower holds and 'tween deck spaces in way thereof may be loaded as one compartment if, in calculating transverse heeling moments, proper account is taken of the flow of grain into the lower spaces.

Ships Loading in Sheltered Waters

11. (1) Notwithstanding sections 5 to 10, where a ship is being partly loaded with grain in bulk at a port within waters of

(a) the Great Lakes and the St. Lawrence River as far seaward as a straight line drawn from Cap des Rosiers to West Point, Anticosti Island and from Anticosti Island to the north shore of the St. Lawrence River along the meridian of longitude 63_ west, or

(b) along the coast of the Province of British Columbia and the State of Washington, lying between a straight line drawn along the parallel of latitude 50_ north from Vancouver Island to the Canadian mainland and a straight line drawn north from Cape Flattery to Vancouver Island,

and the ship will proceed to another port to load additional cargo without leaving those waters, that ship may be loaded in accordance with the requirements of this section in lieu of the requirements of sections 5 to 10.

(2) Where a ship referred to in subsection (1) is being partly loaded with bulk grain, the master shall

(a) be satisfied that the longitudinal strength of the vessel is not impaired;

(b) acquaint himself with the forecast of the weather to be encountered on the voyage by availing himself of the services provided by the National Weather-Broadcasting System, and not proceed when unusually adverse weather conditions are forecast;

(c) reduce the upsetting moments to a minimum by ensuring that as many compartments as possible are filled; and

(d) ensure that all partly filled compartments are trimmed level in the athwartship direction.

(3) For the purposes of this section, a compartment with a saucer that is temporarily secured by lining it with one layer of bagged grain or other suitable cargo shall be considered to be filled.

(4) A ship loaded in accordance with this section shall be shown to meet, throughout the voyage in the waters specified in subsection (1), the following criteria:

the initial metacentric height (GM) after correction for the free surface effects of liquids in tanks shall exceed each of the following values:

$$(a) GM_1 = \frac{\text{upsetting moment} \times 3.73}{\text{displacement}}, \text{ and}$$

$$(b) GM_2 = \frac{\text{upsetting moment} \times \text{beam}}{\text{displacement} \times \text{freeboard}}.$$

where the upsetting moment for

(c) unsecured compartments with no centreline division is the value obtained from the following formula

$$\frac{.0177LB^3}{SF}, \text{ and}$$

(d) unsecured compartments with a centreline division is the value obtained from the following formula

$$\frac{.0044Lb^3}{SF}$$

where L = aggregate length of unsecured compartments

B = moulded breadth of vessel

SF = Stowage Factor as defined in Part I of Schedule I.

Alternative Loading Arrangements for Specially Suitable Ships and Ships without Documents of Authorization

12. (1) Where a ship is loaded in accordance with subsection (2), (4) or (5), it shall be considered to have intact stability characteristics at least equal to the requirements of subsection 6(1).

(2) Existing ships that are constructed with two or more vertical or sloping grain-tight longitudinal divisions suitably disposed to limit the effect of any transverse shift of grain may load bulk grain if

(a) as many holds and compartments as possible are full and trimmed full;

(b) for any arrangements of stowage specified in the grain loading plan referred to in paragraph (c), the ship will not list at an angle greater than five degrees at any stage of the voyage where

(i) in holds or compartments that have been trimmed full, the grain surface settles two per cent by volume from the original surface and shifts to an angle of 12 degrees with that surface under all boundaries of these holds and compartments that have an inclination of less than 30 degrees to the horizontal, and

(ii) in partly filled compartments or holds, free grain surfaces settle and shift as in subparagraph (i) or to such larger angle as may be deemed necessary by the Administration, or by a contracting government on behalf of the Administration, and grain surfaces if overstowed in accordance with subsection (3.1) shift to an angle of eight degrees with the original levelled surfaces; and

(c) the master is provided with a grain loading plan approved by the Administration, or by a contracting government on behalf of the Administration, that covers the stowage arrangements to be adopted and shows the stability conditions upon which the calculations given in paragraph (b) are based.

(3) For the purposes of paragraph (2)(b), shifting boards, if fitted, will be considered to limit the transverse shift of the surface of the grain to an extent demonstrated to the satisfaction of the port warden.

(3.1) For the purposes of subparagraph (2)(b)(ii), where grain surfaces are overstowed with bulk grain levelled and topped off with bagged grain or other suitable cargo, such bagged grain or other suitable cargo shall

(a) be tightly stowed and extend to a height of not less than 1.22 m above the top of the bulk grain within spaces divided by a longitudinal bulkhead or shifting board and not less than 1.52 m within spaces not so divided; and

(b) be supported on suitable platforms laid over the whole surface of the bulk grain, such platforms consisting of bearers spaced not more than 1.22 m apart and 25 mm boards laid thereon spaced not more than 0.10 m apart or of strong separation cloths with adequate overlapping.

(4) An existing ship, that does not have on board the document of authorization issued in accordance with section 13 and the grain loading stability information and that is not using a computer calculation in accordance with subsection 17(5), may load bulk grain if

(a) all filled compartments are fitted with

(i) centreline divisions extending the full length of such compartments and extending downwards from the underside of the deck and hatch covers to a distance below the deck line of at least one-eighth of the maximum breadth of the compartment or 2.4 m, whichever is the greater, or

(ii) centreline divisions, as described in subparagraph (i), under the deck and saucers, constructed in accordance with Part I of Schedule II, in the way of the hatchway;

(b) all hatches to filled compartments are closed and all covers are secured in place;

(c) all free grain surfaces in partly filled compartments are trimmed level and secured in accordance with Part II of Schedule II; and

(d) throughout the voyage the metacentric height after correction for the free surface effects of liquids in tanks is 0.3 m or that given by the following formula, whichever is the greater:

$$GM_R = \frac{L B Vd (0.25 B - 0.645 \sqrt{Vd B})}{SF \times \Delta \times 0.0875}$$

where

L = total combined length of all full compartments

B = moulded breadth of vessel

SF = stowage factor as defined in Part I of Schedule I

Vd = calculated average void depth as per paragraph (a) of Schedule I

D= displacement.

(5) A vessel, designed to carry bulk liquid cargoes, that has two or more longitudinal divisions may load bulk grain if

(a) all compartments containing grain are trimmed full except two centre tanks or two wing tanks;

(b) the vessel is provided with stability information approved by its Administration that will enable the master to make a calculation showing that the vessel complies with subparagraph (2)(b)(i);

(c) the vessel is provided with a statement from its Administration that for all conditions of loading the vessel will comply with subparagraph (2)(b)(i); or

(d) the master proves to the satisfaction of the port warden that the vessel complies with subparagraph (2)(b)(i).

(6) For the purposes of paragraph (5)(d), the angle of heel resulting from grain shift may be obtained from the following formulae:

$$\tan \text{ angle Heel} = \frac{\text{Upsetting Moment}}{GM_L \times \text{Displacement}}$$

where

GM3 = The smallest value of Metaentric Height that will occur during the voyage

Displacement = Displacement of the vessel at the time GM3 occurs

$$\text{Upsetting Moment} = \frac{0.0177LB^3}{SF} + \frac{0.0177L_1B_1^3}{SF}$$

where

L = combined length of all wing tanks to be loaded

B = maximum breadth of wing tanks to be loaded

L1 = combined length of all centre tanks to be loaded

B1 = maximum breadth of centre tanks to be loaded

SF = stowage Factor as defined in Part I of Schedule I.

Authorization

13. (1) No new ship, other than a ship that meets the requirements of subsection 12(5), shall be loaded with bulk grain unless a document of authorization has been issued in respect of that ship.

(2) No existing ship shall be loaded with bulk grain unless

(a) a document of authorization has been issued in respect of that ship; or

(b) the ship meets the requirements of subsection 12(2), (4) or (5).

(3) The document of authorization referred to in subsections (1) and (2) shall be issued,

(a) in respect of a Canadian ship, by a person authorized by the Minister; and

(b) in respect of a ship other than a Canadian ship, by

(i) the Administration,

(ii) an organization recognized by the Administration, or

(iii) a contracting government on behalf of the Administration.

(4) Where a document of authorization is issued in respect of a ship, that ship shall be considered to be capable of complying with these Regulations.

(5) The document of authorization for a ship shall accompany and refer to the grain loading stability information provided in accordance with section 14.

(6) The document of authorization, the grain loading stability information and associated plans shall be written in English or French.

(7) Where copies of the document of authorization, grain loading stability information and associated plans are issued in respect of a ship, they shall be placed on board the ship and shall be produced by the master for inspection upon request by

(a) the port warden, if the vessel is loaded in Canada; or

(b) an officer of the contracting government, if the vessel is a Canadian ship loading outside Canada.

Grain Loading Stability Information

14. (1) Every ship that is to be loaded with bulk grain other than a vessel that meets the requirements of subsection 12(2), (4) or (5) shall be provided with information sufficient to allow the master to determine in all reasonable loading conditions the heeling moments due to grain shift calculated in accordance with Schedule I or II, whichever is applicable, including

(a) information that has been approved by the Administration or by a contracting government on behalf of the Administration and is as follows:

(i) curves or tables of grain heeling moments for every compartment, filled or partly filled, or combination thereof, including the effects of temporary fittings,

(ii) details of

(A) the scantlings of any temporary fittings,

(B) where applicable, the provisions necessary to meet the requirements of section 16 of Schedule II, and

(C) the securing of the hatch covers in cases where no grain is to be carried in a compartment above a filled compartment,

(iii) typical loaded service departure and arrival conditions and, where necessary, intermediate worst service conditions,

(iv) a worked example for the guidance of the master, and

(v) loading instructions in the form of notes summarizing the requirements of these Regulations; and

(b) information that is acceptable to the Administration or to a contracting government acting on behalf of the Administration and is as follows:

(i) particulars of the ship,

(ii) lightship displacement and the vertical distance from the intersection of the moulded base line and midship section to the centre of gravity (KG),

(iii) a table of free surface corrections,

(iv) capacities and centres of gravities,

(v) the angle of flooding (Q f) for the deepest draft, and

(vi) in the case of Canadian ships, cross curves of stability shown for 5 degree intervals of heel from the upright position to 45 degrees through the anticipated operational range of loaded displacement, including cross curves at 12 degrees.

(2) Where a ship that is to be loaded with bulk grain, other than a vessel that meets the requirements of subsection 12(2), (4) or (5), is provided with tables of maximum permissible heeling moments or other similar information sufficient to allow the master to demonstrate the ability of the ship at all stages of any voyage to comply with subsection 6(1) and the information has been approved by the Administration or by a contracting government on behalf of the Administration, the information shall be considered to be part of the grain loading stability information.

Additional Requirements Prior to Loading

15. (1) No person shall enter a cargo compartment of a vessel designed to carry liquid cargoes until,

(a) in the case where the compartment contained a substance that vaporizes to produce a hazardous or dangerous gas, the compartment has been gas freed, tested and found safe as described in paragraph 30(2)(b) of the Safe Working Practices Regulations and a certificate or statement that meets the requirements of subsection 30(3) of those Regulations has been obtained and presented to the port warden; or

(b) in the case where the compartment did not contain a substance referred to in paragraph (a), it has been ventilated to the satisfaction of a qualified person as defined in the Safe Working Practices Regulations.

(2) Bulk grain shall not be loaded in a vessel designed to carry bulk liquid cargoes unless

(a) in each compartment the stripping line suction or one of the main line suctions is enclosed by a box that is

(i) constructed of 64 mm lumber or other material having at least equal strength,

(ii) large enough to enclose an area of at least 0.6 m³, and

(iii) fitted with drainage arrangements so designed that

(A) in every case they will allow water outside the box to drain towards the suction while preventing grain from entering the box after the cargo is loaded, and

(B) in the case where they involve holes or spaces, the total area of the holes or spaces will be at least six times the cross sectional area of the suction pipe;

(b) each compartment is fitted with

(i) a permanent undamaged sounding pipe that meets the following requirements:

(A) the cap is in working order, and

(B) the pipe is grain-tight having an opening only at its upper and lower extremities, and extends from above the main deck level to a level not more than 75 mm above the ship's bottom plating, or

(ii) a temporary pipe that

(A) is constructed of semi-rigid plastic tubing or similar material,

(B) has an internal diameter of at least 38 mm, and

(C) meets the requirements of clause (i)(B);

(c) all heating coils for the compartments are cooled and drained of water and their valves secured closed by means of wire lashings;

(d) all main deck pipeline valves are secured closed by means of wire lashings; and

(e) all sea-valves for the compartments are closed by inserting blanks adjacent to the valves or by securing the valves with chain lashings and padlocks.

(3) Bulk grain shall not be loaded in a vessel other than a vessel described in subsection (2), unless the bilges in every compartment are free of extraneous material and are capable of allowing water outside the bilges to drain to the bilge suctions while preventing grain from entering the bilges.

Issue of Certificate of Readiness to Load

16. A port warden shall not issue a certificate pursuant to subsection 614(2) of the Act for a ship until he receives from an inspector appointed pursuant to the Destructive Insect and Pest Regulations or designated by the Minister of Agriculture a document stating that in the opinion of the inspector every compartment on the ship in which grain will be loaded is free from any material that might contaminate the grain.

Equivalentents

17. (1) Where it is a requirement of these Regulations that a particular fitting, appliance or apparatus, or type thereof, be fitted or carried, or that any particular provision be made

(a) in respect of a Canadian ship, the Minister may allow another fitting, appliance or apparatus, or type thereof, to be fitted or carried or another provision to be made if he is satisfied that such other fitting, appliance or apparatus, or type thereof, or provision, is at least as effective as the one so required; and

(b) in respect of a ship, other than a Canadian ship, and that ship has been allowed, by the Administration or contracting government acting on its behalf, to fit or carry an equivalent fitting, appliance or apparatus or to make an equivalent provision, that requirement shall be considered to have been met.

(2) For the purpose of paragraph (1)(b), an equivalent fitting, appliance, apparatus or provision shall not be considered to have been allowed until the Government of Canada has received the particulars of the fitting, appliance, apparatus or provision from the Administration or the Inter-Governmental Maritime Consultative Organization.

(3) Where departures from assumptions set out in Parts I and II of Schedule I would not operate so as to prevent a ship from meeting the intact stability requirements of subsection 6(1), departures from those assumptions may be authorized

(a) by the Minister, in the case of a Canadian ship; and

(b) by the Administration, in the case of a ship that is not a Canadian ship.

(4) Where, in respect of a ship, an equivalent provision has been allowed in accordance with subsection (1) or (2) or departure from an assumption set out in Schedule I has been authorized pursuant to subsection (3), or the manner of securing hatch covers has been approved for the purpose of section 17 of Schedule II, particulars of any such allowance, authorization or approval shall be included in the document of authorization for that ship.

(5) Notwithstanding sections 13 and 14, where a ship has not been issued a document of authorization or been provided with grain loading stability information, a computer calculation, using a computer program approved by the Minister, that shows compliance by that ship with section 6 may be used in lieu of the grain loading stability information.

(6) Where, in respect of a ship, a computer calculation referred to in subsection (5) is used, a document of authorization and grain loading stability information is not required to be issued.

Exemptions

18. Where, in respect of a ship or class of ships, it appears to

(a) the Minister, in the case of a Canadian ship or class of ships, or

(b) the Administration or a contracting government acting on behalf of the Administration, in the case of a ship or class of ships other than Canadian ships

that because of the sheltered nature or conditions of the voyage that the ship or class of ships is making, any requirement of sections 4 to 15 of these Regulations is unreasonable or unnecessary, the Minister, Administration or contracting government, as the case may be, may exempt that ship or class of ships from that requirement.

SCHEDULE I

(ss. 6, 7, 9, 11, 12, 14 and 17)

CALCULATION OF ASSUMED HEELING MOMENTS

PART I

DESCRIPTION OF THE ASSUMED VOIDS AND METHOD OF CALCULATING INTACT STABILITY

1. For the purpose of calculating the adverse heeling moments due to a shift of cargo surface in ships carrying bulk grain, the following assumptions shall be made:

(a) in filled compartments that have been trimmed in accordance with section 5 of these Regulations a void exists under all boundary surfaces having an inclination to the horizontal that is less than 30 degrees which void is parallel to the boundary surface and has an average depth calculated according to the following formula, or equal to 100 mm, whichever is the greater:

$$V_d = V_{d_1} + 0.75 (d - 600) \text{ mm}$$

where:

V_d = Average void depth in millimetres

V_{d_1} = Standard void depth calculated from Table I below

d = Actual girder depth in millimetres;

(b) in filled compartments that are not trimmed in accordance with section 5 of these Regulations and where the boundary surface has an inclination to the horizontal that is less than 30 degrees, the cargo surface has an inclination of 30 degrees to the horizontal after loading; and

(c) within filled hatchways and in addition to any open void within the hatch cover there is a void of average depth of 150 mm, measured down to grain surface from the lowest part of the hatch cover or the top of the hatchside coaming, whichever is the lower.

TABLE I

Distance from hatchend or hatch-side to boundary of compartment	Standard void depth V_{d_1}
in metres	in millimetres
0.5	570
1.0	530
1.5	500
2.0	480
2.5	450
3.0	440
3.5	430
4.0	430
4.5	430
5.0	430
5.5	450
6.0	470
6.5	490
7.0	520
7.5	550
8.0	590

Notes on Table I:

1. For distances greater than 8 m the standard void depth $Vd1$ shall be linearly extrapolated at 80 mm increase for each 1 m increase in distance.

2. Where there is a difference in depth between the hatchside girder or its continuation and the hatchend beam, the greater depth shall be used except that:

(a) when the hatchside girder or its continuation is shallower than the hatchend beam, the voids abreast the hatchway may be calculated using the lesser depth;

(b) when the hatchend beam is shallower than the hatchside girder or its continuation, the voids fore and aft of the hatchway inboard of the continuation of the hatchside girder may be calculated using the lesser depth; and

(c) where there is a raised deck clear of a hatchway, the average void depth measured from the underside of the raised deck shall be calculated using the standard void depth in association with a girder depth of the hatchend beam plus the height of the raised deck.

2. (1) For the purpose of demonstrating compliance with the stability criteria in subsection 6(1) of these Regulations (see Figure 1), the ship's stability calculations shall be normally based upon the assumption that the centre of gravity of cargo in a filled compartment is at the volumetric centre of the whole cargo space.

(2) Where the Administration authorizes account to be taken of the effect of assumed underdeck voids on the vertical position of the centre of gravity of the cargo in filled compartments, the adverse effect of the vertical shift of grain surfaces shall be compensated for by increasing the assumed heeling moment due to the transverse shift of grain as follows:

total heeling moment = 1.06 x calculated transverse heeling moment.

(3) In all cases the weight of cargo in a filled compartment shall be the volume of the whole cargo space divided by the stowage factor.

(4) In partly filled compartments the adverse effect of the vertical shift of grain surfaces shall be taken into account as follows:

total heeling moment = 1.12 x calculated transverse heeling moment.

(5) Notwithstanding subsections (2) and (4), any method, other than that set out therein, that is equally effective, may be adopted to make the compensation required by those subsections.

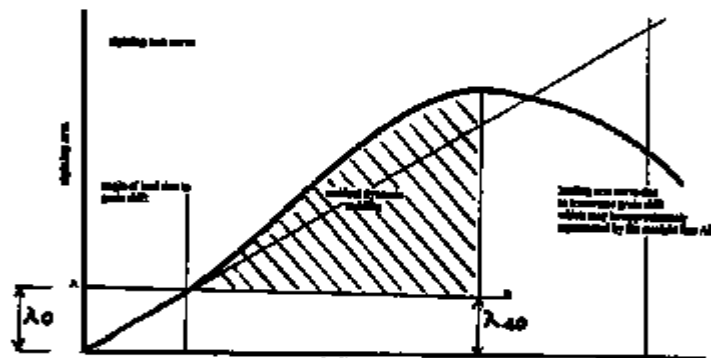


Figure 1

Statical Stability Diagram

Notes on Figure 1:

1. Where

$$\lambda_0 = \frac{\text{Assumed Volumetric Heeling Moment due to Transverse Shift}}{\text{Stowage Factor} \times \text{Displacement}}$$

$$\lambda_{adj} = 0.8 \times \lambda_r$$

Stowage factor = Volume per unit weight of grain cargo

Displacement = Weight of ship, fuel, fresh water, stores etc.

and cargo

2. The righting arm curve shall be derived from cross-curves which are sufficient in number to accurately define the curve for the purpose of these requirements and shall include cross-curves at 12 degrees and 40 degrees.

PART II

ASSUMED VOLUMETRIC HEELING MOMENT OF A FILLED COMPARTMENT

General

3. (1) The pattern of grain surface movement relates to a transverse section across the portion of the compartment being considered and the resultant heeling moment should be multiplied by the length to obtain the total moment for that portion.

(2) The assumed transverse heeling moment due to grain shifting is a consequence of final changes of shape and position of voids after grain has moved from the high side to the low side.

(3) The resulting grain surface after shifting shall be assumed to be at 15 degrees to the horizontal.

(4) In calculating the maximum void area that can be formed against a longitudinal structural member, the effects of any horizontal surfaces, such as flanges or face bars, shall be ignored.

(5) The total areas of the initial and final voids shall be equal.

(6) A discontinuous longitudinal division shall be considered effective over its full length.

Assumptions

4. In this section it is assumed that the total heeling moment for a compartment is obtained by adding the results of separate considerations of the following portions:

(a) for before and abaft hatchways,

(i) if a compartment has two or more main hatchways through which loading may take place, the depth of the underdeck void for every portion between such hatchways shall be determined using the fore and aft distance to the midpoint between the hatchways, and

(ii) after the assumed shift of grain the final void pattern shall be assumed to be as shown in Figure 2 to this section; and

(b) for in and abreast hatchways, after the assumed shift of grain the final void pattern shall be assumed to be as shown in Figure 3 or Figure 4, whichever is applicable.

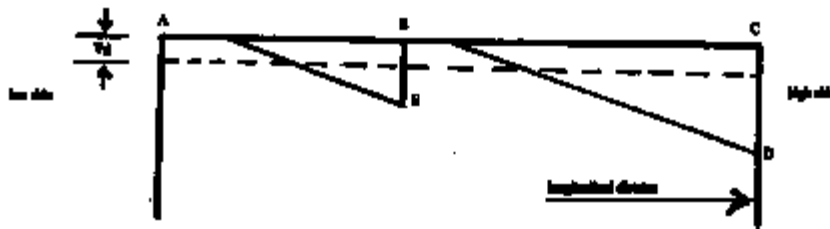


Figure 2

Notes on Figure 2:

1. If the maximum void area that can be formed against the girder at B is less than the initial area of the void under AB, i.e. $AB \times Vd$, the excess area shall be assumed to transfer to the final void on the high side.

2. If the longitudinal division at C is one that has been provided in accordance with section 7 of these Regulations, it shall extend to at least 0.6 m below D or E, whichever gives the greater depth.

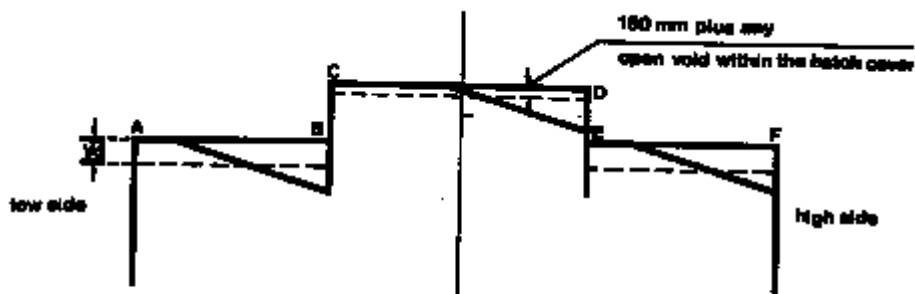


FIGURE 3

Notes on Figure 3:

1. AB = Any area in excess of the area that can be formed against the girder at B shall be transferred to the final void area in the hatchway.

2. CD = Any area in excess of the area that can be formed against the girder at E shall be transferred to the final void area on the high side.

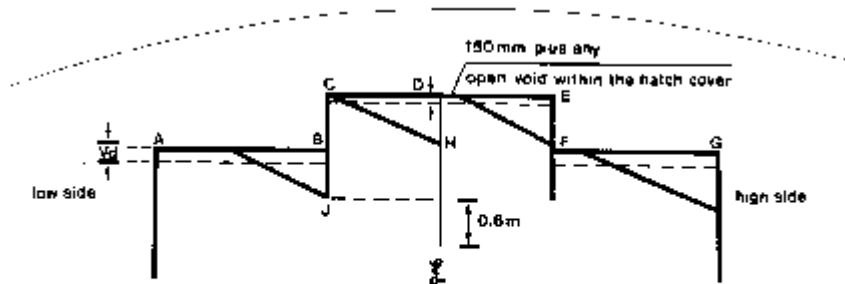


FIGURE 4

Notes on

1. If the centreline division is one that has been provided in accordance with paragraph 7(2)(b) of these Regulations, it shall extend to at least 0.6 m below H or J, whichever gives the greater depth.

2. The excess void area from AB shall transfer to the low side half of the hatchway in which two separate final void areas will be formed as follows: one against the centreline division and the other against the hatchside coaming and girder on the high side.

3. If a bagged saucer or bulk bundle is formed in a hatchway it shall be assumed, for the purpose of calculating transverse heeling moment, that such a device is at least equivalent to the centreline division.

Compartments Loaded in Combination

5. The following paragraphs describe the pattern of void behaviour that shall be assumed when compartments are loaded in combination:

(a) for compartments without effective centreline divisions

(i) under the upper deck, the same assumption as for the single deck arrangement described in section 4 of this Schedule,

(ii) under the second deck, the area of void available for transfer from the low side, i.e. the original void area less the area against the hatchside girder, shall be assumed to transfer as follows:

(A) one-half to the upper deck hatchway, and

(B) one-quarter each to the high side under the upper and second deck, and

(iii) under the third and lower decks, the void areas available for transfer from the low side of each of these decks shall be assumed to transfer in equal quantities to all the voids under the decks on the high side and the void in the upper deck hatchway;

(b) for compartments with effective centreline divisions that extend into the upper deck hatchway,

(i) at all deck levels abreast the division the void areas available for transfer from the low side shall be assumed to transfer to the void under the low side half of the upper deck hatchway,

(ii) at the deck level immediately below the bottom of the division the void area available for transfer from the low side shall be assumed to transfer as follows:

(A) one-half to the void under the low side half of the upper deck hatchway, and

(B) the remainder in equal quantities to the voids under the decks on the high side, and

(iii) at deck levels lower than those described in subparagraphs (i) and (ii), the void area available for transfer from the low side of each of those decks shall be assumed to transfer in equal quantities to the voids in each of the two halves of the upper deck hatchway on each side of the division and the voids under the decks on the high side; and

(c) for compartments with effective centreline divisions that do not extend into the upper deck hatchway, since no horizontal transfer of voids may be assumed to take place at the same deck level as the division, the void area available for transfer from the low side at this level shall be assumed to transfer above the division to voids on the high sides in accordance with the principles of paragraphs (a) and (b).

PART III

ASSUMED VOLUMETRIC HEELING MOMENT OF FEEDERS AND TRUNKS

Suitably Placed Wing Feeders

6. It may be assumed that under the influence of ship motion underdeck voids will be substantially filled by the flow of grain from a pair of longitudinal feeders as shown in Figure 5, if

(a) the feeders extend the full length of the deck and the perforations therein are adequately spaced; and

(b) the volume of each feeder is equal to the volume of the underdeck void outboard of the hatchside girder and its continuation

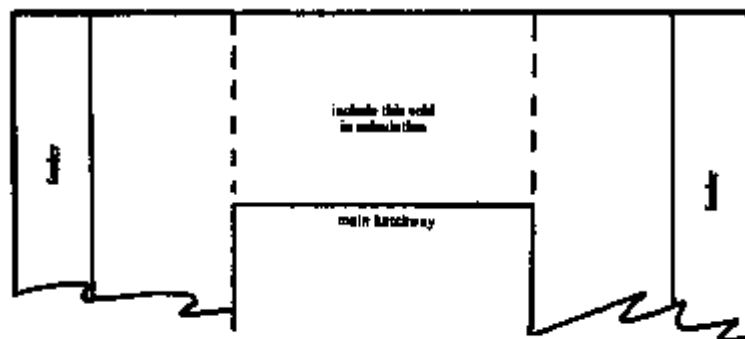
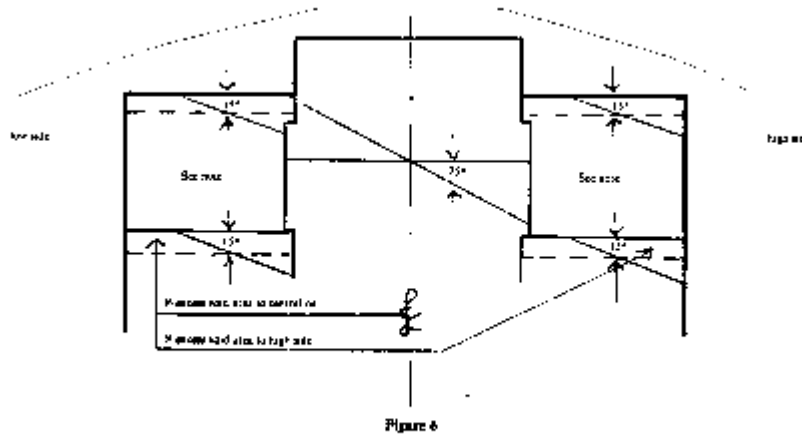


Figure 5

Trunks Situated Over Main Hatchways

7. After the assumed shift of grain the final void pattern in trunks situated over main hatchways shall be assumed to be as shown in Figure 6.



Notes on Figure 6:

1. If the wing spaces in way of the trunk cannot be properly trimmed in accordance with section 5, it shall be assumed that a 25 degree surface shift takes place.

PART IV

ASSUMED VOLUMETRIC HEELING MOMENT OF PARTLY FILLED COMPARTMENTS

General

8. Where the free surface of the bulk grain has not been secured in accordance with subsection 8(1) of these Regulations, it shall be assumed that the grain surface after shifting shall be at 25 degrees to the horizontal.

Discontinuous Longitudinal Divisions

9. (1) Subject to subsection (2), in a compartment in which the longitudinal divisions between the transverse boundaries are not continuous, the length over which any such divisions are effective as devices to prevent full width shifts of grain surfaces shall be taken to be the actual length of the portion of the division under consideration less two-sevenths of the greater of the transverse distances between the division and its adjacent division or the ship's side.

(2) Subsection (1) does not apply in the lower compartments of any combination loading in which the upper compartment is either a filled compartment or a partly filled compartment.

SCHEDULE II

(ss. 7, 8, 9, 12, 14 and 17)

GRAIN FITTINGS AND SECURING

PART I

STRENGTH OF GRAIN FITTINGS

General

1. (1) All timber used for the purpose of grain fittings shall be of good sound quality and of a type and grade that has been proved to be satisfactory for that purpose.

(2) The actual finished dimensions of the timber used for grain fittings shall be in accordance with the dimensions specified in this Schedule.

(3) Plywood of an exterior type bonded with waterproof glue and fitted so that the direction of the grain in the face plies is perpendicular to the supporting uprights or binder may be used for grain fittings if its strength is equivalent to that of solid timber of the appropriate scantlings.

2. In calculating the dimensions of divisions loaded on one side, using Tables I and II to section 12 of this Schedule, the following working stresses should be adopted:

For divisions of steel 2000 kg/cm² (196.13 MPa)

For divisions of wood 160 kg/cm² (15.69 MPa)

3. Materials other than wood or steel may be approved for such divisions if their mechanical properties are taken into account.

4. (1) Unless means are provided to prevent the ends of uprights being dislodged from their sockets, the depth of housing at each end of each upright shall be not less than 75 mm.

(2) If an upright is not secured at the top, the uppermost shore or stay shall be fitted as near thereto as is practicable.

(3) The arrangements provided for inserting shifting boards by removing a part of the cross-section of an upright shall be such that the local level of stresses is not unduly high.

(4) Subject to subsection (5), the maximum bending moment imposed upon an upright supporting a division loaded on one side shall normally be calculated assuming that the ends of the uprights are freely supported.

(5) If an Administration is satisfied that any degree of fixity assumed will be achieved in practice, account may be taken of any reduction in the maximum bending moment arising from any degree of fixity provided at the ends of the upright.

5. Where uprights, binders or any other strength members are formed by two separate sections, one fitted on each side of a division and inter-connected by through bolts at adequate spacing,

the effective section modulus shall be taken as the sum of the two moduli of the separate sections.

6. Where divisions do not extend to the full depth of the hold, such divisions and their uprights shall be supported or stayed so as to be as efficient as those that do extend to the full depth of the hold.

Divisions Loaded on Both Sides

7. (1) Shifting boards shall have a thickness of not less than 50 mm and shall be fitted grain-tight and where necessary supported by uprights.

(2) The maximum unsupported span for shifting boards 50 mm thick shall be 2.5 m and for each 10 mm increase in thickness of shifting boards, the maximum unsupported span may increase by 0.5 m.

(3) The ends of all shifting boards shall be securely housed with 75 mm minimum bearing length.

8. Divisions formed by using materials other than wood shall have a strength equivalent to the shifting boards specified in section 7 of this Schedule.

9. (1) Steel uprights used to support divisions loaded on both sides shall have a section modulus given by

$$W = a \times W1$$

where:

W = section modulus in cubic centimetres

a = horizontal span between uprights in metres

The section modulus per metre span W1 shall be not less than that given by the formula:

$$W1 = 14.8 (h1 - 1.2) \text{ cm}^3/\text{m}$$

where:

h1 is the vertical unsupported span in metres and shall be taken as the maximum value of the distance between any two adjacent stays or between the stay or either end of the upright.

Where this distance is less than 2.4 m the respective modulus shall be calculated as if the actual value was 2.4 m.

(2) The moduli of wood uprights shall be determined by multiplying by 12.5 the corresponding moduli for steel uprights.

(3) The moduli of uprights made of materials other than steel or wood shall be at least that required for steel increased in proportion to the ratio of the permissible stresses for steel to that of the material used and in such cases attention shall be paid also to the relative rigidity of each upright to ensure that the deflection is not excessive.

(4) The horizontal distance between uprights shall be such that the unsupported spans of the shifting boards do not exceed the maximum span specified in subsection 7(2) of this Schedule.

10. (1) Wood shores, when used, shall be in a single piece and shall be securely fixed at each end and heeled against the permanent structure of the ship except that they shall not bear directly against the side plating of the ship.

(2) Subject to subsections (4) and (5), the minimum size of wood shores shall be as follows:

Length of Shore		Rectangular Section	Diameter of Circular Section
	m	mm	mm
1. Not exceeding	3	150 x 100	140
2. Over but not exceeding	3 5	150 x 150	165
3. Over but not exceeding	5 6	150 x 150	180
4. Over but not exceeding	6 7	200 x 150	190
5. Over but not exceeding	7 8	200 x 150	200
6. Exceeding	8	200 x 150	215

(3) Shores of 7 m or more in length shall be securely bridged at approximately mid-length.

(4) When the horizontal distance between the uprights differ significantly from 4 m, the moments of inertia of the shores may be changed in direct proportion.

(5) Where the angle of the shore to the horizontal exceeds 10 degrees, the next larger shore to that required by subsection (2) shall be fitted but in no case shall the angle between any shore and the horizontal exceed 45 degrees.

11. (1) Where stays are used to support divisions loaded on both sides, they shall be fitted horizontally or as near thereto as practicable, well secured at each end and formed of steel wire rope.

(2) The sizes of the wire rope referred to in subsection (1) shall be sufficient to support the divisions and upright when uniformly loaded at 500 kg/m², (4.9 kPa), and to support a breaking load of at least three times that working load.

Divisions Loaded on One Side Only

12. (1) The load in kilograms per metre length of a longitudinal division shall be taken to be as follows:

h (m)	2	3	4	5	6	7	8	10
1.5	850	900	1010	1225	1500	1770	2060	2645
2.0	1390	1505	1710	1985	2295	2605	2930	3590
2.5	1985	2160	2430	2740	3090	3435	3800	4535
3.0	2615	2845	3150	3500	3885	4270	4670	5480
3.5	3245	3525	3870	4255	4680	5100	5540	6425
4.0	3890	4210	4590	5015	5475	5935	6410	7370
4.5	4535	4890	5310	5770	6270	6765	7280	8315
5.0	5185	5570	6030	6530	7065	7600	8150	9260
6.0	6475	6935	7470	8045	8655	9265	9890	11150
7.0	7765	8300	8910	9560	10245	10930	11630	13040
8.0	9055	9665	10350	11075	11835	12595	13370	14930
9.0	10345	11030	11790	12590	13425	14260	15110	16820
10.0	11635	12395	13230	14105	15015	15925	16850	18710
h = height of grain in metres from the bottom of the division ² B = transverse extent of the bulk grain in metres								

For other values of h or B the loads shall be determined by linear interpolation or extrapolation as necessary.

(2) The load in kilograms per metre length of the transverse division shall be taken to be as follows:

h (m)	2	3	4	5	6	7	8	10	12	14	16
1.5	670	690	730	780	835	890	935	1000	1040	1050	1050
2.0	1040	1100	1170	1245	1325	1400	1470	1575	1640	1660	1660
2.5	1460	1563	1675	1780	1880	1980	2075	2210	2285	2305	2305
3.0	1925	2065	2205	2340	2470	2590	2695	2845	2925	2950	2950
3.5	2425	2605	2770	2930	3075	3205	3320	3480	3570	3595	3595
4.0	2950	3160	3355	3535	3690	3830	3950	4120	4210	4235	4240
4.5	3495	3725	3940	4130	4295	4440	4565	4750	4850	4880	4885
5.0	4050	4305	4535	4735	4910	5060	5190	5385	5490	5525	5530
6.0	5175	5465	5720	5945	6135	6300	6445	6655	6775	6815	6825
7.0	6300	6620	6905	7150	7365	7445	7700	7930	8055	8105	8115
8.0	7425	7780	8090	8360	8590	8685	8950	9200	9340	9395	9410
9.0	8550	8935	9275	9565	9820	9930	10205	10475	10620	10685	10705
10.0	9680	10095	10460	10770	11045	11270	11460	11745	11905	11975	11997
h = height of grain in metres from the bottom of the division ² L = longitudinal extent of the bulk grain in metres											

For other values of h or L, the loads shall be determined by

linear interpolation or extrapolation as necessary.

2. Where the distance from a division to a feeder or hatchway is 1 m or less, the height - h - shall be taken to the level of the grain within that hatchway or feeder. In all cases the height shall be taken to the overhead deck in way of the division.

13. (1) The total load per unit length of divisions shown in Tables I and II to section 12 may, if considered necessary, be assumed to have a trapezoidal distribution with height and in such cases, the reaction loads at the upper and lower ends of a vertical member or upright are not equal.

(2) The reaction loads at the upper end of divisions loaded on one side only expressed as percentages of the total load supported by the vertical member or upright, shall be taken to be those shown in Tables III and IV below.

TABLE III
LONGITUDINAL DIVISIONS LOADED ON
ONE SIDE ONLY

Bearing Reaction at the Upper End of Upright as Percentage
of Load (Table I)
B(m)

h (m)	2	3	4	5	6	7	8	10
1.5	43.3	45.1	45.9	46.2	46.2	46.2	46.2	46.2
2.0	44.5	46.7	47.6	47.8	47.8	47.8	47.8	47.8
2.5	45.4	47.6	48.6	48.8	48.8	48.8	48.8	48.8
3.0	46.0	48.3	49.2	49.4	49.4	49.4	49.4	49.4
3.5	46.5	48.8	49.7	49.8	49.8	49.8	49.8	49.8
4.0	47.0	49.1	49.9	50.1	50.1	50.1	50.1	50.1
4.5	47.4	49.4	50.1	50.2	50.2	50.2	50.2	50.2
5.0	47.7	49.4	50.1	50.2	50.2	50.2	50.2	50.2
6.0	47.9	49.5	50.1	50.2	50.2	50.2	50.2	50.2
7.0	47.9	49.5	50.1	50.2	50.2	50.2	50.2	50.2
8.0	47.9	49.5	50.1	50.2	50.2	50.2	50.2	50.2
9.0	47.9	49.5	50.1	50.2	50.2	50.2	50.2	50.2
10.0	47.9	49.5	50.1	50.2	50.2	50.2	50.2	50.2

B = transverse extent of the bulk grain in metres

For other values of h or B the loads shall be determined by linear interpolation or extrapolation as necessary.

TABLE IV

TRANSVERSE DIVISIONS LOADED ON ONE SIDE ONLY

Bearing Reaction at the Upper End of Upright as Percentage of Load (Table II)
L(m)

h (m)	2	3	4	5	6	7	8	10	12	14	16
1.5	37.3	38.7	39.7	40.6	41.4	42.1	42.6	43.6	44.3	44.8	45.0
2.0	39.6	40.6	41.4	42.1	42.7	43.1	43.6	44.3	44.7	45.0	45.2
2.5	41.0	41.8	42.5	43.0	43.5	43.8	44.2	44.7	45.0	45.2	45.2
3.0	42.1	42.8	43.3	43.8	44.2	44.5	44.7	45.0	45.2	45.3	45.3
3.5	42.9	43.5	43.9	44.3	44.6	44.8	45.0	45.2	45.3	45.3	45.3
4.0	43.5	44.0	44.4	44.7	44.9	45.0	45.2	45.4	45.4	45.4	45.4
5.0	43.9	44.3	44.6	44.8	45.0	45.2	45.3	45.5	45.5	45.5	45.5
6.0	44.2	44.5	44.8	45.0	45.2	45.3	45.4	45.6	45.6	45.6	45.6
7.0	44.3	44.6	44.9	45.1	45.3	45.4	45.5	45.6	45.6	45.6	45.6
8.0	44.3	44.6	44.9	45.1	45.3	45.4	45.5	45.6	45.6	45.6	45.6
9.0	44.3	44.6	44.9	45.1	45.3	45.4	45.5	45.6	45.6	45.6	45.6
10.0	44.3	44.6	44.9	45.1	45.3	45.4	45.5	45.6	45.6	45.6	45.6

L = longitudinal extent of the bulk grain in metres

For other values of h or L, the loads shall be determined by linear interpolation or extrapolation as necessary.

(3) The strength of the end connections of such vertical members or uprights may be calculated on the basis of the maximum load likely to be imposed at either end, as follows:

Longitudinal Divisions:

Maximum load at the top 50% of the appropriate

total load from Table I

Maximum Load at the bottom 55% of the appropriate

total load from Table I

Transverse Divisions:

Maximum load at the top 45% of the appropriate

total load from Table II

Maximum load at the bottom 60% of the appropriate

total load from Table II.

(4) The thickness of horizontal wooden boards may also be determined having regard to the vertical distribution of the loading represented by Tables III and IV above and in such cases

$$t = 10 a \sqrt{\frac{p \times k}{h \times 213.3}}$$

where:

t = thickness of board in millimetres

a = horizontal span of the board i.e. distance between

uprights in metres

h = head of grain to the bottom of the division in metres

p = total load per unit length derived from Table I or

II in kilograms

k = factor dependent upon vertical distribution of the

loading

(5) When the vertical distribution of the loading is assumed to be uniform, i.e. rectangular, k shall be taken as equal to 1.0. For a trapezoidal distribution

$$k = 1.0 + 0.06 (50 - R)$$

where:

R is the upper end bearing reaction taken from Table III or IV.

14. The sizes of stays and shores shall be so determined that the loads derived from Tables I and II to section 12 of this Schedule shall not exceed one-third of the breaking loads.

Saucers

15. (1) When a saucer is used to reduce the heeling moments in a filled compartment, its depth, measured from the bottom of the saucer to the deck line, shall be as follows:

(a) for ships with a moulded breadth of up to 9.1 m not less than 1.2 m;

(b) for ships with a moulded breadth of 18.3 m or more, not less than 1.8 m; and

(c) for ships with a moulded breadth between 9.1 m and 18.3 m, the minimum depth of the saucer shall be calculated by interpolation.

(2) The top (mouth) of the saucer shall be formed by the underdeck structure in the way of the hatchway, i.e. hatchside girders or coamings and hatchend beams.

(3) Subject to section 16, the saucer and hatchway above shall be completely filled with bagged grain or other suitable cargo laid down on a separation cloth or its equivalent and stowed tightly against adjacent structures and the portable hatchway beams if the latter are in place.

Bundling of Bulk

16. (1) As an alternative to filling the saucer with bagged grain or other suitable cargo a bundle of bulk grain may be used if

(a) the saucer is lined with a material that is acceptable to the Administration, is provided with suitable means for securing at the top, and has a tensile strength of not less than

(i) 2.68 kN/50 mm strip, or

(ii) 1.34 kN/50 mm strip if the saucer is constructed as follows:

(A) athwartship lashings acceptable to the Administration are placed inside the saucer formed in the bulk grain at intervals of not more than 2.4 m and are of sufficient length to permit being drawn up tight and secured at the top of the saucer, and

(B) dunnage not less than 25 mm in thickness or other suitable material of equal strength and between 150 to 300 mm in width is placed fore and aft over the lashings to prevent the cutting or chafing of the material that is placed thereon to line the saucer;

(b) the saucer is filled with bulk grain and secured at the top except that when using material approved under subparagraph (a)(ii) further dunnage shall be laid on top after lapping the material before the saucer is secured by setting up the lashings;

(c) where more than one sheet of material is used to line the saucer, those sheets are joined at the bottom either by sewing or a double lap; and

(d) the top of the saucer is coincidental with the bottom of the beams when these are in place.

(2) Suitable general cargo or bulk grain may be placed between the beams on top of the saucer that is secured in accordance with subsection (1).

Securing Hatch Covers of Filled Compartments

17. If there is no bulk grain or other cargo above a filled compartment, the hatch covers shall be secured in a manner approved by the Administration having regard to the weight and permanent arrangements provided for securing such covers.

PART II

SECURING OF PARTLY FILLED COMPARTMENT

Strapping or Lashing

18. Where, in order to eliminate heeling moments in partly filled compartments, strapping or lashing is utilized, the securing shall be accomplished as follows:

- (a) the grain shall be trimmed and levelled to the extent that it is very slightly crowned and covered with burlap separation cloths, tarpaulins or the equivalent;
- (b) the separation cloths and tarpaulins shall overlap at least 1.8 m;
- (c) one of the following arrangements shall be made:
 - (i) flooring consisting of
 - (A) two solid floors of rough 25 mm by 150 to 300 mm lumber with the top floor running longitudinally and nailed to an athwartships bottom floor, or
 - (B) one solid floor of 50 mm lumber running longitudinally and nailed over the top of a 50 mm bottom bearer not less than 150 mm wide,in which the bottom bearers extend the full breadth of the compartment and are spaced not more than 2.4 m apart, or
 - (ii) arrangements using other materials regarded by the Administration as equivalent to those described in subparagraph (i);
- (d) lashings consisting of
 - (i) steel wire rope with a diameter of 19 mm at least four clips forming eyes, and set tight by a 32 mm turnbuckle,
 - (ii) doubled steel strapping of 50 mm by 1.3 mm having a breaking load of at least 49.03 kN, with at least three crimp seals for securing the ends and set tight by
 - (A) a 32 mm turnbuckle, or
 - (B) a winch tightener, used in conjunction with a locking arm, if suitable wrenches are available for setting up as necessary, or
 - (iii) chain of strength equivalent to the wire rope or strapping described in subparagraph (i) or (ii), set tight by a 32 mm turnbuckle;
- (e) prior to the completion of loading the lashing shall be positively attached to the framing at a point approximately 450 mm below the anticipated final grain surface by means of either a 25 mm shackle or beam clamp of equivalent strength;
- (f) the lashings shall be spaced not more than 2.4 m apart and each shall be supported by a bearer that is nailed over the top of the fore and aft floor, consists of not less than 25 mm by 150 mm lumber or its equivalent and extends the full breadth of the compartment; and
- (g) during the voyage the strapping shall be regularly inspected and set up where necessary.

Overstowing Arrangements

19. (1) Where bagged grain or other suitable cargo is utilized for the purpose of securing a partly filled compartment, the free grain surface shall be covered with a separation cloth or equivalent or by a suitable platform.

(2) Such platforms shall consist of

(a) bearers spaced not more than 1.2 m apart and 25 mm boards laid thereon spaced not more than 100 mm apart; or

(b) other materials deemed by an Administration to be equivalent to those described in paragraph (a).

Bagged Grain

20. Bagged grain shall be carried in sound bags that are well filled and securely closed.

Established by the CONSOLIDATED REGULATIONS OF CANADA, 1978.

amended by

SOR/79-852 15 November, 1979 pursuant to sections 607 and 627 of the Canada Shipping Act

Paragraph 14(1)(b); and paragraph 17(1)(a) of the French version.

SOR/79-902 27 November, 1979 pursuant to sections 607 and 627 of the Canada Shipping Act

The purpose of these amendments is to convert the units in regulations from imperial to metric (SI).

SOR/83-890 21 November, 1983 pursuant to section 607 of the Canada Shipping Act

Subparagraph 12(2)(b)(ii); and section 12 by adding subsection (3.1).