第 53/2014 號行政長官公告

中華人民共和國是國際海事組織的成員國及一九七四年十一月一日訂於倫敦的《國際海上人命安全公約》（下稱“公約”）的締約國；

國際海事組織海上安全委員會於一九九一年五月二十三日對公約第VI章作出修正時，將有關國際散裝穀物安全運輸規則的規定作為公約的強制性規定，並透過第MSC.23（59）號決議通過了《國際散裝穀物安全運輸規則》；

中華人民共和國於一九九九年十二月十三日以照會通知聯合國秘書長，經修訂的公約自一九九九年十二月二十日起適用於澳門特別行政區；

基於此，行政長官根據澳門特別行政區第3/1999號法律第六條第一款的規定，命令公佈包含上指規則的第MSC.23（59）號決議的中文及英文正式文本。

二零一四年九月十二日發佈。

行政長官　崔世安

Aviso do Chefe do Executivo n.º 53/2014

Considerando que a República Popular da China é um Estado Membro da Organização Marítima Internacional, e um Estado Contratante da Convenção Internacional para a Salvaguarda da Vida Humana no Mar, concluída em Londres, em 1 de Novembro de 1974, adiante designada por Convenção;

Considerando igualmente que, em 23 de Maio de 1991, o Comité de Segurança Marítima da Organização Marítima Internacional, procedeu a emendas ao capítulo VI da Convenção para tornar as disposições relativas ao Código Internacional para o Transporte Seguro de Grãos a Granel obrigatórias nos termos da Convenção, e que, através da sua resolução MSC.23(59), adoptou o Código Internacional para o Transporte Seguro de Grãos a Granel;

Considerando ainda que a República Popular da China, por nota datada de 13 de Dezembro de 1999, notificou o Secretário-Geral das Nações Unidas sobre a aplicação da Convenção, tal como emendada, na Região Administrativa Especial de Macau a partir de 20 de Dezembro de 1999;

O Chefe do Executivo manda publicar, nos termos do n.º 1 do artigo 6.º da Lei n.º 3/1999 da Região Administrativa Especial de Macau, a resolução MSC.23(59), que contém o referido Código, nos seus textos autênticos em línguas chinesa e inglesa.

Promulgado em 12 de Setembro de 2014.

O Chefe do Executivo, *Chui Sai On*.

第 MSC.23（59）號決議

（1991 年 5 月 23 日通過）

通過《國際散裝穀物安全運輸規則》

海上安全委員會，

憶及《國際海事組織公約》關於本委員會職責的第 28（b）條，

注意到由第 MSC.22（59）號決議通過的《1974 年國際海上人命安全公約》（《1974 年安全公約》）經修訂的第 VI 章 C 部分，使《國際散裝穀物安全運輸規則》成為該《公約》的強制性規定，

審議了該建議的規則的文本，

1. 通過《國際散裝穀物安全運輸規則》，其文本載於本決議附件中；

2. 決定該規則應自 1994 年 1 月 1 日起生效；和

3. 要求秘書長將本決議及該規則的核正無誤副本分發給本組織的會員和《1974 年安全公約》的所有締約政府。

附件

A 部分

特別要求

1 適用範圍

1.1 本規則適用於經修正的《1974 年安全公約》第 VI 章 C 部分適用的，從事散裝貨物運輸的船舶，不論大小，包括小於 500 總噸的船舶。

1.2 就本規則而言：

“已建造船舶”一詞係指“已安放龍骨或處於相似建造階段的船舶”。

2 定義

2.1 “穀物”一詞包括小麥、玉米、燕麥、黑麥、大麥、大米、豆類、種子和由其加工的其行為與自然狀態下的穀物相似的穀物製成品。

2.2 “平艙滿載艙”一詞係指按照 A10.2 要求裝載和平艙後，散裝貨物達到其可能的最大高度的任何貨物處所。

2.3 “未平艙滿載艙”一詞係指在艙口處裝至可能的最大程度，但根據適用於所有船舶的 A10.3.1 的規定，或根據適用於特別適裝艙的 A10.3.2 的規定，未在艙口範圍外進行平艙的貨物處所。

2.4 “部分裝載艙”一詞係指未按 A2.2 或 A2.3 規定的方式裝載散裝穀物的任何貨物處所。

2.5 “進水角”（θ_1）一詞係指船體、上層建築或甲板室上不能關閉成風雨密的開口進水時的橫傾角。在引用此定義時，對不可能發生持續進水的小型開口，可不認為是開敞的。

2.6 “積載因素”一詞就計算由於穀物移動造成的穀物傾側力矩而言，係指經裝貨設施證實的貨物單位重量的容積，即對標稱的滿載貨物處所，不考慮損失的艙容。

2.7 “特別適裝艙”一詞係指在構造上至少具備兩個垂直或傾斜縱向穀密分隔，該分隔與艙口側縱桁重合或處於能限制任何穀物橫向移動影響的位置上的貨物處所。如是傾斜分隔，則其橫傾角不小於 30 度。

3 許可證

3.1 每艘按照本規則裝載的船舶，應由主管機關或其承認的機構，或由代表該主管機關的締約政府，發給一份許可證。這種許可證應被承認為該船能符合該規則要求的證明。

3.2 該許可證應附於或編入為使船長能符合 A7 要求而備置的穀物運輸手冊。該手冊應符合 A6.3 的要求。

3.3 這種許可證、穀物裝載穩性資料及其附屬圖表可用發證國的官方語文寫成。如果使用的語文既非英文，又非法文，則該文本應包括上述語文之一的譯文。

3.4 船上應備有這種許可證、穀物裝載穩性資料及其有關圖表的副本，以便在要求提交時，由船長提交給裝貨港所在國締約政府檢查。

3.5 未持有這種許可證的船舶，在船長向主管機關或代表該主管機關的裝貨港所在國締約政府證明該船的計劃航次的裝載情況符合本規則的要求並取得其同意之前，不得裝載穀物。也見 A8.3 和 A9。

4 等效措施

如果使用主管機關按照經修正的《1974 年國際海上人命安全公約》第 I/5 條所接受的等效措施，則其細節應載入許可證或穀物裝載手冊內。

5 免除對某些航次的要求

主管機關或代表該主管機關的締約政府，如認為由於某一航次的遮蔽性和條件，使執行本規則中的任何要求不合理或不必要時，則可對個別船舶或個別類型的船舶免除這些特別要求。

6 關於船舶穩性和穀物裝載的資料

6.1 為使船長保證船舶在國際航行中運輸散裝穀物符合本規則，應提供印成小冊子形式的資料。這種資料應包括 A6.2 和 A6.3 中所列資料。

6.2 可為主管機關或代表主管機關的締約政府所接受的資料應包括：

.1 船舶特徵；

.2 空船排水量和從船型基線與中剖面的交點至船舶重心的垂直距離（KG）；

.3 自由液面修正表；

.4 容量和重心；

.5 在浸水角小於 40 度時，在所有許可排水量狀況下的浸水角的曲線和表格；

.6 適於營運吃水範圍的靜水力性能曲線或表格；和

.7 符合 A7 中要求並包括 12 度和 40 度時曲線的穩性橫交曲線。

6.3 應經主管機關或代表主管機關的締約政府批准的資料應包括：

.1 容量、容量的垂直中心和每個滿載或部分裝載艙或連通裝載艙的假設容量的傾側力矩的曲線或表格，包括臨時裝置的效用；

.2 不同排水量和不同垂直重心的最大許可傾側力矩表格或曲線，以使船長能夠證明符合 A7.1 的要求；

本要求僅適用於在本規則生效之日或之後安放龍骨的船舶；

.3 任何臨時裝置的詳細尺寸和，如合適，滿足 A7、A8 和 A9 要求的必要措施的詳情；

.4 以通知形式出現的，概括本規則要求的裝載說明書；

.5 供指導船長使用的實例；

.6 出港和到港時典型的裝載營運情況，以及必要時抵離港之間的最差裝載營運情況。

7 穩性要求

7.1 任何運輸散裝貨物的船舶的完整穩性特徵應表明在按照本規則 B 部分和圖 A7 所述方法考慮到由於穀物移動產生的傾側力矩後，在整個航次中至少能滿足下列標準：

.1 由於穀物移動引起的橫傾角不應大於 12 度或，如船舶建造於 1994 年 1 月 1 日或此後，甲板邊緣浸水角應取其更小者；

.2 在靜穩性圖表上，到達傾側力臂曲線與復原力臂曲線的縱座標最大差值的橫傾角或 40 度角或進水角（θ_1）時，取其最小者，該兩曲線之間的淨面積或剩餘面積，在一切裝載情況下應不小於 0.075 米-弧度；和

.3 經修正各艙內自由液面影響後的初穩性高度，應不小於 0.30 米。

7.2 在裝載散裝貨物之前，如經裝貨港所在國締約政府要求，船長應證明該船在任何航次的一切階段的穩性均符合本節所要求的穩性標準。

7.3 在裝船後，船長應保證船舶在出海之前處於正浮狀態。

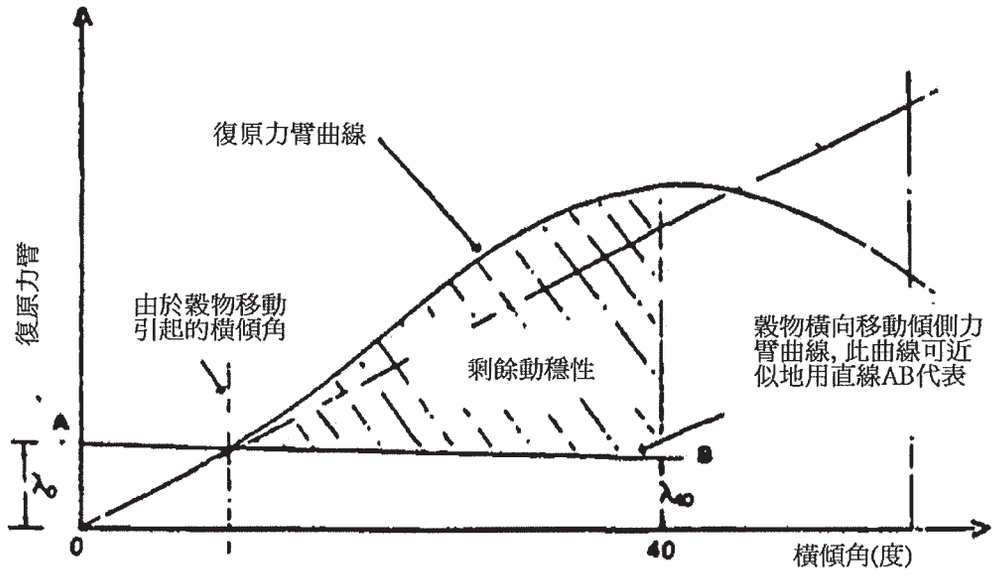

圖 A7

圖 A7 註：

（1）圖中：

$$\lambda_0 = \frac{\text{假設因橫向移動引起的體積傾側力矩}}{\text{積載因素} \times \text{排水量}}$$ ；

$\lambda_{40} = 0.8 \times \lambda_0$ ；

積載因素=穀物單位重量的體積；

排水量=船舶、燃料、淡水、備品等和貨物的重量。

（2）復原力臂曲線應由橫交曲線導出，這些橫交曲線的數目應足以準確地確定所要求的曲線，並應包括 10 度和 40 度處的橫交曲線。

8 對現有船舶的穩性要求

8.1 就本節而言，“現有船舶”一詞係指 1980 年 5 月 25 日前安放龍骨的船舶。

8.2 原先按照根據《1960 年海上人命安全公約》第 VI 章第 12 條、海事組織第 A.184（VI）號決議或第 A.264（VIII）號決議批准的文件裝載的現有船舶，應視為具有至少與本規則 A7 的要求相等的完整穩性。允許這種裝載的批准證就 A7.2 而言應被接受。

8.3 未持有按照本規則 A3 簽發的許可證的現有船舶，可應用 A9 的規定而對可用於運輸散裝貨物的載重量不加限制。

9 對沒有許可證承運部分散裝穀物貨物船舶的非強制穩性要求

9.1 船上未持有按照本規則 A3 簽發的許可證的船舶可允許運輸散裝穀物，只要：

.1 散裝貨物的總重量不超過該船載重量的三分之一；

.2 所有“平艙滿載艙”應設置延伸到該艙全長度的中心線隔壁，此隔壁從甲板或艙口蓋的下面向下延伸到甲板線以下至少等於該船寬度的八分之一或 2.4 米的距離，取其較大者；如按照 A14 的要求製成托盤時，可同意用來代替在艙口內和艙口下的中心線隔壁，但裝運亞麻子和具有類似性質的其他種子情況除外；

.3 所有“平艙滿載艙”的艙口都要關閉，並將艙口蓋固定就位；

.4 在部分裝載貨艙裏的所有穀物自由表面應平整成水平並按A16、A17 或 A18 規定加以固定；

.5 在整個航次中，經修正各液艙內自由液面影響後的初穩性高度應為 0.3 米，或者按下列公式求得，取其較大者：

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

式中：

L=所有滿裝艙的合計總長度（米）

B=船舶的型寬（米）

SF=積載因素（立方米/噸）

Vd=按 B.1 計算的空檔平均深度（米-註：不是毫米）

Δ=排水量（噸）；和

.6 船長向主管機關或代表該主管機關的裝貨港所在的締約國證明按所建議的裝載情況該船將符合本節的要求，並取得其同意。

10 散裝穀物的積載

10.1 應進行一切必要的和合理的平艙工作，以便把所有貨物自由表面整成水平，並使貨物移動的影響減至最小。

10.2 在任何“平艙滿載艙”中，應對散裝貨物加以平艙，使其盡最大可能填滿甲板下方及艙口蓋下方的一切空間。

10.3 在任何“平艙滿載艙”中，應使散裝貨物通過艙口但可在位於艙口邊緣外的其自然角度盡最大可能予以填滿。如“滿載艙”屬於下述類型之一，則可具備這一類別的合格條件：

.1 發給許可證的主管機關可按 B6 在下述情況下允許免予平艙：設置加料管道、甲板添注口或其他類似裝置，使貨物自由流進艙內因而在計算空檔深度時已考慮到由此而形成的甲板下方的空檔形狀；或

.2 該艙是 A2.7 中規定的“特別適裝”的，在這種情況下，可免予對該艙的頂端進行平艙。

10.4 如果在裝有貨物的下層貨艙上沒有散裝貨物或其他貨物，則艙口蓋應在考慮到供固定這些艙口蓋的重量和固定裝置的情況下以認可的方式加以固定。

10.5 當散裝貨物堆裝於不穀密的關閉的二層艙艙蓋上邊時，這種艙蓋應以用膠布粘住接縫、用防水帆布或隔票布蓋住整個艙口或其他合適方法使之穀密。

10.6 裝貨後，在“部分裝載艙”中的所有穀物自由表面應是水平的。

10.7 除非考慮到按照本規則由於穀物移動引起的有害傾側影響，在任何“部分裝載艙”中的散裝穀物的表面應予固定，以防止由於如 A16 中所述的在上面的堆裝而造成貨物移動。或選取另一方法，在“部分裝載艙”中的散裝穀物表面可用 A17 或 A18 中所述用帶捆紮或用繩捆綁加以固定。

10.8 下層貨艙及二層艙可作為一個艙裝載，只要在計算橫向傾側力矩時，適當考慮貨物流入下層艙的情況。

10.9 在“平艙滿載艙”、“未平艙滿載艙”和“部分裝載艙”內，均可設置縱向隔壁，作為減少貨物移動的有害橫傾影響的裝置，只要：

.1 隔壁是穀密的；

.2 構造符合 A11、A12 和 A13 的要求；

.3 如在 B2.8.2 註（2）、B2.9.2 註（3）或 B5.2 中所述，如合適，在二層艙，隔壁從甲板延伸到甲板，在其他貨艙內，隔壁從甲板或艙蓋的下邊向下延伸。

11 穀物裝置的強度

11.1 木材

用於穀物裝置的所有木材應具有上等完好質量，其品種和等級經證明能滿足於這一用途。木材成品的實際尺寸應按照下述規定。外用型用防水膠粘合的膠合板並在設置時使面層板的紋理方向垂直於支撐立柱或束縛物，如其強度與適當尺寸的實體木材的強度等效，也可使用。

11.2 工作應力

當使用表 A13-1 至表 A13-6 計算單側受載的隔壁尺寸時，應採用下列工作應力。

對鋼製隔壁 19.6 千牛/厘米 ^{2}

對木製隔壁 1.57 千牛/厘米 ^{2}

（1 牛頓相當於 0.102 千克）

11.3 其他材料

除木材或鋼材之外的其他材料，如對其機械性能已作適當考慮，可同意用來製造此種隔壁。

11.4 立柱

.1 除設有能防止立柱端部從其插座中脫出的裝置者外，每一立柱每端插入插座的深度應不小於 75 毫米。如果一立柱在其頂端未作固定，則最上面的撐柱或拉索應儘可能靠近其頂端設置。

.2 如將立柱的剖面削除一部分用來插入止移板，則這種措施不應使局部應力過分增高。

.3 作用在支持單側受載隔壁的立柱上的最大彎曲力矩，通常應在計算時假定各立柱的兩端為自由支持。但是，如主管機關同意所假定的某種程度的固定將能在實際中達到，則可考慮對由於立柱兩端作某種程度的固定而產生的最大彎曲力矩作某種減少。

11.5 組合剖面

如果立柱、束縛件或任何其他強力構件是由兩個分開的剖面組成，在隔壁的兩側各設一個剖面，並按適當間距用貫穿螺栓使其相互連結，則其有效剖面模數應取兩個分開的剖面模數之和。

11.6 局部隔壁

如果隔壁未延伸到貨艙的全深度，這種隔壁及其立柱應加以支持或牽拉，以使其達到與延伸到貨艙全深度的隔壁同等有效。

12 兩側受載的隔壁

12.1 止移板

.1 止移板的厚度不應小於 50 毫米，並應設置成穀密，且在其必要處用立柱支持。

.2 各種厚度的止移板的最大自由跨距應如下：

厚度	最大自由跨距
50 毫米	2.5 米
60 毫米	3.0 米
70 毫米	3.5 米
80 毫米	4.0 米

如果厚度超過上述數值，則最大自由跨距可直接隨厚度的增大而異。

.3 所有止移板的端部應牢固地嵌入插槽，並具有 75 毫米的最小支承長度。

12.2 其他材料

採用木材以外的其他材料構成的隔壁，應與 A12.1 中對止移板要求的強度等效。

12.3 立柱

.1 用於支持兩側受載隔壁的鋼質立柱，其剖面模數應按下式求得：

$$W=a \times W_1$$

式中：

W=剖面模數，厘米 ^{3}

a=立柱間水平跨距（米）。

每米跨距的剖面模數 W_1 應不小於下述公式求得之值：

$$W_1=14.8（h_1 - 1.2）厘來^3/米$$

式中：

h_1 是垂向自由跨距，以米計，應取相鄰兩支索的固定點之間或支索固定點與立柱任一端部之間的最大距離。如這個距離小於 2.4 米，則應在計算各模數時，假定距離的實際值為 2.4 米。

.2 木質立柱的模數應按鋼質立柱的相應模數乘以 12.5 來確定。如採用其他材料，其模數至少應等於對鋼的要求，並按鋼與所採用材料的許用應力的比例予以增加。在這些情況下，還應注意到每根立柱的相對剛性，以保證其不致發生過度的彎曲。

.3 立柱間的水平距離，應使止移板的自由跨距不超過 A12.1.3 中要求的最大跨距。

12.4 撐柱

.1 當使用木質撐柱時，該撐柱應為整根的，其每一端均應牢固地加以固定，並應將撐柱的跟部撐牢在船舶的永久性結構上，但不應直接支撐在船側外板上面。

.2 按照 A12.4.3 和 A12.4.4 的規定，木質撐柱的最小尺寸如下：

撐柱長度 米	矩形剖面 毫米	圓形剖面直徑 毫米
不超過 3 米	150 x 100	140
3 米以上不足 5 米	150 x 150	165
5 米以上不足 6 米	150 x 150	180
6 米以上不足 7 米	200 x 150	190
7 米以上不足 8 米	200 x 150	200
超過 8 米	200 x 150	215

撐柱長度在 7 米或 7 米以上時，應在接近長度的中點處牢固地架撐。

.3 當各立柱之間的水平距離與 4 米相差甚大時，撐柱的慣性矩可按比例予以變更。

.4 當撐柱與水平線所成夾角超過 10 度時，應選用按 A12.4.2 所要求的較大一檔的撐柱，但在任何情況下，撐柱與水平線之間的夾角不應超過 45 度。

12.5 拉索

如使用拉索來支持兩側受載的隔壁，則拉索應水平地或儘可能水平地設置。拉索應由鋼絲繩製成，其兩端應妥善固定。鋼絲繩的尺寸，應按假定由拉索支持的隔壁和立柱所承受的均勻負荷 4.9 千牛/米 ^{2} 來確定。由此假定的在拉索上的工作負荷，應不超過其破斷負荷的三分之一。

13 僅單側受載的隔壁

13.1 縱向隔壁

隔壁的每米長度所受負荷（P）的牛頓數，應取下述數值：

.1 表 A13-1

B（米）								
h（米）	2	3	4	5	6	7	8	10
1.50	8.336	8.826	9.905	12.013	14.710	17.358	20.202	25.939
2.00	13.631	14.759	16.769	19.466	22.506	25.546	28.733	35.206
2.50	19.466	21.182	23.830	26.870	30.303	33.686	37.265	44.473
3.00	25.644	27.900	30.891	34.323	38.099	41.874	45.797	53.740
3.50	31.823	34.568	37.952	41.727	45.895	50.014	54.329	63.008
4.00	38.148	41.286	45.013	49.180	53.691	58.202	62.861	72.275
4.50	44.473	47.955	52.073	56.584	61.488	66.342	71.392	81.542
5.00	50.847	54.623	59.134	64.037	69.284	74.531	79.924	90.810
6.00	63.498	68.009	73.256	78.894	84.877	90.859	96.988	109.344

式中：h=從隔壁底部算起的穀物高度（米）。當貨艙裝滿時，高度（h）應取至隔壁所在處的頂甲板。在艙口或從

隔壁到艙口的距離是 1 米或小於 1 米時，高度（h）應取至該艙內的穀物水平面。

B=散裝穀物橫向範圍（米）。

.2 表 A13-1 內的內插法可用於 B 的中間數值和當 h 等於或小於 6.0 米時，可用於 h 的中間數值。

.3 h 數值超過 6.0 米時，隔壁的每米長度所受負荷（P）的牛頓數可以使用 B/h 的比率和利用下述公式用表 A13-2 計算：

$$P=f \times h^2$$

.4 表 A13-2

B/h	f	B/h	f
0.2	1.687	2.0	3.380
0.3	1.742	2.2	3.586
0.4	1.809	2.4	3.792
0.5	1.889	2.6	3.998
0.6	1.976	2.8	4.204
0.7	2.064	3.0	4.410
0.8	2.159	3.5	4.925
1.0	2.358	4.0	5.440
1.2	2.556	5.0	6.469
1.4	2.762	6.0	7.499
1.6	2.968	8.0	9.559
1.8	3.174		

13.2 橫向隔壁

隔壁每米長度所受負荷（P）的牛頓數，應取下述數值：

.1 表 A13-3

L（米）											
h（米）	2	3	4	5	6	7	8	10	12	14	16
1.50	6.570	6.767	7.159	7.649	8.189	8.728	9.169	9.807	10.199	10.297	10.297
2.00	10.199	10.787	11.474	12.209	12.994	13.729	14.416	15.445	16.083	16.279	16.279
2.50	14.318	15.347	16.426	17.456	18.437	19.417	20.349	21.673	22.408	22.604	22.604
3.00	18.878	20.251	21.624	22.948	24.222	25.399	26.429	27.900	28.684	28.930	28.930
3.50	23.781	25.546	27.164	28.733	30.155	31.430	32.558	34.127	35.010	35.255	35.255
4.00	28.930	30.989	32.901	34.667	36.187	37.559	38.736	40.403	41.286	41.531	41.580
4.50	34.274	36.530	38.638	40.501	42.120	43.542	44.767	46.582	47.562	47.856	47.905
5.00	39.717	42.218	44.473	46.434	48.151	49.622	50.897	52.809	53.839	54.182	54.231
6.00	50.749	53.593	56.094	58.301	60.164	61.782	63.204	65.263	66.440	66.832	66.930

式中：h=從隔壁底部算起的穀物高度（米）。當貨艙裝滿時，高度（h）應取至隔壁所在處的頂甲板。在艙口或從隔壁到艙口的距離是 1 米或小於 1 米時，高度（h）應取至該艙內的穀物水平面。

L=散裝穀物的縱向範圍（米）。

.2 當 h 等於或小於 6.0 米時，L 的中間數值和 h 的中間數值可用內插法使用表 A13-3 計算。

.3 當 h 數值超過 6.0 米時，隔壁每米長度的負荷（P）的牛頓數可以使用 L/h 的比率和採用下述公式利用表 A13-4 計算：

$$P=f \times h^2$$

.4 表 A13-4

L/h	f	L/h	f
0.2	1.334	2.0	1.846
0.3	1.395	2.2	1.853
0.4	1.444	2.4	1.857
0.5	1.489	2.6	1.859
0.6	1.532	2.8	1.859
0.7	1.571	3.0	1.859
0.8	1.606	3.5	1.859
1.0	1.671	4.0	1.859
1.2	1.725	5.0	1.859
1.4	1.769	6.0	1.859
1.6	1.803	8.0	1.859
1.8	1.829		

13.3 表 A13-1 至 A13-4 中所示隔壁的每單位長度的總負荷，如認為必要，可假定沿高度成梯形分佈。在這種情況下，垂向構件或立柱的上端或下端的反作用負荷是不相同的。以垂向構件或立柱所承受的總負荷的百分數表示的上端反作用力負荷，可取表 A13-5 和表 A13-6 所列數值。

.1 表 A13-5：僅單側受載的縱向隔壁

立柱上端的支承反作用力，以 A13.1 中負荷的百分數表示

B（米）								
h（米）	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	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	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	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	47.7	49.4	50.1	50.2	50.2	50.2	50.2	50.2
6	47.9	49.5	50.1	50.2	50.2	50.2	50.2	50.2
7	47.9	49.5	50.1	50.2	50.2	50.2	50.2	50.2
8	47.9	49.5	50.1	50.2	50.2	50.2	50.2	50.2
9	47.9	49.5	50.1	50.2	50.2	50.2	50.2	50.2
10	47.9	49.5	50.1	50.2	50.2	50.2	50.2	50.2
B=散裝穀物橫向範圍（米）								

h 或 B 為其他數值時，反作用負荷應按需要用線性內插法或外插法計算。

.2 表 A13-6：僅單側受載的橫向隔壁

支柱上端的支承反作用力以 A13.2 中負荷的百分數表示

L（米）											
h（米）	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	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	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	43.5	44.0	44.4	44.7	44.9	45.0	45.2	45.4	45.4	45.4	45.4
5	43.9	44.3	44.6	44.8	45.0	45.2	45.3	45.5	45.5	45.5	45.5
6	44.2	44.5	44.8	45.0	45.2	45.3	45.4	45.6	45.6	45.6	45.6
7	44.3	44.6	44.9	45.1	45.3	45.4	45.5	45.6	45.6	45.6	45.6
8	44.3	44.6	44.9	45.1	45.3	45.4	45.5	45.6	45.6	45.6	45.6
9	44.3	44.6	44.9	45.1	45.3	45.4	45.5	45.6	45.6	45.6	45.6
10	44.3	44.6	44.9	45.1	45.3	45.4	45.5	45.6	45.6	45.6	45.6
L=散裝穀物縱向範圍（米）											

h 或 L 為其他數值時，反作用負荷應按需要用線性內插法或外插法計算。

.3 這種垂向構件或立柱的端部連接的強度，可以每一端可能承受的最大負荷作為基礎來計算。這些負荷如下：

縱向隔壁

頂端最大負荷　　A13.1 中相應總負荷的 50%

底端最大負荷　　A13.1 中相應總負荷的 55%

橫向隔壁

頂端最大負荷　　A13.2 中相應總負荷的 45%

底端最大負荷　　A13.2 中相應總負荷的 60%

.4 在考慮到表 A13-5 和表 A13-6 所表示的負荷的垂向分佈的情況下，水平木板的厚度也可按下式確定：

$$t=10a\sqrt{\frac{p\times k}{h\times 2091.8}}$$

式中：

t=木板厚度（毫米）

a=板的水平跨距，即立柱間的距離（米）

h=從穀物頂部到隔壁的底部的高度（米）

p=從表中求得的單位長度總負荷（牛頓）

k=按負荷垂向分佈而定的系數。

假定負荷的垂向分佈是均勻的，即矩形分佈，k 應取為 1.0。對於梯形分佈，則

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

式中：

R 為從表 A13-5 或表 A13-6 所查得的上端支承反作用負荷。

.5 拉索或撐柱

拉索或撐柱的尺寸應這樣來確定，即從表 A13-1 至表 A13-4 中求得的負荷不應超過破斷負荷的三分之一。

14 托盤

14.1 為了減少傾側力矩，僅在按 2.2 規定的“平艙滿載艙”內，在艙口位置的縱向隔壁可以用托盤代替，但裝運亞麻子和具有類似性質的其他種子的情況除外。在該種情況下，托盤不可用來代替縱向隔壁。如設置縱向隔壁，應符合 A10.9 的要求。

14.2 量自托盤底部至甲板線的托盤深度應如下：

.1 對於型寬在 9.1 米以下的船舶，不小於 1.2 米。

.2 對於型寬為 18.3 米或 18.3 米以上的船舶，不小於 1.8 米。

.3 對於型寬在 9.1 米和 18.3 米之間的船舶，托盤的最小深度應用內插法計算。

14.3 托盤的頂部（盤口）應由艙口範圍的甲板下結構，即艙口邊桁材或圍板及艙口端樑所構成。托盤和其上面的艙口都應全都以放置在墊隔布或其等效物上的袋裝貨物或其他適宜貨物所填充，並應與鄰近的構件緊靠堆裝，以使之與這種物件有相當於按 A14.2 規定的一半深度或更大深度的支承接觸。如果船殼結構沒有這種支承表面，托盤應由鋼絲繩、鏈條或按 A17.1.4 規定的雙股鋼帶固定在位置上，而離開間隔不得大於 2.4 米。

15 散裝穀物捆包

作為另一方法，在“平艙滿載”的艙內，可用散裝貨物捆包代替袋裝穀物或其他適宜貨物來填裝托盤，但需：

.1 固定捆包在應有位置的尺寸和方法與 A14.2 和 A14.3 中對托盤的規定相同。

.2 托盤頂上備有適當的固定裝置，托盤內襯以經主管機關同意的材料，這種材料具有每 5 厘米寬的狹條不小於 2,687 牛頓的抗拉強度。

.3 如果托盤具有下述結構，亦可使用經主管機關同意的具有每 5 厘米寬狹條不小於 1,344 牛頓的抗拉強度材料，作為變通辦法，來代替 A15.2 的要求：

.3.1 用幾根經主管機關同意的橫向綁繩放置在插入散裝貨物內的托盤內面，其間距不大於 2.4 米。這些綁繩應有足夠長度，使能拉緊並固定在托盤的頂上。

.3.2 用厚度不小於 25 毫米和寬度為 150 至 300 毫米的木墊板或其他同等強度的適當材料，沿首尾方向放置在這些綁繩上，以防止應放在托盤內的襯裏材料被割破或擦傷。

.4 托盤內應裝滿散裝貨物，並在頂上加以固定。但當使用 A15.3 認可的材料時，襯裏材料在包裹起來之後，在用綁繩捆紮使托盤固定之前，還應將木墊板放在捆包的頂上。

.5 如用一張以上的襯裏材料來墊托盤，則各張材料應在盤底縫合或加以鉤邊折迭。

.6 托盤的頂部應與安裝就位的艙口活動樑的底部相迭合，並在托盤的頂上，用適宜的雜貨或散裝貨物放置於活動樑之間。

16 面上堆裝佈置

16.1 如利用袋裝穀物或其他適宜貨載以固定“部分裝載”艙，穀物自由表面應予平整並應蓋上墊隔布或其等效物或用一個合適的平台予以覆蓋。這種平台應由在間距不大於 1.2 米的墊木上方放置間距不大於 100 毫米、厚 25 毫米的木板所組成。平台也可用經主管機關認為是等效的其他材料構成。

16.2 應在平台或墊隔布上用袋裝穀物緊密地堆裝，堆裝高度不小於穀物自由表面最大寬度的十六分之一或 1.2 米，取其大者。

16.3 袋裝穀物應裝在牢固的袋中並應妥善裝滿，牢固封口。

16.4 緊密堆裝的其他適宜貨物並在至少能施加按照 A16.2 規定的堆裝的袋裝貨物相同壓力時，可用於代替袋裝穀物。

17 捆紮或綁縛

為了消除部分裝載艙內的傾側力矩，當利用捆紮或綁縛時，應按下列方式固定：

.1 穀物應加以平艙和整平至使頂部略呈拱形，並以墊隔用的粗帆布、艙蓋布或等效物覆蓋。

.2 墊隔用的粗帆布和（或）艙蓋布應至少搭接 1.8 米。

.3 應鋪設二層滿鋪的木地板，每塊木塊厚約 25 毫米、寬 150 至 300 毫米，上層地板縱向鋪置，釘於底層橫向鋪置的地板上。亦可採用另一種辦法，即用一層滿鋪地板，厚 50 毫米，縱向鋪置，釘於厚 50 毫米，寬度不少於 150 毫米的底墊木上。這些底墊木應延伸到艙的全寬，其間隔距離不超

過 2.4 米。利用其他材料製成的裝置，經主管機關認為與上述裝置等效者，也可加以採用。

.4 鋼絲繩（直徑 19 毫米或等效者）、雙層鋼帶（50 毫米 x 1.3 毫米，破斷拉力至少 49 千牛頓），或同等強度的鏈條，每一件皆用 32 毫米的鬆緊旋扣旋緊者，均可作為綁縛的工具。當使用鋼帶時，採用與鎖制桿連用的絞車拉緊器可以代替 32 毫米的鬆緊旋扣，但應備有必要的供拉緊用的適當扳手。使用鋼帶時，至少應有 3 個折卷封頭用來繫固端部。使用鋼絲繩時，至少應有 4 個鋼繩夾用來構成綁繩的眼環。

.5 在完成裝載之前，綁繩應用一種 25 毫米的卸扣或同等強度的樑夾具牢固地連接於船體骨架上，連接點是在預計的貨物最終表面以下約 450 毫米處。

.6 各根綁繩的放置間距不應超過 2.4 米，每根要由釘在縱向地板上的墊木予以支持。這種墊木應由不小於 25 毫米 x 150 毫米的木材或其等效物所組成，並應延伸到該艙的全寬。

.7 在航次中，應對鋼帶經常進行檢查，必要時應重新收緊。

18 用鋼絲網固定

為了消除“部分裝載”艙內的穀物傾側力矩，當利用捆紮或綁縛時，作為對 A17 中所述辦法的替代辦法，可按下述方法固定：

.1 穀物應加以平艙和整平，沿艙的前後中心線略呈拱形。

.2 穀物的整個表面應用隔墊用的粗帆布、艙蓋布或等效物覆蓋。覆蓋的材料應具有每 5 厘米寬的狹條不小於 1,344 牛頓的抗拉強度。

.3 在粗帆布或其他覆蓋物頂部應有二層鋼絲加強材網。底層應橫向放置，頂層應縱向放置。鋼絲網的長度至少搭接 75 毫米。頂層網放置在底層網上的方式是這樣的，即由兩層所構成的正方形約為 75 毫米 × 75 毫米。鋼絲加強材網所用類型應是加強的實物結構。它應由 3 毫米直徑鋼絲織成，其破損強度不小於 52 千牛頓/厘米 ^{2}，焊接成 150 毫米 × 150 毫米的正方形。可使用帶鏽皮的鋼絲網，但不能使用帶稀疏的、薄片狀鏽的網。

.4 在艙的左右兩舷的鋼絲網的邊緣應用 150 毫米 × 50 毫米木板固定。

.5 從艙的一邊拉到另一邊的固定綁繩放置的間距不大於 2.4 米，但第一根與最後一根綁繩與前後舷墻的距離分別不應大於 300 毫米。在完成裝載前，綁繩應用一種 25 毫米的卸扣或同等強度的樑夾具牢固連接於船體骨架上，連接點是在預計的穀物最終表面以下約 450 毫米處。綁繩應從這點引出通過 A18.1.4 中所述邊緣木板的上方，其功能為分擔綁繩所施加的向下壓力。每根綁繩底下垂直於船中線面上的中間處應鋪置二層 150 毫米 × 25 毫米的木板並延伸至整個船艙寬度。

.6 固定綁繩應由鋼絲繩（19 毫米直徑或等效者）、雙層鋼帶（50 毫米 × 1.3 毫米，破斷拉力至少 49 千牛頓）或等效強度的鏈條，每一件皆用 32 毫米的鬆緊旋扣旋緊。當使用鋼帶時，採用與鎖制桿連用的絞車拉緊器可以代替 32 毫米的鬆緊旋扣，但應備有必要的供拉緊用的適當搬手。當使

用鋼帶時，至少應有 3 個折卷封頭用來繫固端部。使用鋼絲繩時，至少應有 4 個鋼繩夾用來構成綁繩的眼環。

.7 在航次中，應對固定綁繩經常進行檢查，必要時應重新收緊。

B 部分

假定傾側力矩和一般假定的計算

1 一般假定

1.1 為了計算裝運散裝穀物的船舶由於貨物表面移動產生的有害傾側力矩，應假定：

.1 按照 A10.2 的規定經過平艙的滿載艙內，在所有對水平面的傾角小於 30 度的限界面下存在一個空檔，該空檔與邊界表面平行，其平均深度按下列公式計算：

$Vd=Vd_1 + 0.75（d - 600）$ 毫米

式中：

Vd=空檔平均深度（毫米）；

Vd_1=下面表 1-1 所列標準空檔深度；

d=實際桁材深度（毫米）。

在任何情況下，Vd 值概不得小於 100 毫米。

表 B1-1

從艙口端或艙口邊到貨艙邊界的距離	標準空檔深度 Vd
米	毫米
0.5	570

從艙口端或艙口邊到貨艙邊界的距離	標準空檔深度 Vd
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

表 B1-1 註：

（1）如距離大於 8.0 米，如長度每增加 1 米，深度增加 80 毫米時，標準空檔深度（Vd_1）可按線性外插法計算。

（2）在艙的舷側區域，邊界距離應為艙口邊桁材線或艙口端橫樑線到艙邊的垂直距離，取其大者。桁材深度（d）應採用艙口邊桁材的深度或艙口端橫樑的深度，取其小者。

（3）當在艙口之外有一升高甲板時，則量自升高甲板下邊的空檔平均深度，應以標準空檔深度加上艙口端橫樑的桁材深度，再加上升高甲板的高度來計算。

.2 在裝滿的艙口內，除在艙口蓋內任何開敞的空檔外，有一個自艙口蓋最低部分或艙口邊圍板的頂端（取得較低者）量至貨物表面的平均深度為 150 毫米的空檔。

.3 按 A10.3.1 規定免於從艙口外圍進行平艙的“未平艙滿載艙”應假定裝載後的穀物表面從有空檔的開口邊緣到水平面從所有方向有 30 度角傾斜到甲板下的空檔。

.4 按 A10.3.2 規定在艙端免於平艙的“未平艙滿載艙”裏，應假定裝載後穀物表面從艙口端樑下邊到裝滿區域從所有方向均有 30 度角的傾斜。但如按表 B1-2 規定的在艙口端樑上有加注孔，那末裝載後穀物表面應假定作為圖 B1 所示實際貨物表面的頂端和低部中間數的艙口端樑上的一線算起從所有方向有 30 度角的傾斜。

表 B1-2

最小直徑（毫米）	面積（厘米 ^{2}）	最大間距（米）
90	63.6	.60
100	78.5	.75
110	95.0	.90
120	113.1	1.07
130	133.0	1.25

最小直徑 （毫米）	面積 （厘米 ^{2}）	最大間距 （米）
140	154.0	1.45
150	177.0	1.67
160	201.0	1.90
170 或以上	227.0	2.00 最大值

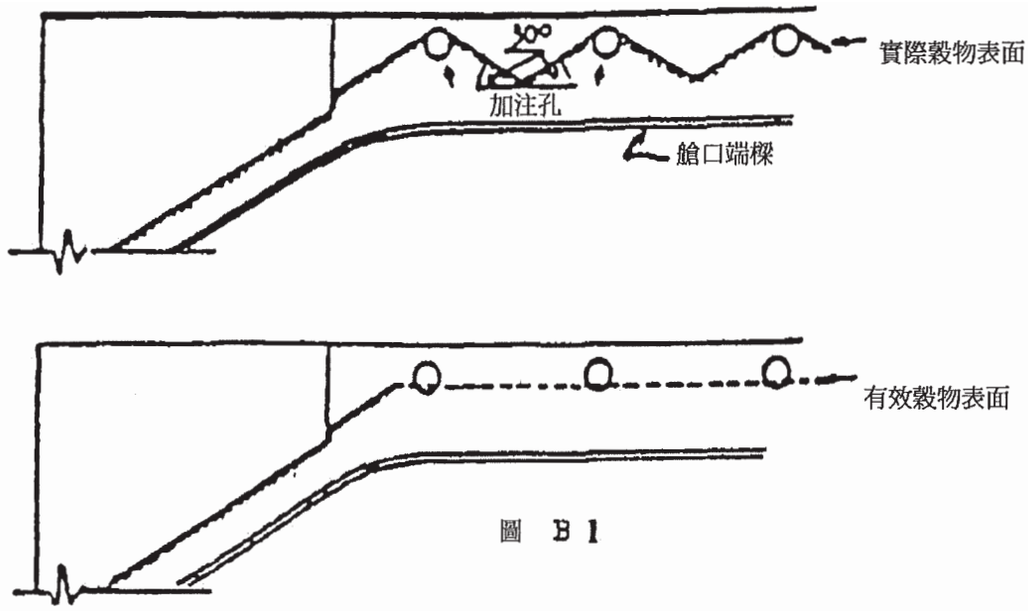

圖 B 1

1.2 在部分裝置艙內，假定穀物表面變動形狀的說明包括在 B5 內。

1.3 為了證明符合 A7 的穩性標準，通常應根據假定“平艙滿載艙”的貨物重心就是整個貨物處所的體積中心來進行船舶的穩性計算。在某些情況下，如主管機關批准在“平艙滿載艙”內應考慮甲板下方各假定空檔對貨物重心的垂向位置的影響時，則有必要按下式用增加由於貨物橫向移動的假定傾側力矩，以補償穀物表面垂向移動的有害影響：

總傾側力矩=1.06 × 計算的橫向傾側力矩。

在所有情況下，在“平艙滿載艙”內貨物的重量應為整個貨物處所的容積除以積載因素。

1.4 在“未平艙滿載艙”內貨物重心應為不計空檔的整個貨艙的體積中心。在所有情況下，貨物重量應為貨物體積（以 B1.1.3 或 B1.1.4 所述假定得出）除以積載因素。

1.5 在部分裝載艙內，應按下式計算穀物表面垂直移動的有害影響：

總傾側力矩=1.12 × 計算的橫向傾側力矩。

1.6 B1.3 和 B1.5 所要求的補償，可採用任何其他等效方法。

2 平艙滿載艙的假定體積傾側力矩

通則

2.1 穀物表面移動的形狀與通過所考慮的該艙某一部分的橫剖面有關，該部分的總力矩應以所得傾側力矩乘以長度求得。

2.2 由於穀物移動而假定的橫向傾側力矩，是穀物從高邊向低邊移動後，各空檔形狀和位置最終變更的結果。

2.3 移動後所得到的穀物表面，應假定為與水平成 15 度角。

2.4 計算相對於縱向構件所能形成的最大空檔面積時，任何水平面的影響，例如折邊或面材，應忽略不計。

2.5 初始和最終的空檔總面積應相等。

2.6 穀密的縱向結構構件可被認為對其全深度有效，但在這些構件是作為減少貨物移動的有害影響設施時除外，在該時應適用 A10.9 的規定。

2.7 一個不連續的縱向隔壁，應認為對其全長有效。

假定

在下述各段內，一個艙的假定總傾側力矩是由分別考慮下列各部分的結果相加而得：

2.8 各艙口的以前和以後部分：

.1 如果一個艙間有兩個或兩個以上的主艙口可進行裝載，則這些艙口之間一部分（或幾部分）的甲板下空檔深度，應以艙口以前及以後至兩艙口間中點的距離確定。

.2 假定穀物移動之後，最終的空檔形狀應如圖 B2-1 所示。

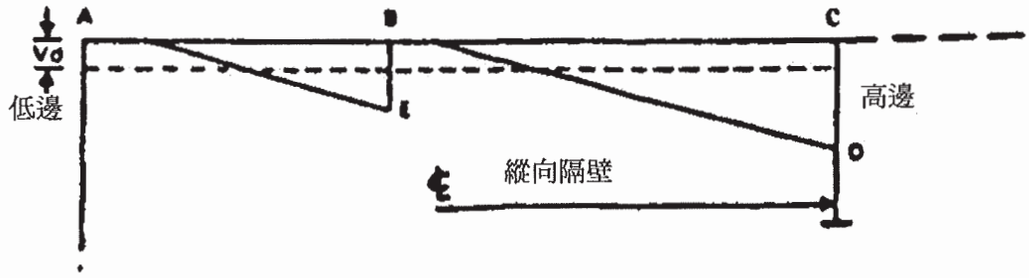

圖 B2-1

圖 B2-1 註：

（1）如靠着 B 處桁材所能形成的最大空檔面積，小於在 AB 之下空檔的初始面積，即 AB × Vd，則多餘的面積應假定轉移到高邊的最終空檔。

（2）如果，舉例說，C 處的縱向隔壁係根據 A10.9 規定設置者，則該隔壁應向下延伸低於 D 或 E 點至少 0.6 米，取其較深者。

2.9

.1 設有縱向隔壁的各艙口內和兩側

假定貨物移動之後，最終的空檔形狀應如圖 B2-2 或圖 B2-3 所示：

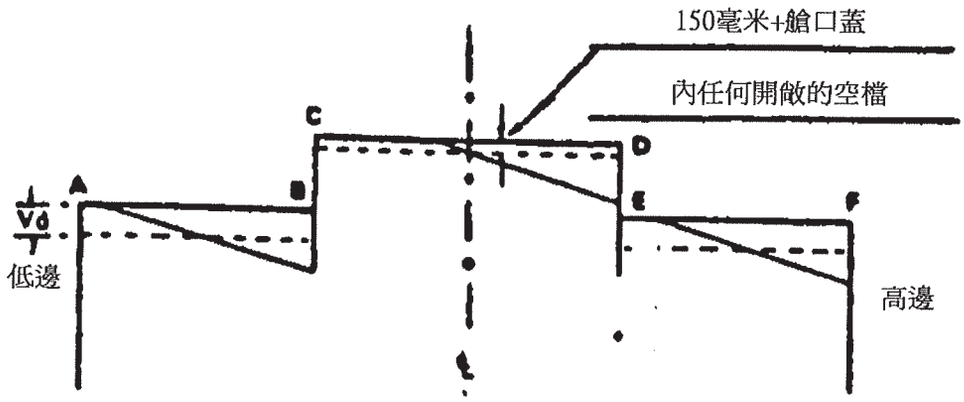

圖 B2-2

圖 B2-2 註：

（1）AB 處：任何對着 B 處桁材所能形成的多餘面積，應轉移到艙口內的最終空檔面積。

（2）CD 處：任何對着 E 處桁材所能形成的多餘面積，應轉移到高邊的最終空檔面積。

.2 設有縱向隔壁的各艙口內和兩側：

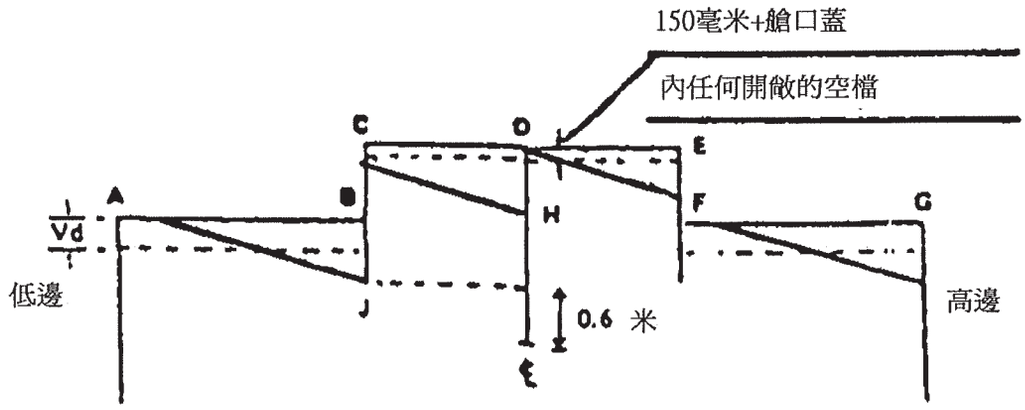

圖 B2-3

圖 B2-3 註：

（1）AB 處的多餘空檔面積應轉移到艙口內低半邊，在此艙口內將形成兩個分開的最終空檔面積，即一個靠着中心線隔壁，另一個靠着在高邊的艙口邊圍板和桁材。

（2）如果艙口內構成一袋裝托盤或散裝貨物捆包，則為了計算橫向傾側力矩，應假定這種設施至少可與中心線隔壁等效。

（3）如果中心線隔壁已按 A10.9 的規定設置，則該隔壁應向下延伸低於 H 或 J 點至少 0.6 米，取其深者。

連通裝載艙

下列各段說明當各艙作連通裝載時，應假定空檔變動的形狀：

2.10 未設置有效的中心線隔壁：

.1 在上層甲板下方 – 當作 B2.8.2 和 B2.9.1 所述的單層甲板佈置。

.2 在第二層甲板下方 – 供從低邊轉移的空檔面積，即原面積減去靠於艙口邊桁材的空檔面積，應假定轉移如下：

一半轉移到上甲板的艙口內，四分之一轉移到上甲板下方的高邊，另四分之一轉移到第二層甲板的高邊。

.3 在第三層及更低的甲板下方 – 供從這些甲板的每一低邊轉移的空檔面積應假定為按相等的數量轉移到各層甲板下方高邊的所有空檔和上甲板艙口內的空檔。

2.11 設有延伸到上甲板艙口內的有效的中心線隔壁：

.1 在所有甲板水平面內的隔壁兩側，供從低邊轉移的空檔面積，應假定轉移到上甲板艙口低半邊下方的空檔內。

.2 在直接位於隔壁底端下面的一層甲板的水平面內，供從低邊轉移的空檔面積，應假定轉移如下：

一半轉移到上甲板艙口低半邊下方的空檔，其餘按相等數量轉移到各層甲板下方高邊的各空檔內。

.3 在低於 B2.11.1 或 B2.11.2 中所述的各甲板水平面內，所有供從這些甲板每層低邊轉移的空檔面積，應假定按相等數量轉移到上甲板艙口內的隔壁兩邊的每一空檔內，以及各層甲板下方高邊的各空檔內。

2.12 設有未延伸到上甲板艙口內的有效的中心線隔壁：

由於在與隔壁相同的甲板水平面內可假定不發生空檔在水平方向的轉移，所以在此水平面內供從低邊轉移的空檔面積，應假定為按照 B2.10 和 B2.11 的原則，轉移到隔壁上方各高邊的空檔內。

3 未平艙滿載艙的假定體積傾側力矩

3.1 B2 中所載“平艙滿載艙”的所有規定，除下邊說明者外，也適用於“未平艙滿載艙”。

3.2 在按照 A10.3.1 規定免於從艙口外圍平艙的“未平艙滿載艙”內：

.1 在移動後所得的貨物表面應假定與水平面成 25 度角。但如果在該艙艙口的前部、後邊或兩側的任何部位，在該部位的空檔的平均橫斷面積等於或小於適用 B1.1 所得到的面積，則在該部位移動後貨物表面的角度應假定與水平面成 15 度角；和

.2 該艙的任何橫向部位的空檔面積應假定與貨物轉移之前和之後相同，即應假定在貨物轉移時，未發生另外的添注。

3.3 在按照 A10.3.2 規定在艙口端部、前邊和後部免於平艙的“未平艙滿載艙”內：

.1 移動後艙口兩側所得穀物表面應假定與水平面成 15 度角；和

.2 移動後，艙口的端部、前部或後部所得貨物表面應假定為與水平面成 25 度角。

4 圍阱的假定體積傾側力矩

在假定的穀物移動後，其最終空檔形狀如圖 B4 所示：

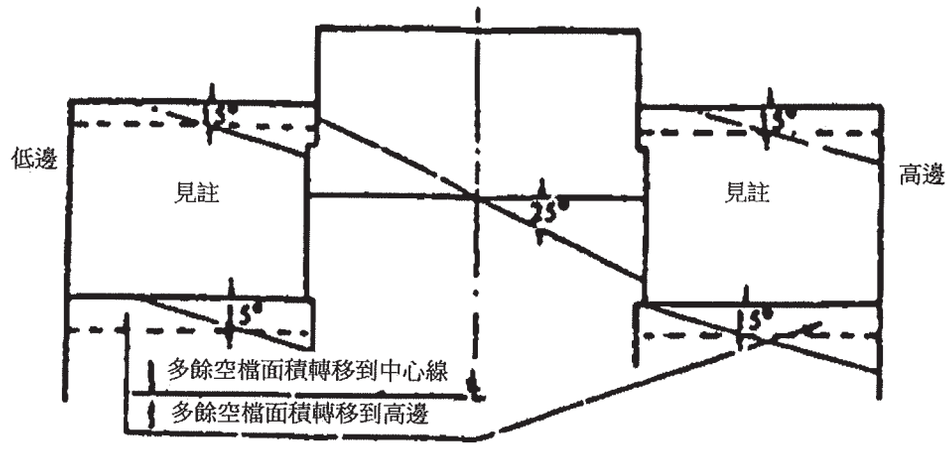

圖 B4

圖 B4 註：

位於圍阱的兩側處所如不能按 A10 作適當的平艙，則應假定會發生 25 度的表面移動

5 部分裝載艙的假定體積傾側力矩

5.1 當散裝貨物的自由表面未經按照 A16、A17 或 A18 加以固定時，假定穀物表面在移動之後與水平面成 25 度角。

5.2 在一部分裝載艙內，如設置有隔壁，則該隔壁應從貨物表面平面上該艙最大寬度的八分之一處延伸至穀物表面下的同樣距離。

5.3 在某一艙內，如果縱向隔壁在該艙的橫向邊界之間不連續，則任何此種作為阻止穀物表面作全寬度移動的隔壁有效長度，應取該隔壁的實際長度減去該隔壁與相鄰隔壁之間或該隔壁與船舷之間的較大橫向距離的七分之二。這個修正對上層艙間可以是滿載艙或是部分裝載艙的任何連通裝載的底層艙不適用。

6 其他假定

主管機關或代表一個主管機關的締約政府在其認為裝載或結構安排符合 A7 中穩性標準的情況下，可批准背離本規則中所包括的假定。當按本規定給予這種批准時，批准書或穀物裝載資料中應包括具體細節。

RESOLUTION MSC.23(59)

(adopted on 23 May 1991)

ADOPTION OF THE INTERNATIONAL CODE FOR THE SAFE CARRIAGE OF GRAIN IN BULK

THE MARITIME SAFETY COMMITTEE,

RECALLING Article 28(b) of the Convention on the International Maritime Organization concerning the functions of the Committee,

NOTING part C of revised chapter VI of the International Convention for the Safety of Life at Sea, 1974 (SOLAS 74), adopted by resolution MSC.22(59) which, inter alia, makes the provisions of the International Code for the Safe Carriage of Grain in Bulk mandatory under that Convention,

HAVING CONSIDERED the text of the proposed Code,

1. ADOPTS the International Code for the Safe Carriage of Grain in Bulk, the text of which is set out in the Annex to the present resolution;

2. DECIDES that the Code shall take effect on 1 January 1994; and

3. REQUESTS the Secretary-General to transmit to the Members of the Organization and all Contracting Governments to SOLAS 74 certified copies of the present resolution and the Code.

ANNEX

PART A

SPECIFIC REQUIREMENTS

1 APPLICATION

1.1 This Code applies to ships regardless of size, including those of less than 500 tons gross tonnage, engaged in the carriage of grain in bulk, to which part C of chapter VI of the 1974 SOLAS Convention, as amended, applies.

1.2 For the purpose of this Code:

the expression "ships constructed" means "ships the keels of which are laid or which are at a similar stage of construction".

2 DEFINITIONS

2.1 The term "grain" covers wheat, maize (corn), oats, rye, barley, rice, pulses, seeds and processed forms thereof, whose behaviour is similar to that of grain in its natural state.

2.2 The term "filled compartment, trimmed", refers to any cargo space in which, after loading and trimming as required under A 10.2, the bulk grain is at its highest possible level.

2.3 The term "filled compartment, untrimmed", refers to a cargo space which is filled to the maximum extent possible in way of the hatch opening but which has not been trimmed outside the periphery of the hatch opening either by the provisions of A 10.3.1 for all ships or A 10.3.2 for specially suitable compartments.

2.4 The term "partly filled compartment" refers to any cargo space wherein the bulk grain is not loaded in the manner prescribed in A 2.2 or A 2.3.

2.5 The term "angle of flooding" (θ_1) means the angle of heel at which openings in the hull, superstructures or deckhouses, which cannot be closed weathertight, immerse. In applying this definition, small openings through which progressive flooding cannot take place need not be considered as open.

2.6 The term "stowage factor", for the purposes of calculating the grain heeling moment caused by a shift of grain, means the volume per unit weight of the cargo as attested by the loading facility, i.e. no allowance shall be made for lost space when the cargo space is nominally filled.

2.7 The term "specially suitable compartment" refers to a cargo space which is constructed with at least two vertical or sloping, longitudinal, grain-tight divisions which are coincident with the hatch side girders or are so positioned as to limit the effect of any transverse shift of grain. If sloping, the divisions shall have an inclination of not less than 30° to the horizontal.

3 DOCUMENT OF AUTHORIZATION

3.1 A document of authorization shall be issued for every ship loaded in accordance with the regulations of this Code either by the Administration or an organization recognized by it or by a Contracting Government on behalf of the Administration. It shall be accepted as evidence that the ship is capable of complying with the requirements of these regulations.

3.2 The document shall accompany or be incorporated into the grain loading manual provided to enable the master to meet the requirements of A 7. The manual shall meet the requirements of A 6.3.

3.3 Such a document, grain loading stability data and associated plans may be drawn up in the official language or languages of the issuing country. If the language used is neither English nor French, the text shall include a translation into one of these languages.

3.4 A copy of such a document, grain loading stability data and associated plans shall be placed on board in order that the master, if so required, shall produce them for the inspection of the Contracting Government of the country of the port of loading.

3.5 A ship without such a document of authorization shall not load grain until the master demonstrates to the satisfaction of the Administration, or of the Contracting Government of the port of loading acting on behalf of the Administration, that, in its loaded condition for the intended voyage, the ship complies with the requirements of this Code. See also A 8.3 and A 9.

4 EQUIVALENTS

Where an equivalent accepted by the Administration in accordance with regulation I/5 of the International Convention for the Safety of Life at Sea, 1974, as amended, is used, particulars shall be included in the document of authorization or in the grain loading manual.

5 EXEMPTIONS FOR CERTAIN VOYAGES

The Administration, or a Contracting Government on behalf of the Administration, may, if it considers that the sheltered nature and conditions of the voyage are such as to render the application of any of the requirements of this Code unreasonable or unnecessary, exempt from those particular requirements individual ships or classes of ships.

6 INFORMATION REGARDING SHIP'S STABILITY AND GRAIN LOADING

6.1 Information in printed booklet form shall be provided to enable the master to ensure that the ship complies with this Code when carrying grain in bulk on an international voyage. This information shall include that which is listed in A 6.2 and A 6.3.

6.2 Information which shall be acceptable to the Administration or to a Contracting Government on behalf of the Administration shall include:

.1 ship's particulars;

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

.3 table of liquid free surface corrections;

.4 capacities and centres of gravity;

.5 curve or table of angle of flooding, where less than 40°, at all permissible displacements;

.6 curves or tables of hydrostatic properties suitable for the range of operating drafts; and

.7 cross curves of stability which are sufficient for the purpose of the requirements in A 7 and which include curves at 12° and 40°.

6.3 Information which shall be approved by the Administration or by a Contracting Government on behalf of the Administration shall include:

.1 curves or tables of volumes, vertical centres of volumes, and assumed volumetric heeling moments for every compartment, filled or partly filled, or combination thereof, including the effects of temporary fittings;

.2 tables or curves of maximum permissible heeling moments for varying displacements and varying vertical centres of gravity to allow the master to demonstrate compliance with the requirements of A 7.1;

this requirement shall apply only to ships the keels of which are laid on or after the entry into force of this Code;

.3 details of the scantlings of any temporary fittings and, where applicable, the provisions necessary to meet the requirements of A 7, A 8 and A 9;

.4 loading instructions in the form of notes summarizing the requirements of this Code;

.5 a worked example for the guidance of the master; and

.6 typical loaded service departure and arrival conditions and where necessary intermediate worst service conditions.

7 STABILITY REQUIREMENTS

7.1 The intact stability characteristics of any ship carrying bulk grain shall be shown to meet, throughout the voyage, at least the following criteria after taking into account in the manner described in part B of this Code and, in figure A 7, the heeling moments due to grain shift:

.1 the angle of heel due to the shift of grain shall not be greater than 12° or in the case of ships constructed on or after 1 January 1994 the angle at which the deck edge is immersed, whichever is the lesser;

.2 in the statical stability diagram, the net or residual area between the heeling arm curve and the righting arm curve up to the angle of heel of maximum difference between the ordinates of the two curves, or 40° or the angle of flooding (θ_1), whichever is the least, shall in all conditions of loading be not less than 0.075 metre-radians; and

.3 the initial metacentric height, after correction for the free surface effects of liquids in tanks, shall be not less than 0.30 m.

7.2 Before loading bulk grain the master shall, if so required by the Contracting Government of the country of the port of loading, demonstrate the ability of the ship at all stages of any voyage to comply with the stability criteria required by this section.

7.3 After loading, the master shall ensure that the ship is upright before proceeding to sea.

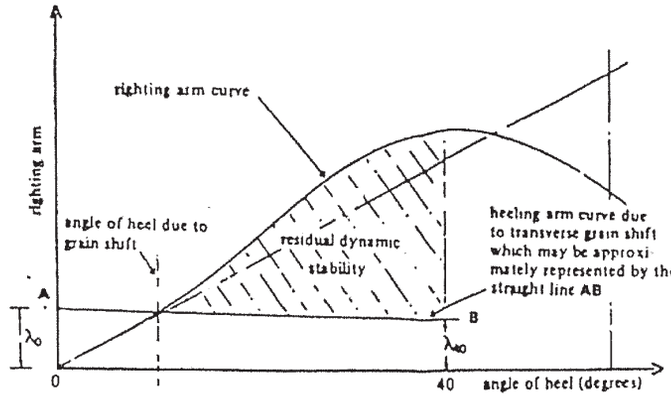

Figure A7

Notes on figure A7

(1) Where.

$$\lambda_0 = \frac{\text{assumed volumetric heeling moment due to transverse shift}}{\text{stowage factor x displacement}};$$

$\lambda_{40} = 0.8 \times \lambda_0$;

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° and 40°.

8 STABILITY REQUIREMENTS FOR EXISTING SHIPS

8.1 For the purposes of this section the term "existing ship" means a ship, the keel of which is laid before 25 May 1980.

8.2 An existing ship loaded in accordance with documents previously approved under regulation 12 of chapter VI of SOLAS 1960, IMO resolutions A.184(VI) or A.264(VIII) shall be considered to have intact stability characteristics at least equivalent to the requirements of A 7 of this Code. Documents of authorization permitting such loadings shall be accepted for the purposes of A 7.2.

8.3 Existing ships not having on board a document of authorization issued in accordance with A 3 of this Code may apply the provisions of A 9 without limitation on the deadweight which may be used for the carriage of bulk grain.

9 OPTIONAL STABILITY REQUIREMENTS FOR SHIPS WITHOUT DOCUMENTS OF AUTHORIZATION CARRYING PARTIAL CARGOES OF BULK GRAIN

9.1 A ship not having on board a document of authorization issued in accordance with A 3 of this Code may be permitted to load bulk grain provided that:

.1 the total weight of the bulk grain shall not exceed one third of the deadweight of the ship;

.2 all "filled compartments, trimmed" shall be fitted with centreline divisions extending, for the full length of such compartments, downwards from the underside of the deck or 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 except that saucers constructed in accordance with A 14 may be accepted in lieu of a centreline division in and beneath a hatchway except in the case of linseed and other seeds having similar properties;

.3 all hatches to "filled compartments, trimmed" shall be closed and covers secured in place;

.4 all free grain surfaces in partly filled cargo space shall be trimmed level and secured in accordance with A 16, A 17 or A 18;

.5 throughout the voyage the metacentric height after correction for the free surface effects of liquids in tanks shall be 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 (metres)

B = moulded breadth of the vessel (metres)

SF = stowage factor (cubic metres per tonne)

Vd = calculated average void depth calculated in accordance with B.1 (metres - Note: not millimetres)

= displacement (tonnes); and

.6 the master demonstrates to the satisfaction of the Administration or the Contracting Government of the port of loading on behalf of the Administration that the ship in its proposed loaded condition will comply with the requirements of this section.

10 STOWAGE OF BULK GRAIN

10.1 All necessary and reasonable trimming shall be performed to level all free grain surfaces and to minimize the effect of grain shifting.

10.2 In any "filled compartment, trimmed", the bulk grain shall be trimmed so as to fill all spaces under the decks and hatch covers to the maximum extent possible.

10.3 In any "filled compartment, untrimmed" the bulk grain shall be filled to the maximum extent possible in way of the hatch opening but may be at its natural angle of repose outside the periphery of the hatch opening. A "filled compartment" may qualify for this classification if it falls into one of the following categories:

.1 the Administration issuing the document of authorization may, under B 6, grant dispensation from trimming in those cases where the underdeck void geometry resulting from free flowing grain into a compartment, which may be provided with feeder ducts, perforated decks or other similar means, is taken into account when calculating the void depths; or

.2 the compartment is "specially suitable" as defined in A 2.7, in which case dispensation may be granted from trimming the ends of that compartment.

10.4 If there is no bulk grain or other cargo above a lower cargo space containing grain, the hatch covers shall be secured in an approved manner having regard to the mass and permanent arrangements provided for securing such covers.

10.5 When bulk grain is stowed on top of closed 'tween-deck hatch covers which are not grain-tight, such covers shall be made grain-tight by taping the joints, covering the entire hatchway with tarpaulins or separation cloths, or other suitable means.

10.6 After loading, all free grain surfaces in "partly filled compartments" shall be level.

10.7 Unless account is taken of the adverse heeling effect due to the grain shift according to this Code, the surface of the bulk grain in any "partly filled compartment" shall be secured so as to prevent a grain shift by overstowing as described in A 16. Alternatively, in "partly filled compartments", the bulk grain surface may be secured by strapping or lashing as described in A 17 or A 18.

10.8 Lower cargo spaces and 'tween-deck spaces in way thereof may be loaded as one compartment provided that, in calculating transverse heeling moments, proper account is taken of the flow of grain into the lower spaces.

10.9 In "filled compartments, trimmed", "filled compartments, untrimmed", and "partly filled compartments", longitudinal divisions may be installed as a device to reduce the adverse heeling effect of grain shift provided that:

.1 the division is grain-tight;

.2 the construction meets the requirements of A 11, A 12 and A 13; and

.3 in 'tween-decks the division extends from deck to deck and in other cargo spaces the division extends downwards from the underside of the deck or hatch covers, as described in B 2.8.2, note (2), B 2.9.2, note (3), or B 5.2, as applicable.

11 STRENGTH OF GRAIN FITTINGS

11.1 Timber

All timber used for grain fittings shall be of good sound quality and of a type and grade which has been proved to be satisfactory for this purpose. The actual finished dimensions of the timber shall be in accordance with the dimensions specified below. 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 provided that its strength is equivalent to that of solid timber of the appropriate scantlings.

11.2 Working stresses

When calculating the dimensions of divisions loaded on one side, using tables A 13-1 to A 13-6, the following working stresses should be adopted:

For divisions of steel 19.6 kN/cm^2
For divisions of wood 1.57 kN/cm^2

(1 newton is equivalent to 0.102 kilograms)

11.3 Other materials

Materials other than wood or steel may be approved for such divisions provided that proper regard has been paid to their mechanical properties.

11.4 Uprights

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

.2 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.

.3 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. However, 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.

11.5 Composite section

Where uprights, binders or any other strength members are formed by two separate sections, one fitted on each side of a division and interconnected by through bolts at adequate spacing, the effective section modulus shall be taken as the sum of the two moduli of the separate sections.

11.6 Partial division

Where divisions do not extend to the full depth of the cargo space such divisions and their uprights shall be supported or stayed so as to be as efficient as those which do extend to the full depth of the cargo space.

12 DIVISIONS LOADED ON BOTH SIDES

12.1 Shifting boards

.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 of various thicknesses shall be as follows:

Thickness	Maximum unsupported span
50 mm	2.5 m
60 mm	3.0 m
70 mm	3.5 m
80 mm	4.0 m.

If thicknesses greater than these are provided the maximum unsupported span will vary directly with the increase in thickness.

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

12.2 Other materials

Divisions formed by using materials other than wood shall have a strength equivalent to the shifting boards required in A 12.1.

12.3 Uprights

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

$$W = a \times W_1$$

Where:

W = section modulus in cubic centimetres:
a = horizontal span between uprights in metres.

The section modulus per metre span W_1 shall be not less than that given by the formula:

$$W_1 = 14.8(h_1 - 1.2)cm^3/m$$

Where:

h_1 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 a stay and 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 were 2.4 m.

.2 The moduli of wood uprights shall be determined by multiplying by 12.5 the corresponding moduli for steel uprights. If other materials are used their moduli 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. In such cases attention shall be paid also to the relative rigidity of each upright to ensure that the deflection is not excessive.

.3 The horizontal distance between uprights shall be such that the unsupported spans of the shifting boards do not exceed the maximum span specified in A 12.1.3.

12.4 Shores

.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 the provisions of A 12.4.3 and A 12.4.4, the minimum size of wood shores shall be as follows:

Length of shore in metres	Rectangular section mm	Diameter of circular section mm
Not exceeding 3 m	150 x 100	140
Over 3 m but not exceeding 5 m	150 x 150	165
Over 5 m but not exceeding 6 m	150 x 150	180
Over 6 m but not exceeding 7 m	200 x 150	190
Over 7 m but not exceeding 8 m	200 x 150	200
Exceeding 8 m	200 x 150	215

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

.3 When the horizontal distance between the uprights differs significantly from 4 m the moments of inertia of the shores may be changed in direct proportion.

.4 Where the angle of the shore to the horizontal exceeds 10° the next larger shore to that required by A 12.4.2 shall be fitted provided that in no case shall the angle between any shore and the horizontal exceed 45°.

12.5 Stays

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. The sizes of the wire rope shall be determined assuming that the divisions and upright which the stay supports are uniformly loaded at 4.9 kN/m^2. The working load so assumed in the stay shall not exceed one third of its breaking load.

13 DIVISIONS LOADED ON ONE SIDE ONLY

13.1 Longitudinal divisions

The load (P) in newtons per metre length of the divisions shall be taken as follows:

.1 Table A 13-1

	B (m)							
h(m)	2	3	4	5	6	7	8	10
1.50	8.336	8.826	9.905	12.013	14.710	17.358	20.202	25.939
2.00	13.631	14.759	16.769	19.466	22.506	25.546	28.733	35.206
2.50	19.466	21.182	23.830	26.870	30.303	33.686	37.265	44.473
3.00	25.644	27.900	30.891	34.323	38.099	41.874	45.797	53.740
3.50	31.823	34.568	37.952	41.727	45.895	50.014	54.329	63.008
4.00	38.148	41.286	45.013	49.180	53.691	58.202	62.861	72.275
4.50	44.473	47.955	52.073	56.584	61.488	66.342	71.392	81.542
5.00	50.847	54.623	59.134	64.037	69.284	74.531	79.924	90.810
6.00	63.498	68.009	73.256	78.894	84.877	90.859	96.988	109.344

Where: h = height of grain in metres from the bottom of the division. When the cargo space is filled, the height (h) shall be taken to the overhead deck in way of the divison. In a hatchway or where the distance from a division to a hatchway is 1 m or less, the height (h) shall be taken to the level of the grain in the hatchway.

B = transverse extent of the bulk grain in metres.

.2 Linear interpolation within table A 13-1 may be used for intermediate values of B and for intermediate values of h when h is equal to or less than 6.0 m.

.3 For values of h exceeding 6.0 m the load (P) in newtons per metre length of the divisions may be determined from table A 13-2 by entering with the ratio B/h and utilizing the formula:

$$P = f \times h^2$$

.4 Table A 13-2

B/h	f	B/h	f
0.2	1.687	2.0	3.380
0.3	1.742	2.2	3.586
0.4	1.809	2.4	3.792
0.5	1.889	2.6	3.998
0.6	1.976	2.8	4.204
0.7	2.064	3.0	4.410
0.8	2.159	3.5	4.925
1.0	2.358	4.0	5.440
1.2	2.556	5.0	6.469
1.4	2.762	6.0	7.499
1.6	2.968	8.0	9.559
1.8	3.174		

13.2 Transverse divisions

The load (P) in newtons per metre length of the divisons shall be taken as follows:

.1 Table A 13-3

	L (m)										
h(m)	2	3	4	5	6	7	8	10	12	14	16
1.50	6.570	6.767	7.159	7.649	8.189	8.728	9.169	9.807	10.199	10.297	10.297
2.00	10.199	10.787	11.474	12.209	12.994	13.729	14.416	15.445	16.083	16.279	16.279
2.50	14.318	15.347	16.426	17.456	18.437	19.417	20.349	21.673	22.408	22.604	22.604
3.00	18.878	20.251	21.624	22.948	24.222	25.399	26.429	27.900	28.684	28.930	28.930
3.50	23.781	25.546	27.164	28.733	30.155	31.430	32.558	34.127	35.010	35.255	35.255
4.00	28.930	30.989	32.901	34.667	36.187	37.559	38.736	40.403	41.286	41.531	41.580
4.50	34.274	36.530	38.638	40.501	42.120	43.542	44.767	46.582	47.562	47.856	47.905
5.00	39.717	42.218	44.473	46.434	48.151	49.622	50.897	52.809	53.839	54.182	54.231
6.00	50.749	53.593	56.094	58.301	60.164	61.782	63.204	65.263	66.440	66.832	66.930

Where: h = height of grain in metres from the bottom of the division. When the cargo space is filled, the height (h) shall be taken to the overhead deck in way of the division. In a hatchway, or where the distance from a division to a hatchway is 1 m or less, the height (h) shall be taken to the level of the grain in the hatchway.

L = longitudinal extent of the bulk grain in metres.

.2 Intermediate values of L and intermediate values of h when h is equal to or less than 6.0 m may be determined by linear interpolation using table A 13-3.

.3 For values of h exceeding 6.0 m the load (P) in newtons per metre length of the divisions may be determined from table A 13-4 by entering with the ratio L/h and utilizing the formula:

$$P = f \times h^2$$

.4 Table A 13-4

L/h	f	L/h	f
0.2	1.334	2.0	1.846
0.3	1.395	2.2	1.853
0.4	1.444	2.4	1.857
0.5	1.489	2.6	1.859
0.6	1.532	2.8	1.859
0.7	1.571	3.0	1.859
0.8	1.606	3.5	1.859
1.0	1.671	4.0	1.859
1.2	1.725	5.0	1.859
1.4	1.769	6.0	1.859
1.6	1.803	8.0	1.859
1.8	1.829		

13.3 The total load per unit length of divisions shown in tables A 13-1 to A 13-4 inclusive may, if considered necessary, be assumed to have a trapezoidal distribution with height. In such cases, the reaction loads at the upper and lower ends of a vertical member or upright are not equal. The reaction loads at the upper end expressed as percentages of the total load supported by the vertical member or upright may be taken to be those shown in tables A 13-5 and A 13-6.

.1 Table A 13-5: Longitudinal divisions loaded on one side only

Bearing reaction at the upper end of upright as a percentage of load from A 13.1

	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	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	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	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	47.7	49.4	50.1	50.2	50.2	50.2	50.2	50.2
6	47.9	49.5	50.1	50.2	50.2	50.2	50.2	50.2
7	47.9	49.5	50.1	50.2	50.2	50.2	50.2	50.2
8	47.9	49.5	50.1	50.2	50.2	50.2	50.2	50.2
9	47.9	49.5	50.1	50.2	50.2	50.2	50.2	50.2
10	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 reaction loads shall be determined by linear interpolation or extrapolation as necessary.

.2 Table A 13-6: Transverse divisions loaded on one side only

Bearing reaction at the upper end of upright as a percentage of load from A 13.2

	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	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	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	43.5	44.0	44.4	44.7	44.9	45.0	45.2	45.4	45.4	45.4	45.4
5	43.9	44.3	44.6	44.8	45.0	45.2	45.3	45.5	45.5	45.5	45.5
6	44.2	44.5	44.8	45.0	45.2	45.3	45.4	45.6	45.6	45.6	45.6
7	44.3	44.6	44.9	45.1	45.3	45.4	45.5	45.6	45.6	45.6	45.6
8	44.3	44.6	44.9	45.1	45.3	45.4	45.5	45.6	45.6	45.6	45.6
9	44.3	44.6	44.9	45.1	45.3	45.4	45.5	45.6	45.6	45.6	45.6
10	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 reaction 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. These loads are as follows:

Longitudinal divisions

Maximum load at the top	50% of the appropriate total load from A 13.1
Maximum load at the bottom	55% of the appropriate total load from A 13.1

Transverse divisions

Maximum load at the top	45% of the appropriate total load from A 13.2
Maximum load at the bottom	60% of the appropriate total load from A 13.2

.4 The thickness of horizontal wooden boards may also be determined having regard to the vertical distribution of the loading represented by tables A 13-5 and A 13-6 and in such cases

$$t = 10a\sqrt{\frac{p \times k}{h \times 2091.8}}$$

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 the tables in newtons
k = factor dependent upon vertical distribution of the loading.

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 A 13-5 or A 13-6.

.5 Stays or shores

The sizes of stays and shores shall be so determined that the loads derived from tables A 13-1 to A 13-4 inclusive shall not exceed one third of the breaking loads.

14 SAUCERS

14.1 For the purpose of reducing the heeling moment a saucer may be used in place of a longitudinal division in way of a hatch opening only in a "filled, trimmed" compartment as defined in A 2.2, except in the case of linseed and other seeds having similar properties, where a saucer may not be substituted for a longitudinal division. If a longitudinal division is provided, it shall meet the requirements of A 10.9.

14.2 The depth of the saucer, measured from the bottom of the saucer to the deck line, shall be as follows:

.1 For ships with a moulded breadth of up to 9.1 m, not less than 1.2 m.

.2 For ships with a moulded breadth of 18.3 m or more, not less than 1.8 m.

.3 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.

14.3 The top (mouth) of the saucer shall be formed by the underdeck structure in way of the hatchway, i.e. hatch side girders or coamings and hatch end beams. 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 structure so as to have a bearing contact with such structure to a depth equal to or greater than one half of the depth specified in A 14.2. If hull structure to provide such bearing surface is not available, the saucer shall be fixed in position by steel wire rope, chain, or double steel strapping as specified in A 17.1.4 and spaced not more than 2.4 m apart.

15 BUNDLING OF BULK GRAIN

As an alternative to filling the saucer in a "filled, trimmed" compartment with bagged grain or other suitable cargo a bundle of bulk grain may be used provided that:

.1 The dimensions and means for securing the bundle in place are the same as specified for a saucer in A 14.2 and A 14.3.

.2 The saucer is lined with a material acceptable to the Administration having a tensile strength of not less than 2,687 N per 5 cm strip and which is provided with suitable means for securing at the top.

.3 As an alternative to A 15.2, a material acceptable to the Administration having a tensile strength of not less than 1,344 N per 5 cm strip may be used if the saucer is constructed as follows:

.3.1 Athwartship lashings acceptable to the Administration shall be placed inside the saucer formed in the bulk grain at intervals of not more than 2.4 m. These lashings shall be of sufficient length to permit being drawn up tight and secured at the top of the saucer.

.3.2 Dunnage not less than 25 mm in thickness or other suitable material of equal strength and between 150 mm and 300 mm in width shall be placed fore and aft over these lashings to prevent the cutting or chafing of the material which shall be placed thereon to line the saucer.

.4 The saucer shall be filled with bulk grain and secured at the top except that when using material approved under A 15.3 further dunnage shall be laid on top after lapping the material before the saucer is secured by setting up the lashings.

.5 If more than one sheet of material is used to line the saucer they shall be joined at the bottom either by sewing or by a double lap.

.6 The top of the saucer shall be coincidental with the bottom of the beams when these are in place and suitable general cargo or bulk grain may be placed between the beams on top of the saucer.

16 OVERSTOWING ARRANGEMENTS

16.1 Where bagged grain or other suitable cargo is utilized for the purpose of securing "partly filled" compartments, the free grain surface shall be level and shall be covered with a separation cloth or equivalent or by a suitable platform. Such platform shall consist of bearers spaced not more than 1.2 m apart and 25 mm boards laid thereon spaced not more than 100 mm apart. Platforms may be constructed of other materials provided they are deemed by the Administration to be equivalent.

16.2 The platform or separation cloth shall be topped off with bagged grain tightly stowed and extending to a height of not less than one sixteenth of the maximum breadth of the free grain surface or 1.2 m, whichever is the greater.

16.3 The bagged grain shall be carried in sound bags which shall be well filled and securely closed.

16.4 Instead of bagged grain, other suitable cargo tightly stowed and exerting at least the same pressure as bagged grain stowed in accordance with A 16.2 may be used.

17 STRAPPING OR LASHING

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

.1 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.

.2 The separation cloths and/or tarpaulins shall overlap by at least 1.8 m.

.3 Two solid floors of rough 25 mm by 150 mm to 300 mm lumber shall be laid with the top floor running longitudinally and nailed to an athwartships bottom floor. Alternatively, 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, may be used. The bottom bearers shall extend the full breadth of the compartment and shall be spaced not more than 2.4 m apart. Arrangements utilizing other materials and deemed by the Administration to be equivalent to the foregoing may be accepted.

.4 Steel wire rope (19 mm diameter or equivalent), double steel strapping (50 mm x 1.3 mm and having a breaking load of at least 49 kN), or chain of equivalent strength, each of which shall be set tightly by means of a 32 mm turnbuckle, may be used for lashings. A winch tightener, used in conjunction with a locking arm, may be substituted for the 32 mm turnbuckle when steel strapping is used, provided suitable wrenches are available for setting up as necessary. When steel strapping is used, not less than three crimp seals shall be used for securing the ends. When wire is used, not less than four clips shall be used for forming eyes in the lashings.

.5 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.

.6 The lashings shall be spaced not more than 2.4 m apart and each shall be supported by a bearer nailed over the top of the fore and aft floor. This bearer shall consist of lumber of not less than 25 mm by 150 mm or its equivalent and shall extend the full breadth of the compartment.

.7 During the voyage the strapping shall be regularly inspected and set up where necessary.

18 SECURING WITH WIRE MESH

When, in order to eliminate grain heeling moments in "partly filled" compartments, strapping or lashing is utilized, the securing may, as an alternative to the method described in A 17, be accomplished as follows:

.1 The grain shall be trimmed and levelled to the extent that it is very slightly crowned along the fore and aft centreline of the compartment.

.2 The entire surface of the grain shall be covered with burlap separation cloths, tarpaulins, or the equivalent. The covering material shall have a tensile strength of not less than 1,344 N per 5 cm strip.

.3 Two layers of wire reinforcement mesh shall be laid on top of the burlap or other covering. The bottom layer is to be laid athwartships and the top layer is to be laid longitudinally. The lengths of wire mesh are to be overlapped at least 75 mm. The top layer of mesh is to be positioned over the bottom layer in such a manner that the squares formed by the alternate layers measure approximately 75 mm by 75 mm. The wire reinforcement mesh is the type used in reinforced concrete construction. It is fabricated of 3 mm diameter steel wire having a breaking strength of not less than 52 kN/cm^2, welded in 150 mm x 150 mm squares. Wire mesh having mill scale may be used but mesh having loose, flaking rust may not be used.

.4 The boundaries of the wire mesh, at the port and starboard side of the compartment, shall be retained by wood planks 150 mm x 50 mm.

.5 Hold-down lashings, running from side to side across the compartment, shall be spaced not more than 2.4 m apart except that the first and the last lashing shall not be more than 300 mm from the forward or after bulkhead, respectively. Prior to the completion of the loading, each 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. The lashing shall be led from this point over the top of the boundary plank described in A 18.1.4, which has the function of distributing the downward pressure exerted by the lashing. Two layers of 150 mm x 25 mm planks shall be laid athwartships centred beneath each lashing and extending the full breadth of the compartment.

.6 The hold-down lashings shall consist of steel wire rope (19 mm diameter or equivalent), double steel strapping (50 mm x 1.3 mm and having a breaking load of at least 49 kN), or chain of equivalent strength, each of which shall be set tight by means of a 32 mm turnbuckle. A winch tightener, used in conjunction with a locking arm, may be substituted for the 32 mm turnbuckle when steel strapping is used, provided suitable wrenches are available for setting up as necessary. When steel strapping is used, not less than three crimp seals shall be used for securing the ends. When wire rope is used, not less than four clips shall be used for forming eyes in the lashings.

.7 During the voyage the hold-down lashings shall be regularly inspected and set up where necessary.

PART B

CALCULATION OF ASSUMED HEELING MOMENTS
AND GENERAL ASSUMPTIONS

1 GENERAL ASSUMPTIONS

1.1 For the purpose of calculating the adverse heeling moment due to a shift of cargo surface in ships carrying bulk grain it shall be assumed that:

.1 In filled compartments which have been trimmed in accordance with A 10.2, a void exists under all boundary surfaces having an inclination to the horizontal less than 30° and that the void is parallel to the boundary surface having an average depth calculated according to the formula:

$$Vd = Vd_1 + 0.75\ (d - 600)\ mm$$

Where:

Vd = average void depth in millimetres;

Vd_1 = standard void depth from table B 1-1 below;

d = actual girder depth in millimetres.

In no case shall Vd be assumed to be less than 100 mm.

Table B 1-1

Distance from hatch end or hatch side to boundary of compartment	Standard void depth Vd.
metres	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 B 1-1:

(1) For boundary distances greater than 8.0 m the standard void depth (Vd_1) shall be linearly extrapolated at 80 mm increase for each 1.0 m increase in length.

(2) In the corner area of a compartment the boundary distance shall be the perpendicular distance from the line of the hatch side girder or the line of the hatch end beam to the boundary of the compartment, whichever is the greater. The girder depth (d) shall be taken to be the depth of the hatch side girder or the hatch end beam, whichever is the less.

(3) Where there is a raised deck clear of the 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 hatch end beam plus the height of the raised deck.

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

.3 In a "filled compartment, untrimmed" which is exempted from trimming outside the periphery of the hatchway by the provisions of A 10.3.1, it shall be assumed that the surface of the grain after loading will slope into the void space underdeck, in all directions, at an angle of 30° to the horizontal from the edge of the opening which establishes the void.

.4 In a "filled compartment, untrimmed" which is exempted from trimming in the ends of the compartment under the provisions of A 10.3.2, it shall be assumed that the surface of the grain after loading will slope in all directions away from the filling area at an angle of 30° from the lower edge of the hatch end beam. However, if feeding holes are provided in the hatch end beams in accordance with table B 1-2, then the surface of the grain after loading shall be assumed to slope in all directions, at an angle of 30° from a line on the hatch end beam which is the mean of the peaks and valleys of the actual grain surface as shown in figure B 1.

Table B 1-2

Diameter (mm) Minimum	Area (cm^2)	Spacing (metres) Maximum
90	63.6	.60
100	78.5	.75
110	95.0	.90
120	113.1	1.07
130	133.0	1.25
140	154.0	1.45
150	177.0	1.67
160	201.0	1.90
170 or above	227.0	2.00 maximum

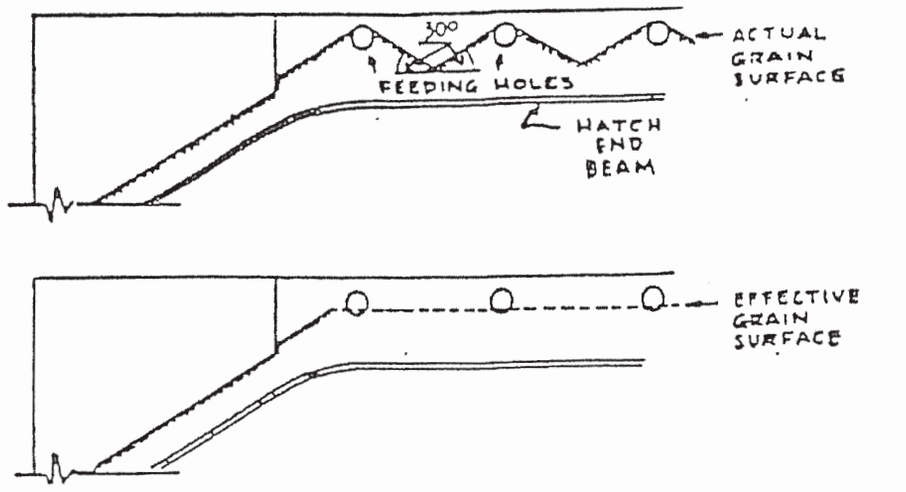

Figure B 1

1.2 The description of the pattern of grain surface behaviour to be assumed in partly filled compartments is contained in B 5.

1.3 For the purpose of demonstrating compliance with the stability criteria in A 7, the ship's stability calculations shall normally be based upon the assumption that the centre of gravity of cargo in a "filled compartment, trimmed" is at the volumetric centre of the whole cargo space. In those cases 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 caro in "filled compartments, trimmed" it will be necessary to compensate for the adverse effect of the vertical shift of grain surfaces 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.

In all cases the weight of cargo in a "filled compartment, trimmed" shall be the volume of the whole cargo space divided by the stowage factor.

1.4 The centre of gravity of cargo in a "filled compartment, untrimmed" shall be taken to be the volumetric centre of the whole cargo compartment with no account being allowed for voids. In all cases the weight of cargo shall be the volume of the cargo (resulting from the assumptions stated in B 1.1.3 or B 1.1.4) divided by the stowage factor.

1.5 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.

1.6 Any other equally effective method may be adopted to make the compensation required in B 1.3 and B 1.5.

2 ASSUMED VOLUMETRIC HEELING MOMENT OF A FILLED COMPARTMENT, TRIMMED

General

2.1 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.

2.2 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.

2.3 The resulting grain surface after shifting shall be assumed to be at 15° to the horizontal.

2.4 In calculating the maximum void area that can be formed against a longitudinal structural member, the effects of any horizontal surfaces, e.g. flanges or face bars, shall be ignored.

2.5 The total areas of the initial and final voids shall be equal.

2.6 Longitudinal structural members which are grain-tight may be considered effective over their full depth except where they are provided as a device to reduce the adverse effect of grain shift, in which case the provisions of A 10.9 shall apply.

2.7 A discontinuous longitudinal division may be considered effective over its full length.

Assumptions

In the following paragraphs it is assumed that the total heeling moment for a compartment is obtained by adding the results of separate consideration of the following portions:

2.8 Before and abaft hatchways:

.1 If a compartment has two or more main hatchways through which loading may take place, the depth of the underdeck void for the portion or portions between such hatchways shall be determined using the fore and aft distance to the midpoint between the hatchways.

.2 After the assumed shift of grain the final void pattern shall be as shown in figure B 2-1.

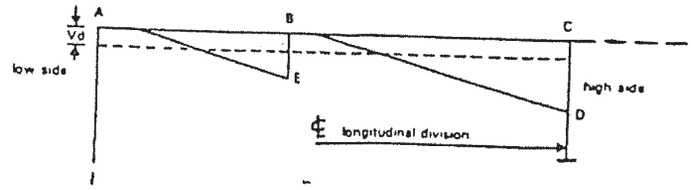

Figure B 2-1

Notes on figure B 2-1

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

(2) If, for example, the longitudinal division at C is one which has been provided in accordance with A 10.9, it shall extend to at least 0.6 m below D or E whichever gives the greater depth.

2.9.

.1 In and abreast of hatchways without longitudinal division:

After the assumed shift of grain the final void pattern shall be as shown in figure B 2-2 or figure B 2-3:

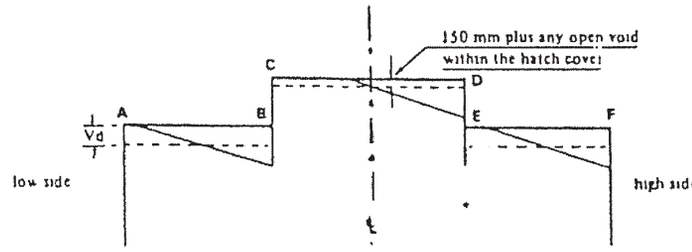

Figure B 2-2

Notes on figure B 2-2:

(1) AB Any area in excess of that which can be formed against the girder at B shall transfer to the final void area in the hatchway.

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

.2 In and abreast of hatchways with longitudinal division:

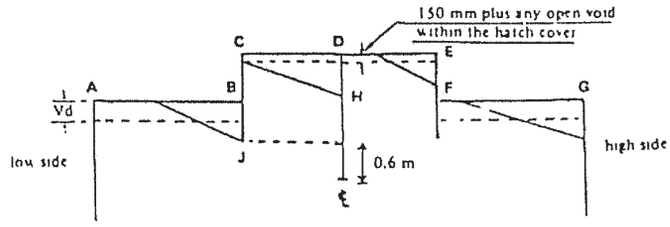

Figure B 2-3

Notes on figure B 2-3:

(1) 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 viz. one against the centreline division and the other against the hatch side coaming and girder on the high side.

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

(3) If the centreline division is one which has been provided in accordance with A 10.9, it shall extend to at least 0.6 m below H or J whichever gives the greater depth.

Compartments loaded in combination

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

2.10 Without effective centreline divisions:

.1 Under the upper deck - as for the single deck arrangement described in B 2.8.2 and B 2.9.1.

.2 Under the second deck - the area of void available for transfer from the low side, i.e. original void area less area against the hatch side girder, shall be assumed to transfer as follows:

one half to the upper deck hatchway and one quarter each to the high side under the upper and second deck.

.3 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.

2.11 With effective centreline divisions which extend into the upper deck hatchway:

.1 At all deck levels abreast of 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.

.2 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:

one half to the void under the low side half of the upper deck hatchway and the remainder in equal quantities to the voids under the decks on the high side.

.3 At deck levels lower than those described in B 2.11.1 or B 2.11.2, 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.

2.12 With effective centreline divisions which 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 side in accordance with the principles of B 2.10 and B 2.11.

3 ASSUMED VOLUMETRIC HEELING MOMENT OF A FILLED COMPARTMENT, UNTRIMMED

3.1 All the provision for "filled compartments, trimmed" set forth in B 2 shall also apply to "filled compartments, untrimmed" except as noted below.

3.2 In "filled compartments, untrimmed" which are exempted from trimming outside the periphery of the hatchway under the provisions of A 10.3.1:

.1 the resulting grain surface after shifting shall be assumed to be at an angle of 25° to the horizontal. However, if in any section of the compartment, forward, aft, or abreast of the hatchway the mean transverse area of the void in that section is equal to or less than the area which would obtain by application of B 1.1, then the angle of grain surface after shifting in that section shall be assumed to be 15° to the horizontal; and

.2 the void area at any transverse section of the compartment shall be assumed to be the same both before and after the grain shift, i.e. it shall be assumed that additional feeding does not occur at the time of the grain shift.

3.3 In "filled compartments, untrimmed" which are exempted from trimming in the ends, forward and aft of the hatchway, under the provisions of A 10.3.2:

.1 the resulting grain surface abreast of the hatchway after shifting shall be assumed to be at an angle of 15° to the horizontal; and

.2 the resulting grain surface in the ends, forward and aft of the hatchway after shifting shall be assumed to be at an angle of 25° to the horizontal.

4 ASSUMED VOLUMETRIC HEELING MOMENTS IN TRUNKS

After the assumed shift of grain the final void pattern shall be as shown in figure B 4:

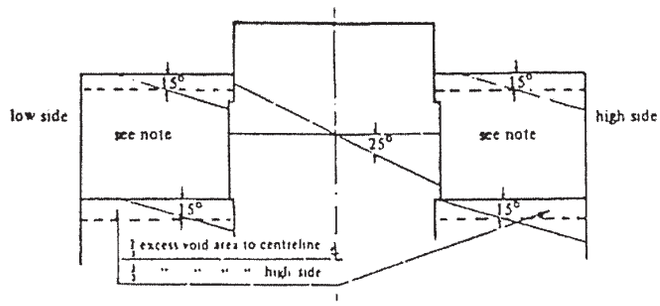

Figure B 4

Note on figure B 4:

If the wing spaces in way of the trunk cannot be properly trimmed in accordance with A 10, it shall be assumed that a 25° surface shift takes place.

5 ASSUMED VOLUMETRIC HEELING MOMENT OF A PARTLY FILLED COMPARTMENT

5.1 When the free surface of the bulk grain has not been secured in accordance with A 16, A 17 or A 18, it shall be assumed that the grain surface after shifting is at 25° to the horizontal.

5.2 In a partly filled compartment, a division, if fitted, shall extend from one eighth of the maximum breadth of the compartment above the level of the grain surface and to the same distance below the grain surface.

5.3 In a compartment in which the longitudinal divisions are not continuous between the transverse boundaries, 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 ship's side. This correction 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.

6 OTHER ASSUMPTIONS

An Administration or a Contracting Government on behalf of an Administration may authorize departure from the assumptions contained in this Code in those cases where it considers this to be justified having regard to the provisions for loading or structural arrangements provided the stability criteria in A 7 are met. Where such authorization is granted under this regulation, particulars shall be included in the document of authorization or grain loading data.

第 54/2014 號行政長官公告

中華人民共和國是國際海事組織的成員國及一九七四年十一月一日訂於倫敦的《國際海上人命安全公約》的締約國；

國際海事組織大會於一九九三年十一月四日透過第A.741（18）號決議通過了《國際船舶安全操作和防止污染管理規則》，且有關規則自一九九九年十二月二十日起對澳門特別行政區生效；

基於此，行政長官根據澳門特別行政區第3/1999號法律第六條第一款的規定，命令公佈包含上指規則的第A.741（18）號決議的中文及英文正式文本。

二零一四年九月十二日發佈。

行政長官　崔世安

Aviso do Chefe do Executivo n.º 54/2014

Considerando que a República Popular da China é um Estado Membro da Organização Marítima Internacional e um Estado Contratante da Convenção Internacional para a Salvaguarda da Vida Humana no Mar, concluída em Londres em 1 de Novembro de 1974;

Considerando igualmente que, em 4 de Novembro de 1993, a Assembleia da Organização Marítima Internacional, através da resolução A.741(18), adoptou o Código Internacional de Gestão para a Segurança da Exploração dos Navios e para a Prevenção da Poluição, e que tal Código entrou em vigor, em relação à Região Administrativa Especial de Macau, em 20 de Dezembro de 1999;

O Chefe do Executivo manda publicar, nos termos do n.º 1 do artigo 6.º da Lei n.º 3/1999 da Região Administrativa Especial de Macau, a resolução A.741(18), que contém o referido Código, nos seus textos autênticos em línguas chinesa e inglesa.

Promulgado em 12 de Setembro de 2014.

O Chefe do Executivo, *Chui Sai On*.