第 131/2015 號行政長官公告

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《1974年國際海上人命安全公約》（下稱“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；

國際海事組織海上安全委員會於二零零五年五月二十日透過第MSC.194（80）號決議通過了經修正的公約的修正案，該修正案自二零零九年一月一日起適用於澳門特別行政區；

基於此，行政長官根據第3/1999號法律《法規的公佈與格式》第六條第一款的規定，命令公佈包含上指修正案的第MSC.194（80）號決議的中文及英文文本。

二零一五年十二月二十八日發佈。

行政長官　崔世安

Aviso do Chefe do Executivo n.º 131/2015

Considerando 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 Internacional para a Salvaguarda da Vida Humana no Mar de 1974, adiante designada por Convenção, tal como emendada, na Região Administrativa Especial de Macau a partir de 20 de Dezembro de 1999;

Considerando igualmente que, em 20 de Maio de 2005, o Comité de Segurança Marítima da Organização Marítima Internacional, através da resolução MSC.194(80), adoptou emendas à Convenção, tal como emendada, e que tais emendas são aplicáveis na Região Administrativa Especial de Macau desde 1 de Janeiro de 2009;

O Chefe do Executivo manda publicar, nos termos do n.º 1 do artigo 6.º da Lei n.º 3/1999 (Publicação e formulário dos diplomas), a resolução MSC.194(80), que contém as referidas emendas, nos seus textos em línguas chinesa e inglesa.

Promulgado em 28 de Dezembro de 2015.

O Chefe do Executivo, *Chui Sai On*.

第 MSC.194（80）號決議

（2005 年 5 月 20 日通過）

通過經修正的 1974 年國際海上人命安全公約的修正案

海上安全委員會，

憶及《國際海事組織公約》關於本委員會的職能的第 28（b）條，

進一步憶及《1974 年國際海上人命安全公約》（此後稱《公約》）關於適用於除第 I 章的規定以外的《公約》附則的修正程序的第 VIII（b）條，

在其第八十次會議上，**審議了**按照第 VIII（b）（i）條提出並散發的《公約》修正案，

1. 按照《公約》第 VIII（b）（iv）條，**通過**《公約》的修正案，修正案的文本列於本決議的附件；

2. 按照《公約》第 VIII（b）（vi）（2）（bb）條，**決定**：

（a）列於附件 1 的上述修正案將於 2006 年 7 月 1 日視為已被接受；和

（b）列於附件 2 的上述修正案將於 2008 年 7 月 1 日視為已被接受，

除非在該日期之前有超過三分之一的締約政府或其合計商船噸位不小於世界商船總噸位 50%的締約政府書面通知反對該修正案；

3. **請**《海上安全公約》締約政府注意，按照《公約》第 VIII（b）（vii）（2）條：

在按照上述第 2 段獲得接受後，

（a）列於附件 1 的修正案將於 2007 年 1 月 1 日生效；和

（b）列於附件 2 的修正案將於 2009 年 1 月 1 日生效。

4. **要求**秘書長，按照《公約》第 VIII（b）（v）條，將本決議和附件中所含修正案的核證無誤的副本轉交《公約》所有締約政府；

5. **進一步要求**秘書長將本決議及其附件的副本轉交非《公約》締約政府的本組織所有成員國。

附件 1

經修正的 1974 年國際海上人命安全公約的修正案

第 II–1 章

構造－結構、分艙和穩性、機電設備

A 部分

通則

第 2 條－定義

1 在第 13 款之後增加下列新的第 14 款：

“14 *散貨船*係指第 XII/1.1 條中定義的散貨船”。

A–1 部分

船舶的結構

2 A–1 部分的現有文本修改如下：

“A–1 部分

船舶的結構

第 3–1 條

對船舶的結構性、機電設備的要求

除了本規則中所含的其他要求外，船舶的設計、建造和維護應符合主管機關按照第 XI–1/1 條規定認可的船級社有關結構性和機電設備方面的要求，或可適用的具有同等安全水平的主管機關的國內標準。

第 3–2 條

油船和散貨船海水壓載艙的防止鏽蝕

（本條適用於 1998 年 7 月 1 日或以後建造的油船和散貨船）

所有的專用海水壓載艙都應具備有效的抗鏽蝕系統，例如堅硬的或等效的保護塗層。保護塗層最好是淺色的。該系統的選擇、應用和維護機制應經主管機關依據本組織通過的指南認可。適當時也可使用陽極防鏽蝕處理。

第 3–3 條

液貨船船艏的安全通道

1 就本條和第 3–4 條而言，液貨船包括第 2 條定義的油船和第 VII/8.2 條定義的化學品船以及第 VII/11.2 條定義的氣體運輸船。

2 每一液貨船應備有能夠使船員即使在惡劣的天氣條件下也能安全走到船艏的通道。此種通道應經主管機關根據本組織制訂的指南予以認可。

第 3–4 條

液貨船應急拖航裝置

1 應急拖航裝置應安裝在每艘不小於 20,000 載重噸的液貨船的兩端。

2 對於 2002 年 7 月 1 日或以後建造的液貨船：

.1 該裝置應能在船舶缺少主電源的情況下隨時都能迅速被拖並容易與拖船連接。應急拖航裝置中應至少有一個事先安裝就緒，即刻可用；和

.2 船舶兩端的應急拖航裝置都應有足夠的強度，同時考慮船舶的尺寸和載重量及在惡劣天氣條件下的預期受力情況。應急拖航裝置的設計、建造和原型試驗應經主管機關根據本組織制訂的指南予以認可。

3 對於 2002 年 7 月 1 日前建造的液貨船，應急拖航裝置的設計和建造應經主管機關根據本組織制訂的指南予以認可。

第 3–5 條

新裝含有石棉的材料

1 本條適用於本公約所涉及的結構、機電裝置和設備所使用的材料。

2 對所有船舶，除下列情況外，應禁止新安裝含石棉的材料：

.1 在旋轉葉片式壓縮機和旋轉葉片式真空泵中使用的葉片；

.2 在高溫（超過 350℃）或高壓（超過 7×10^6Pa）下有着火、腐蝕或毒性危險的環境中用於液體循環的水密接頭和襯墊；和

.3 用於 1000℃以上溫度環境中的柔軟且可伸縮的隔熱組件。

第 3–6 條

通向並進入油船和散貨船貨物區域的處所和首部的通道

1 適用範圍

1.1 除第 1.2 款規定者外，本條適用於 2006 年 1 月 1 日或以後建造的 500 總噸及以上的油船和第 IX/1 條定義的 20,000 總噸及以上的散貨船。

1.2 對於 1994 年 10 月 1 日或以後、但在 2005 年 1 月 1 日前建造的 500 總噸及以上的油船，應符合經海安會第 MSC.27（61）號決議通過的第 II–1/12–2 條的規定。

2 通向貨物處所和其他處所的通道

2.1 每一處所必須配備通道，以在整個船舶壽命期間，能使第 IX/1 條界定的主管機關、公司和船舶人員及其他必要人員對船舶結構進行全面和近觀檢查以及厚度測量。這種通道應符合第 5 款的要求和海上安全委員會以第 MSC.133（76）號決議通過的檢查通道的技術規定；決議可能由本組織修改，但此類修正案應按照本公約第 VIII 條關於除附則第 I 章以外的適用修正程序的規定通過和生效。

2.2 如果永久性通道在正常貨物裝卸作業期間可能容易受到損壞，或在安裝永久性通道不切實際時，主管機關可以允許提供符合技術規定要求的可移動的或輕便的通道，但掛靠、架起、懸掛或支撐可移動通道的裝置須構成船舶結構的永久性部分。所有可移動設備應能由船上人員即刻立起並展開。

2.3 所有通道及其附着在船舶構件上的附屬物的構造和材料應使主管機關滿意。該通道應按照第 I/10 條規定在使用前或執行檢驗時接受檢驗。

3 通向貨艙、液貨艙、壓載艙和其他處所的安全通道

3.1 通向貨艙、隔離空艙、壓載艙、液貨艙和貨物區域其他處所的安全通道應直接從開敞甲板開始並能確保其完成檢查。通向雙層底處所或船艏壓載艙的安全通道可以從泵房、深隔離空艙、管隧、貨艙、雙層殼處所或不打算運載油或有害物質的類似艙室通過。

3.2 長度為 35m 或以上的液艙和分艙，應儘實際可能至少安裝兩個艙口通道和梯子。長度小於 35m 的液艙應至少有一個艙口通道和梯子。當液艙被一個或多個緩衝艙壁或類似障礙物分隔，不允許從現成的通道到達液艙的其他部分時，則應至少安裝有兩個二艙口和梯子。

3.3 每一貨艙應儘可能備有至少兩條通道。通常這些通道應按對角線佈置，例如一條通道靠近左舷的前艙壁，而另一條靠右舷的尾艙壁。

4 船舶結構通道手冊

4.1 對船舶進行全面檢查、近觀檢查和厚度測量的通道，必須在主管機關認可的船舶結構通道手冊中加以描述，該手冊的更新副本應保存在船上。船舶結構通道手冊應包括下列每一處所：

.1 表示通向處所的平面圖，連同適當的技術規範和尺寸；

.2 表明每一處所內實行近觀檢查的通道的平面圖，連同適當的技術規範和尺寸。平面圖應標明能進行檢查的每一區域；

.3 表示每一處所內進行全面檢查通道的平面圖，連同適當的技術規範和尺寸。平面圖應標明關鍵性結構區域的位置，無論是永久性的通道還是可移動的通道以及能進行檢查的每一區域；

.4 檢查和維護所有通道及其附件的結構強度的說明，並考慮可能在處所內有任何腐蝕性氣體；

.5 使用筏進行近觀檢查和厚度測量時的安全須知；

.6 以安全方式架起和使用任何的可移動通道的說明；

.7 所有可移動通道的負載情況；和

.8 定期檢查和維修保養船舶通道的記錄。

4.2 就本條而言，“關鍵性結構區域”是已經從需要監測的計算或類似船舶或姊妹船的營運歷史識別出來的容易斷裂、翹曲、變形或腐蝕的位置，它會損害船舶結構的完整性。

5 一般技術規範

5.1 對於通過水平開口、艙口或人孔的通道，其尺寸應能允許一人穿戴自持式空氣呼吸裝置和保護設備毫無阻礙地上下任何梯子，並備有便於將受傷者從處所的底部提升到甲板的暢通無阻的通道。該通道最小不小於 600 毫米×600 毫米。當從貨艙口進到貨艙時，梯子的頂部應佈置為儘可能靠近艙口圍板。接近具有高度大於 900 毫米的艙口圍板的通道還應在於梯子相連的外面有階梯。

5.2 對穿過緩衝艙壁、地板、桁材和腹板的垂直開口或人孔的、為處所的整個長度和寬度提供過道的通道，其最小的開口應至少為 600 毫米×800 毫米，其高度不超過底殼板以上 600 毫米，除非備有格柵板或其他的踏腳板。

5.3 對於小於 5,000 載重噸的油船，在特殊情況下，主管機關可以批准小於第 5.1 和 5.2 段所述尺寸的開口，如果橫穿開口或運送傷員的能力使主管機關滿意的話。

第 3–7 條

建造圖紙保存在船上和岸上

1 一套建造圖紙及其他表明任何結構性改變的平面圖應保存在 2007 年 1 月 1 日或以後建造的船上。

2 按第 IX/1.2 條規定，岸上應有另一套相同的圖紙由船公司保存。

第 3–8 條

拖航和繫泊設備

1 本條適用於 2007 年 1 月 1 日或以後建造的船舶，但不適用於按照第 3–4 條規定配備的應急拖航裝置。

2 船舶應配備足夠安全負荷的佈置、設備和備件，能夠進行各種與船舶正常作業相關的拖航和繫泊作業。

3 按照第 2 款配備的佈置、設備和艙裝，應滿足主管機關或主管機關按第 I/6 條認可的組織的要求。

4 按照本條配備的每一種配件或各項設備，應清楚地標明與其安全操作相關的任何限制，並考慮其給船舶結構帶來的強度。”

B 部分

分艙和穩性

3 在原有的第 23–2 條之後增加下列新的第 23–3 條：

“第 23–3 條

散貨船以外的單艙貨船上的水位探測器

1 2007 年 1 月 1 日以前建造的散貨船以外的單艙貨船上的水位探測器，應不晚於 2007 年 1 月 1 日之後進行中間檢驗或換證檢驗之日符合本條的要求，以較早的日期為準。

2 就本條而言，*乾舷甲板*具有現行的國際船舶載重線公約所規定的意義。

3 長度（L）小於 80 米或 1998 年 7 月 1 日以前建造的長度小於 100 米的船舶，若乾舷甲板以下為單一貨艙，或在乾舷甲板以下的貨艙沒有至少一堵水密至甲板的艙壁隔開，則應在此類處所裝配水位探測器。

4 第 3 款要求的水位探測器應：

.1 在貨艙內底上方的水位高度達到不小於 0.3m，以及在該水位高度達到不小於貨艙平均深度的 15%時，分別在駕駛台上給出聲光報警；和

.2 安裝在貨艙的尾端，或安裝在不與設計水線相平行的內底最低部分的上方，如腹板或部分水密艙壁是安裝在內底的上方，主管機關可要求安裝附加的探測器。

5 在符合第 XII/12 規定的船上，或在貨艙每側具有至少自內底板至乾舷甲板長度延伸垂直水密邊艙的船上，第 3 款要求的水位探測器不必安裝。”

C 部分

機器設備

第 31 條－機器的控制

4 刪除原有的第 2.10 款。

5 在原有的第 5 款之後增加下列新的第 6 款：

“6 2004 年 7 月 1 日或以後建造的船舶應符合經修正的 1 至 5 款的要求：

.1 第 2 款中新增的.10 項如下：

“.10 自動化系統的設計應確保及時地向航行值班的駕駛員發出推進系統即將或緊急減速或停車的臨界警報，以便值班駕駛員在緊急情況下評估航行狀態。尤其是該系統在為負責航行值班的駕駛員提供人工干預操作機會的同時，應能控制、監測、警示和採取減速或停止推進系統的安全行動，除非手動干預將使主機和/或推進設備在短時間內徹底停車，例如在超速的情況下。” ”

附件 2

經修正的 1974 年國際海上人命安全公約的修正案

第 II–1 章

構造－結構、分艙與穩性、機電設備

1 本章第 A、B 和 B–1 部分的現有的條文代之以下文：

“A 部分

通則

第 1 條

適用範圍

1.1 除另有明文規定外，本章應適用於在 2009 年 1 月 1 日或以後安放龍骨或處於相似建造階段的船舶。

1.2 就本章而言，“*處於相似建造階段*”係指：

.1 可辨認為具體船舶的建造開始的階段；和

.2 包括至少 50 噸或所有結構材料估計質量 1%的該船拼裝已經開始階段，以量小者為準。

1.3 就本章而言：

.1 *建造船舶*係指已安放龍骨或處於相應建造階段的船舶；

.2 *所有船舶*係指在 2009 年 1 月 1 日、以前或以後建造的船舶；

.3 被改建為客船的貨船，無論何時建造，就於開始改裝之日起作為建造客船看待。

.4 *重大改裝和改建*係指，就貨船分艙和穩性而言，影響該船分艙水平的對構造的任何改建。如果貨船經過這種改建，則應證明經過這種修改後該船計算的 A/R 率不低於在改建前該船計算得到的 A/R 率。但是，如果在改建前船舶 A/R 率等於或大於的情況下，則改建後船舶只要 A 值不低於 R 值即可。

2 除另有明文規定外，對於在 2009 年 1 月 1 日以前建造的船舶，主管機關應保證使其符合經 MSC.1（XLV）、MSC.6（48）、MSC.11（55）、MSC.12（56）、MSC.13（57）、MSC.19（58）、MSC.26（60）、MSC.27（61）、1995 年安全公約大會第 1 號決議、MSC.47（66）、MSC.57（67）、MSC.65（68）、MSC.69（69）、MSC.99（73）、MSC.134（76）、MSC.151（78）和 MSC.170（79）決議修正的 1974 年海上人命安全公約第 II–1 章所適用的要求。

3 所有進行過修理、改裝、改建以及與之有關的艏裝的船舶應至少繼續符合這些船舶原先適用的要求。這些船舶，如果是在相關修正案生效之日前建造的，原則上應符合在該日期或以後建造的船舶的要求，至少要達到該船修理、改裝、改建或艏裝之前原來的程度。重大的修理、改裝、改建以及與之有關的艏裝，在主管機關認為合理和可行的範圍內，應符合相關修正案生效之時或以後建造的船舶的要求。

4 一國的主管機關如果考慮到航程的遮蔽性及其條件，認為適用本章的某些具體要求為不合理或不必要時，可對懸掛其國旗、在航程中距離最近陸地不超過 20 海哩的個別船舶或某類船舶免除適用這些要求。

5 若客船承擔大量特種運輸業務，如朝聖的旅客，則這些船舶的船旗國主管機關，如認為實施本章要求不切實際時，可以免除此類船舶適用這些要求，但是他們應完全符合下列規定：

.1 《1971 年特種業務客船協定》所附的規則；和

.2 《1973 年特種業務客船艙室要求議定書》所附的規則。

第 2 條

定義

就本章而言，除另有明文規定外：

1 *船舶分艙長度（L_s）*係指最深分艙吃水限制垂直進水程度的一處或多處甲板或以下的那部分船舶的凸出的最大型長。

2 *中間長度*係指船舶分艙長度的中點。

3 *尾端*係指分艙長度的最後一點。

4 *艏端*係指分艙長度的最前一點。

5 *長度（L）*係指現行的國際載重線公約所定義的長度。

6 *乾舷甲板*係指現行的國際載重線公約所定義的甲板。

7 *首垂線*係指現行的國際載重線公約所定義的首垂線。

8 *船寬（B）*係指船舶在最深分艙吃水線或以下的最大型寬。

9 *吃水（d）*係指船中龍骨線至有關水線的垂直距離。

10 *最深分艙吃水（d_s）*係指與船舶夏季載重線吃水的水線。

11 *空載吃水（d_l）*係指相應於最輕裝載和相關艙容的營運吃水，但包括可能為了穩性或沉浸的壓載吃水。客船應包括船上所有旅客和船員全部到位在編。

12 *部分分艙吃水（d_p）*係指空載吃水加空載吃水與最深分艙吃水之差值的 60%。

13 *縱傾*係指首吃水和尾吃水之間的差異，這種吃水分別是從首部和尾部量得，不考慮龍骨的任何傾斜。

14 某一處所的*滲透率（μ）*係指該處所能被水佔領的容積與浸沒容積之比。

15 *機器處所*係指由船型基線至界限並介於兩段主橫向水密艙壁間供安裝主輔推進機械及推進所需的鍋爐、發電機和電動馬達的艙室。對於特殊佈置的船舶，主管機關可以確定機器處所的界限。

16 *風雨密*係指在任何海況下，水都不會滲入船舶。

17 *水密*係指材料和佈置能夠在完整和破損情況下防止任何方向水在水壓下通過。在破損情況下，水的壓頭是按最壞的情況得平均值來考慮，包括期間進水階段。

18 *設計壓力*係指在設計中假定為水密的每一構造或設備能在完整性和破壞穩性計算的靜水壓力。

19 *艙壁甲板*對於客船係指主艙壁和船殼水密船型分艙長度（L_s）任何點的最高甲板，和在本章第 8 條和 B–2 部分所定義的破損情況下的任何浸水階段乘客和船員撤離不會受浸水妨礙的最低甲板。隔壁甲板可能是游步甲板。在貨船中，乾舷甲板可作為艙壁甲板。

20 *載重量*係指船舶在重力為 1.025 的海水中，相當於所勘劃的夏季載重線的排水量與該船空載排水量之差，以噸計算。

21 *空載排水量*係指船舶艙內沒有貨物、燃油、潤滑油、壓載水、淡水、鍋爐給水和易耗物料，且無旅客、船員及其行李時的排水量，以噸計算。

22 *油輪*係指經 1973 年防止船舶造成污染國際公約 1978 年議定書附則 1 第 1 條所定義的油輪。

23 *滾裝客船*係指備有滾裝貨物處所或第 II–2/3 條所定義的特殊類型處所的客船。

24 *散貨船*係指第 XII/1.1 條所定義的散貨船。

25 *龍骨線*係指平行於穿過船舶中上的龍骨斜坡線經過：

.1 就金屬船殼的船舶而言，在中心線的龍骨頂部或者船殼內側與龍骨的交叉線，如果條形龍骨延伸至該線以下；或

.2 木質和混合結構船舶的垂直距離從龍骨槽口的下緣量起。如船中截面較低部分形成空洞，或裝有加厚的護板時，則設垂直距離是從船底的平坦部分向內延伸線與船中中心線相交之點量起。

26 *船中*係指艙舶長度（L）的中間點。

第 3 條

有關 *C*、*D* 和 *E* 部分的定義

除非另有明文規定，就 C、D 和 E 部分而言：

1 *操舵裝置控制系統*係指用以將舵令由駕駛室傳至操舵裝置動力設備的一套設備。操舵裝置控制系統由發送器、接收器、液壓控制泵及其相聯的電動機、電動機控制器、管系和電纜組成。

2 *主操舵裝置*係指在正常航行情況下為駕駛船舶而使舵產生動作所必需的機械，舵執行器、操舵動力設備（如設有）以及附屬設備和對舵杆施加扭矩的設施（如舵柄或舵扇）。

3 *操舵裝置動力設備*係指：

.1 如為電動舵機，係指電動機及其相聯的電氣設備；

.2 如為電動液壓舵機，係指電動機和其相聯的電氣設備以及與電機相連接的泵；

.3 如為其他液壓舵機，係指驅動機及其相連接的泵。

4 *輔助操舵裝置*係指如主操舵裝置有故障時，為駕駛船舶所必需的設備，它不屬於主操舵裝置的任何部分，但不包括舵柄、舵扇或作同樣用途的部件。

5 *正常操作和可居住條件*係指船舶作為一個整體，其機器、設施、保證推進的輔助設備、操舵能力、安全航行、消防和浸水安全、內外通信聯絡和信號、脫險通道和應急救生艇絞車，以及設計的舒適居住條件均處於正常工作和發揮效用的狀態。

6 *緊急狀態*係指由於主電源發生故障以致正常操作和居住條件所需的設施均處於工作失常的狀態。

7 *主電源*係指向主配電板供電以分配給保持船舶正常操作和居住條件所必需的一切設施的電源。

8 *癱船狀態*係指由於缺少動力，致使主推進裝置、鍋爐和輔機不能運轉的狀態。

9 *主發電站*係指主電源所在處所。

10 *主配電板*係指由主電源直接供電並將電能分配給船上各種設施的配電板。

11 *應急配電板*係指主電源供電系統發生故障情況下，由應急電源或臨時應急電源直接供電，並將電能分配給應急用途的配電板。

12 *應急電源*係指主電源的供電發生故障情況下，用來向應急配電板供電的電源。

13 *動力執行系統*係指提供動力以轉動舵杆的液壓設備，由一個或幾個操舵動力設備，連同相聯的管系和附件以及舵執行器所組成。各個動力執行系統可共用一些機械部件，即舵柄、舵扇和舵杆或同樣用途的部件。

14 *最大營運前進航速*係指船舶在最大航海吃水情況下保持海上營運的最大設計航速。

15 *最大後退速度*係指船舶在最大航海吃水情況下用設計的最大後退功率估計能夠達到的速度。

16 *機器處所*係指一切 A 類機器處所和一切包含推進機械、鍋爐、燃油裝置、蒸汽機和內燃機、發電機和主要電動機械、加油站、冷藏機、防搖裝置、通風機和空調機械的其他處所和類似處所以及通往這些處所的圍壁通道。

17 *A 類機器處所*係指包含下列設施的處所以及通往這些處所的圍壁通道：

.1 用作主推進的內燃機；或

.2 非主推進用的合計總輸出功率不小於 375kW 的內燃機；或

.3 任何燃油鍋爐或燃油裝置。

18 *控制站*係指船舶無線電設備、主要航行設備或應急電源所在的處所或火警指示器或火災控制設備集中的處所。

19 *化學品液貨船*係指建造或改建用於散裝運輸任何液體產品的貨船，這些產品已列入：

.1 海上安全委員會以 MSC.4（48）號決議通過的《國際散裝運輸危險化學品船舶構造和設備規則》第 17 章，以下簡稱《國際散化規則》，該規則本組織可能修訂；或

.2 本組織大會以 A.212（VII）決議通過的《散裝運輸危險化學品船舶構造和設備規則》第 VI 章，以下簡稱《散化規則》，該規則已經由本組織修訂或還可能修訂。

其一適用即可。

20 *氣體運輸船*係指建造或改建用於散裝運輸任何液化氣體或其他產品的貨船，這些產品已列入：

.1 海上安全委員會以 MSC.5（48）號決議通過的《國際散裝液化氣體運輸船構造和設備規則》第 19 章，以下簡稱《液化氣船規則》，該規則本組織可能修訂。

.2 本組織以 A.328（IX）號決議通過的《散裝液化氣體運輸船構造和設備規則》第 XIX 章，以下簡稱《液化氣船規則》。該規則已經由本組織修訂或還可能再加以修訂。

其一適用即可。

B 部分

分艙和穩性

第 4 條

通則

1 B–1 至 B–4 部分的破損穩性要求應適用於 80 米船長（L）及以上的貨船和所有客船，不論其長度，但應排除已經表明符合本組織制定的其他文件中分艙和破損穩性規定的那些貨船。

2 主管機關可以接受某一特定船舶或一組船舶的替代方法，如果主管機關認為這些規定至少能達到同樣程度的安全。允許此類替代方法的主管機關應將具體細節通知本組織。

3 船舶應按其擬定的業務性質儘可能作有效的分艙。分艙的程度應視船舶的分艙長度（L_s）和業務而定，對於以客運為主的船舶，最高程度的分艙應與最大船舶分艙長度對應。

4 凡擬裝配足夠密閉的甲板、內殼板或縱艙壁以嚴格限制水的流動者，在計算中對此類結構的有利或不利影響的適當考慮，應經主管機關同意。

B–1 部分

穩性

第 5 條

完整穩性資料

1 所有客船，不論尺寸，和所有船長 24 米及以上的貨船在完工時應作傾斜試驗，並確定其穩性要素。

2 主管機關可以允許某一貨船免除傾斜試驗，但須具有其姐妹船作傾斜試驗所得的基本穩性數據且經主管機關同意認為可由此基本數據求得第 5-1 條要求的所免除船舶的可靠穩性資料。船舶完工時應進行重量檢驗，與從姐妹船獲得的數據相比較，如果船長 160 米或以上的船舶其空船排水量偏差超過 1%，船長 50 米或以下船舶空船排水量偏差超過 2%並用內插法確定中間船長或者空船縱向重心超過 $0.5\%L_s$，則船舶應進行傾斜試驗。

3 如果參考類似船舶的現有數據清楚表明，由於船舶的尺度比例及佈置，在一切可能的裝載情況下具有超過足夠的初穩性高度時，主管機關亦可以允許某一船舶或某一類船舶免除傾斜試驗，特別是專門設計用來運輸散裝液體或礦石的船舶。

4 如果船舶作某種改建以致對提供給船長的穩性資料有實質性影響時，應提供修正的穩性資料。必要時，船舶應重做傾斜試驗。如果預計的偏差超過第 5 段所述的其中一個值，船舶應重做傾斜試驗。

5 對所有客船，定期間隔不超過 5 年，應進行空船重量檢驗，以核查空船排水量和縱向重心的任何變化。與認可的穩性資料相比較，

如果發現或預計空船排水量的偏差超過 2%，或縱向重心的偏差超過 1%L_s 時，則該船應重做傾斜試驗。

6 每艘船舶在其船艏和船艉均應清楚地標註吃水範圍。如果吃水標記的位置不易於識讀或由於特定業務的操作限制使識讀吃水標記較為困難，則船舶也應設置可靠的吃水指示系統，從而可以確定船艏和船艉的吃水。

第 5–1 條

向船長提供的穩性資料

1 使其在各種營運狀態下能以迅速和簡單的方法獲得有關船舶穩性的準確指導。應將穩性資料的一份副本提供給主管機關。

2 這些資料應包括：

.1 確證符合有關完整和破損穩性要求的最小營運穩心高度（GM）對吃水的關係曲線或表格，或者相應的最大許用重心高度（KG）對吃水的曲線或表格，或者與這些曲線等效的其他形式；

.2 有關橫貫注水裝置的操作說明；和

.3 為保持要求的完整穩性和破損後穩性可能需要的其他數據和輔助措施。

3 穩性資料應表明在操作的縱傾範圍超過 L_s 的+/－ 0.5%的情況下各種縱傾的影響。

4 對於必須滿足 B–1 部分穩性要求的船舶，本條第 2 段所述的資料應按照下述方式從分艙指數有關的考慮中確定：與 d_s、d_p 和 d_l 三

種吃水對應的最小要求 GM（或最大許用重心高度 KG）等於用於計算生存因數 "s_i" 的相應裝載情況下的 GM（或 KG 值）。對於中間吃水，所採用的值應分別對通過最深分艙吃水和局部分艙吃水之間和部分載重線和空船營運吃水之間的 GM 值的線性內插法取得。通過保留每一吃水的最小要求 GM 值的最大值或最大許用 KG 值的最小值，來計入完整穩性衡準。如果對不同縱傾計算分艙指數，則應以相同方式確立若干條要求的 GM 曲線。

5 當最小營運初穩心高度（GM）對吃水的曲線或表格不恰當時，船長應確保營運狀態不會偏離研究的裝載條件，或通過計算核驗穩性衡準在這種裝載條件可以得到滿足。

第 6 條

要求的分艙指數 *R*

1 如果按照第 7 條確定的達到的分艙指數 A 不低於按照本條計算所得的要求分艙指數 R，此外如果局部指數 A_s、A_p 和 A_l 就客船而言不低於 0.9R、就貨船而言不低於 0.5R，則船舶分艙可視為足夠。

2 對於適用本章破損穩性要求的所有船舶，提供的分艙程度由下述所要求的分艙指數 R 來確定：

.1 對於船長（L_s）在 100 米以上的貨船：

$$R = 1 - \frac{128}{L_s + 152}$$

.2 對於船長（L_s）在 80 米及以上但不超過 100 米的貨船：

$$R = 1 - \left[1/\left(1 + \frac{L_s}{100} \times \frac{R_0}{1 - R_0}\right)\right]$$

式中 R_0 等於按照第.1 小段的公式計算所得的 R 值。

.3 對於客船：

$$R = 1 - \frac{5000}{L_s + 2.5N + 15225}$$

式中：

N = N_1+2N_2

N_1 = 需要提供救生艇的人數

N_2 = 在 N_1 以外船舶允許載運的人數（包括高級船員和普通船員）。

.4 若營運條件不允許符合本條第 2.3 段的 $N=N_1+2N_2$，且主管機關認為存在的危險程度適當降低，則可以採取一較小的 N 值，但在任何情況下不得小於 $N=N_1+N_2$。

第 7 條

達到的分艙指數 *A*

1 達到的分艙指數 A 通過對第 2 條定義的吃水 d_s、d_p、d_l 的計算所得的局部指數 A_s、A_p、A_l 的相加總和得出，按下式計算：

$$A=0.4A_s+0.4A_p+0.2A_l$$

每一局部指數是對考慮的所有破損情況的影響的總和，應按下式計算：

$$A=\sum p_i s_i$$

式中：

i 表示所考慮的每一個艙或艙組，

P_i 表示所考慮的艙或艙組可能浸水的概率，不考慮第 7–1 條定義的任何水平分艙，

S_i 表示考慮的艙或艙組浸水後的生存概率，包括第 7–2 條定義的任何水平分艙的影響。

2 在計算 A 時，最深分艙吃水和局部分艙吃水應採用水平縱傾。空船營運吃水應採用實際營運縱傾。若在任何營運條件下，與計算所得的縱傾相比較，縱傾變量大於船長（L_s）的 0.5%，則需要對同一吃水但不同的縱傾進行一次或以上 A 的額外計算，以使在所有營運條件下，與用於一次計算的參考縱傾相比較縱傾的差異將小於 L_s 的 0.5%。

3 在確定剩餘穩性曲線的正復原力臂（GZ）時，應採用完整條件下的排水，即採用持續排水計算方法。

4 上述公式所表示的總和應計及整個船舶分艙長度（L_s）範圍內單個艙或兩個或更多相鄰艙的所有浸水情況。在不對稱佈置的情況下，計算得出的 A 值應是對兩邊計算值的平均值，或是明顯得出最不利結果的那邊的值。

5 若設有邊艙，邊艙浸水的所有情況應加入公式所表示的總和中。此外，邊艙或艙組和其相鄰的內側艙或艙組同時浸水的所有情況也應加入總和，但是不包括破損的橫向範圍大於一半船寬（B）的情況。就本條而言，橫向範圍應從船舶內側垂直至最深分艙吃水水平面中心線測量。

6 按照本條進行的浸水計算，僅需要假定船殼只有一處破損和僅

只有一個自由液面。假定的破損垂直範圍為從基線向上擴展至水線以上或更高的任一水密水平分艙。但是，如果一個較小範圍的破損將產生更為嚴重的後果，則應假定為該範圍。

7 如在假定破損範圍內設有管子、導管弄或軸隧，其佈置應做到保證繼續浸水不會擴展到那些假定浸水的艙室以外的其他艙室。但是，如果證實繼續浸水的影響能被容易地控制並且不妨礙船舶安全，則主管機關可允許較小的繼續浸水。

第 7–1 條

因數 P_i 的計算

1 一艙或艙組的因數 P_i 應按照第 1.1 款和第 1.2 款計算，採用下列表示法：

j = 從船艉 1 號區域開始破損的最後端的破損區域號；

n = 破損的相鄰破損區域的數量；

k = 從船殼向中心線計算的某一特定縱向艙壁作為某一破損區域橫向穿透隔離的數量。船殼為 k=0；

x1 = 從 L_s 的後端點至所考慮的區域後端的距離；

x2 = 從 L_s 的後端點到所考慮的區域前端的距離；

b = 計算因數 P_i 所用的縱向界限之間的平均橫向距離船殼板和假定縱板該距離在最深分艙載重線，且等於或與所考慮的縱艙壁所有或部分最外部分相一致。該垂直板的方向應使至船殼板的平均橫向距離最大，但不超過該板和船殼板之間最小距離的兩倍。如果縱艙壁的上端部分

在最深分艙載重線以下，則可假定用於確定 b 的縱板向上延伸至最深分艙水線。在任何情況下，b 不應大於 B/2。

若破損僅涉及單一區域：

$$P_i = p(x1_j,x2_j)\cdot[r(x1_j,x2_j,b_k) - r(x1_j,x2_j+1,b_{k-1})]$$

若破損涉及兩個相鄰區域：

$$P_i = p(x1_j,x2_{j+1})\cdot[r(x1_j,x2_{j+1},b_k) - r(x1_j,x2_{j+1},b_{k-1})]$$
$$- p(x1_j,x2_j)\cdot[r(x1_j,x2_j,b_k) - r(x1_j,x2_j,b_{k-1})]$$
$$- p(x1_{j+1},x2_{j+1})\cdot[r(x1_{j+1},x2_{j+1},b_k) - r(x1_{j+1},x2_{j+1},b_{k-1})]$$

若破損設計三個或三個以上相鄰區域：

$$P_i = p(x1_j,x2_{j+n-1})\cdot[r(x1_j,x2_{j+n-1},b_k) - r(x1_j,x2_{j+n-1},b_{k-1})]$$
$$- p(x1_j,x2_{j+n-2})\cdot[r(x1_j,x2_{j+n-2},b_k) - r(x1_j,x2_{j+n-2},b_{k-1})]$$
$$- p(x1_{j+1},x2_{j+n-1})\cdot[r(x1_{j+1},x2_{j+n-1},b_k) - r(x1_{j+1},x2_{j+n-1},b_{k-1})]$$
$$+ p(x1_{j+1},x2_{j+n-2})\cdot[r(x1_{j+1},x2_{j+n-2},b_k) - r(x1_{j+1},x2_{j+n-2},b_{k-1})]$$

且式中 $r(x1,x2,b0) = 0$

1.1 因數 p（x1,x2）須按照下列公式計算：

總的規範最大破損長度： $J_{max} = 10/33$

分配中的折角點： $J_{kn} = 5/33$

J_{kn} 的累計概率： $P_k = 11/12$

最大絕對破損長度： l_{max} = 60m

在正常分佈末端的長度： L^* = 260m

在 J=0 時概率密度：

$$b_0 = 2\left(\frac{P_k}{J_{kn}} - \frac{1-P_k}{J_{max}-J_{kn}}\right)$$

當 $L_s \le L^*$：

$$J_m = \min\left\{J_{max}, \frac{l_{max}}{L_s}\right\}$$

$$J_k = \frac{J_m}{2} + \frac{1-\sqrt{1+(1-2p_k)b_0 J_m + \frac{1}{4}b_0{}^2 J_m{}^2}}{b_0}$$

$$b_{12} = b_0$$

當 $L_s > L^*$：

$$J_m{}^* = \min\left\{J_{max}, \frac{l_{max}}{L^*}\right\}$$

$$J_k{}^* = \frac{J_m{}^*}{2} + \frac{1-\sqrt{1+(1-2p_k)b_0 J_m{}^* + \frac{1}{4}b_0{}^2 J_m{}^{*2}}}{b_0}$$

$$J_m = \frac{J_m{}^* \cdot L^*}{L_s}$$

$$J_k = \frac{J_k{}^* \cdot L^*}{L_s}$$

$$b_{12} = 2\left(\frac{p_k}{J_k} - \frac{1-p_k}{J_m - J_k}\right)$$

$$b_{11} = 4\frac{1-p_k}{(J_m - J_k)J_k} - 2\frac{p_k}{J_k{}^2}$$

$$b_{21} = -2\frac{1-p_k}{(J_m - J_k)^2}$$

$$b_{22} = -b_{21}J_m$$

無量綱（因次）破損長度：

$$J = \frac{(x2-x1)}{L_s}$$

一艙或艙組的規範長度：

J_n 應以 J 和 J_m 小者計入

1.1.1 若所考慮的艙或艙組的界限均不能與後端點或前端點相重合：

$J \leq J_k$：

$$P(x1,x2) = P_1 = \frac{1}{6}J^2(b_{11}J + 3b_{12})$$

$J > J_k$：

$$P(x1,x2) = P_2 = -\frac{1}{3}b_{11}J_k^3 + \frac{1}{2}(b_{11}J - b_{12})J_k^2 + b_{12}JJ_k - \frac{1}{3}b_{21}(J_n^3 - J_k^3)$$

$$+\frac{1}{2}(b_{21}J - b_{22})(J_n^2 - J_k^2) + b_{22}J(J_n - J_k)$$

1.1.2 若所考慮的艙或艙組的後界限與後端點相重合，或者所考慮的艙或艙組前界限與前端點相重合：

$J \leq J_k$：

$$P(x1,x2) = \frac{1}{2}(P_1 + J)$$

$J > J_k$：

$$P(x1,x2)=\frac{1}{2}(P_2+J)$$

1.1.3 若所考慮的艙或艙組延伸整個分艙長度（L_s）：

P（$x1$, $x2$）= 1

1.2 因數 r（$x1$, $x2$,b）應由下列公式確定：

$$r(x1,x2,b)=1-(1-C)\cdot\left[1-\frac{G}{p\{x1,x2\}}\right]$$

若：

$C = 12\cdot J_b\cdot(-45\cdot J_b+4)$，若

$$J_b=\frac{b}{15\cdot B}$$

1.2.1 若所考慮的艙或艙組延伸整個分艙長度（L_s）：

$$G=G_1=\frac{1}{2}b_{11}J_b^{\,2}+b_{12}J_b$$

1.2.2 若所考慮的艙或艙組的界限均不能與後端點或前端點相重合：

$$G=G_2=-\frac{1}{3}b_{11}J_0^{\,3}+\frac{1}{2}(b_{11}J-b_{12})J_0^{\,2}+b_{12}JJ_0$$，若

$$J_0=\min\{J,J_b\}$$

1.2.3 若所考慮的艙或艙組的後界限與後端點相重合，或者所考慮的艙或艙組的前界限與前端點相重合：

$$G=\frac{1}{2}\cdot\{G_2+G_1\cdot J\}$$

第 7–2 條

因數 S_i 的計算

1 一艙或艙組的假定浸水的每種情況的系數 S_i 應按照下列表示法和本條有關規定來確定。

“θ_e”係指在任何浸水階段的平衡傾斜角，以度表示；

“θ_v”係指復原力臂變為負數在任何浸水階段的角度，或者一不能被關閉成風雨密的開口被淹沒的角度；

“GZ_{max}”係指最大正復原力臂（米）至 θ_v 角；

“範圍”係指從 θ_e 角測量的正復原力臂的範圍（度數）。正範圍應直至 θ_v 角；

“浸水階段”係指在浸水過程中任何間斷步驟，包括在達到最後平衡前的平衡前階段。

1.1 對於在初始裝載情況的任一破損情況的因數 S_i，“d_i”應從下列公式中取得：

$$S_i = \text{minimum}\{S_{intermediate,i} \text{ or } S_{final,i} \cdot S_{mom,i}\}$$

式中：

“$S_{intermediate,i}$”係指在最後平衡階段前所有中間浸水階段的生存概率，並應按照第 2 段計算；

“$S_{final,i}$”係指在最後平衡浸水階段的生存概率。其應按照第 3 段計算；

“$S_{mom,i}$”係指船舶傾斜的生存概率，應按照第 4 段計算。

2 系數“$S_{intermediate,i}$”只適用於客船（對於貨船系數“$S_{intermediate,i}$”應作為單元）且應為包括平衡前階段（如有的話）在內的所有浸水階段所得到的最小 s 因數，並應按下述計算：

$$S_{intermediate,i} = \left[\frac{GZ_{max}}{0.05} \cdot \frac{Range}{7}\right]^{\frac{1}{4}}$$

若“GZ_{max}”沒有大於 0.05 米且“範圍”未超過 7 度。如果中間傾斜角超過 15 度則 $S_{intermediate,i} = 0$。若需要橫貫浸水裝置，則平衡所需時間不應超過 10 分鐘。

3 系數“$S_{final,i}$”應從下述公式取得：

$$S_{final,i} = K \left[\frac{GZ_{max}}{0.12} \cdot \frac{Range}{16}\right]^{\frac{1}{4}}$$

式中：

“GZ_{max}”不大於 0.12 米；

“範圍”不大於 16 度；

$K = 1$ 如果 $\theta_e \leq \theta_{min}$

$K = 0$ 如果 $\theta_e \geq \theta_{max}$

$K = \sqrt{\frac{\theta_{max} - \theta_e}{\theta_{max} - \theta_{min}}}$ 否則；

式中：

“θ_{min}”對客船為 7 度，對貨船為 25 度，且

“θ_{max}”對客船為 15 度，對貨船為 30 度。

4 系數“$S_{mom,i}$”只適用於客船（對貨船而言系數“$S_{mom,i}$”應作為單元）且應在最終平衡狀態下從下列公式計算得出：

$$S_{mom,i} = \frac{(GZ_{max} - 0.04) \cdot Displacement}{M_{heel}}$$

式中：

“排水”係指在分艙吃水的完整排水；

“M_{heel}”係指按照第 4.1 小段計算所得的最大假定傾斜力矩；和

$S_{mom,i} \leq 1.0$

4.1 傾斜力矩“M_{heel}”應按下列計算：

M_{heel} = maximum {$M_{passenger}$；M_{wind}；$M_{survivalcraft}$}

4.1.1 “$M_{passenger}$”係指乘客移動所導致的最大假定傾斜力矩；並按下列所取得：

$M_{passenger}$ =（0.075·Np）·（0.45·B）（tm）

式中：

“Np”對應所考慮的最深分艙吃水在營運條件下船上所允許裝載的最大乘客數；和

“B”係指船舶的橫樑。

或者，為計算橫傾力矩，假定乘客按照每平米 4 人分佈在集合站所載的各層甲板的一舷可供站立的甲板區域，且其產生最不利的橫傾力矩。這樣的話，則可以假定每一乘客的重量為 75kg。

4.1.2 “M_{wind}”係指在破損情況下所作用的最大假定風力。

$$M_{wind} = （P \cdot A \cdot Z）/9806（tm）$$

式中：

$P = 120N/m^2$

A = 水線以上突出的邊側區域

Z = 水線以上突出邊側區域中間至 T/2 的距離

T = 船舶吃水，d_i

4.1.3 “$M_{survivalcraft}$”係指在船舶一舷滿載降放所有的吊架降落式救生艇筏時所產生的最大假定橫傾力矩。應採用下述假設來計算：

.1 假定船舶破損後位於船舶傾斜一舷的所有救生艇和救助艇，均滿載懸掛於舷外並準備降放；

.2 對從存放位置滿載降落佈置的救生艇，應考慮在降落過程中的最大橫傾力矩；

.3 假定船舶破損後位於傾斜一舷的每個吊架上均吊有滿載的吊架降落式救生筏，救生筏已懸掛於舷外並準備降放；

.4 不在懸掛於舷外的救生設備內的人員不增加傾側力矩或復原力矩；

.5 位於船舶傾斜相反一舷的救生設備假定為處於存放位置。

5 應符合有效佈置使不對稱浸水降至最小程度。如必需校正大橫傾角時，所採用的方法應儘可能是自動的，但在任何情況下，當設有控制平衡裝置的設備時，此項設備應能在艙壁甲板以上操作。這些裝

置連同其控制設備應為主管機關接受。關於使用平衡裝置的相關資料應提供給船長。

5.1 參與平衡的液艙和艙室應設置空氣管或具有充足橫截面的等效裝置以確保不會延遲水流入平衡艙室的進程。

5.2 在任何情況“S_i”取值為 0，若考慮下沉，橫傾和縱傾後的最終水線浸沒：

.1 某些開口的下緣，通過該開口可能發生繼續浸水，且這些浸水並未在計算“S_i”系數時計入。這些開口應包括空氣管、通風筒和以風雨密門或艙口蓋關閉的開口；和

.2 根據第 II–2 章被認為是水平撤離路線的客船艙壁甲板的任何部分。

5.3 “S_i”應取值為 0，若考慮下沉、橫傾和縱傾，在任何中間浸水階段或最終浸水階段中發生任一下列情況：

.1 浸沒擬符合第 II–2 章的艙壁甲板上任何垂直逃生艙口；

.2 用於水密門操作的任何控制裝置、平衡裝置或用於保持艙壁甲板上方水密艙壁完整性的管子閥或通風管變為無法通達或無法操作；

.3 浸沒穿過位於造成達到指數 A 破損情況的任一艙室中水密界限的管子或通風管的任何部分，若沒有在每一界限裝設水密關閉裝置。

5.4 但是，若由於繼續浸水假定艙室浸水被計入破損穩性中，則為計算“$S_{intermediate,i}$”的多項值可以假設在額外浸水階段的平衡。

5.5 除第 5.3.1 款另有規定，通過水密人孔蓋和平面艙蓋關閉的開口、小型水密艙口蓋、遙控操作的滑動水密門、非打開型舷窗以及需要在海上航行中保持關閉的水密出入門和艙口蓋，可以不需要考慮。

6 若水平水密界限裝設在所考慮的水線以上，則對水線以下的艙或艙組其 s 值應以第 1.1 款確定的值按照第 6.1 款乘以表示水平分艙以上處所不浸水的概率的縮減系數 v_m 求得。

6.1 系數 v_m 應按下列公式求得：

$$v_m = v(H_{j,n,m},d) - v(H_{j,n,m-1},d)$$

式中：

$H_{j,n,m}$ 係指基線以上的最小高度（米），並處於第 m^{th} 水平界限的 $x_{1(j)} \ldots x_{2(j+n-1)}$ 的縱向範圍內，假設該界限是限制所考慮的破損艙室的浸水垂直範圍。

$H_{j,n,m-1}$ 係指基線以上的最小高度（米），並處於第（m－1）th 水平界限的 $x_{1(j)} \ldots x_{2(j+n-1)}$ 的縱向範圍內，假設該界限是限制所考慮的破損艙室的浸水垂直範圍。

“j”表示所考慮的破損艙室的後端點；

“m”表示從所考慮的基線向上數的每一個水平界限；

“d”係指第 2 條定義的當前吃水；和

“x_1”和“x_2”表示第 7－1 條所考慮的艙或艙組的端點。

6.1.1 系數 $v(H_{j,n,m},d)$ 和 $v(H_{j,n,m-1},d)$ 應從下列公式取得：

$v(H,d) = 0.8\frac{(H-d)}{7.8}$，如果（$H_m$ - d）小於或等於 7.8 米

$v(H,d) = 0.8 + 0.2\left[\frac{(H-d)-7.8}{4.7}\right]$，在所有其他情況下

式中：

$v(H_{j,n,m},d)$應取值為 1，如果 H_m 與船舶最上層的水密界限重合，且在（$x1_{(j)}$ ...$x2_{(j+n-1)}$）範圍內，及

$v(H_{j,n,0},d)$ 應取值為 0。

無論如何，v_m 取值不應小於 0 或大於 1。

6.2 一般而言，每一指數 A 的輔助 dA 在水平分隔的情況下由下列公式取得：

$$dA = p_i \cdot [v_1 \cdot s_{min1} + (v_2 - v_1) \cdot s_{min2} + \cdots + (1 - v_{m-1}) \cdot S_{min\,m}]$$

式中：

v_m = v 值按照第 6.1 段計算

S_{min} = 當假定破損從假定破損高度 H_m 向下延伸時，對所取得的破損各種相加值的最小系數 “s”

第 7–3 條

滲透率

1 就本規定的分艙和破損穩性計算而言，每一通常艙室或某艙室的一部分的滲透率應按以下規定：

處所	滲透率
儲物處所	0.60
起居處所	0.95
機器處所	0.85
空艙處所	0.95
液體處所	0 或 0.95[1]

[1] 取其導致更加嚴格要求者

2 就本規定的分艙和破損穩性計算而言，每一貨物艙室或某一艙室部分的滲透率應按以下規定：

處所	吃水 d_s 處的滲透率	吃水 d_p 處的滲透率	吃水 d_l 處的滲透率
乾貨處所	0.70	0.80	0.95
集裝箱處所	0.70	0.80	0.95
滾裝貨物處所	0.90	0.90	0.95
液體貨	0.70	0.80	0.95

3 如果有計算支持也可以使用其他滲透率數字。

第 8 條

客船穩性的特殊要求

1 擬載運 400 名或以上乘客的客船應具備防撞艙壁後水密分艙，以便在計算分艙指數所基於的三種裝載條件下及發生從首垂線量起 0.08L 以內的所有艙室的破損時，S_i=1。

2 擬載運 36 名或以上乘客的客船應能夠承受沿着船側板至第 3 款所述範圍內的破損。通過證明在計算分艙指數所基於的三種裝載條件下，第 7–2 條定義的 “S_i” 不小於 0.9，即認為符合本條規定。

3 若證明符合第 2 款，假定的破損程度將同時取決於第 6 條定義的 N 和第 2 條定義的 L_s，例如：

.1 垂直破損範圍從船型基線延伸至高出第 2 條定義的最深分艙吃水位置 12.5 米的位置處，若較小的垂直破損範圍給出一個較低的 “s_i” 值，在這種情況下，可以採用該減小的程度。

.2 若載運 400 名或以上乘客，則可以在沿着船側板任何位置假設 $0.03L_s$ 破損長度，但不小於 3 米，連同 0.1B 的船內滲水，但是從船內側量起至最深分艙吃水水平面中心線的垂直距離不應小於 0.75 米。

.3 若載運乘客少於 400 名，則可以在沿着橫向水密艙壁之間的船殼板的任何位置假設破損長度，但是兩個相鄰橫向水密艙壁之間的距離不應小於假設的破損長度。若兩個相鄰橫向水密艙壁之間的距離小於假設的破損長度，則就證明符合第 2 款規定，只有一個這樣的艙壁可被視為有效。

.4 如載運 36 名乘客，則可假設 $0.015L_s$ 不小於 3 米的破損長度，連同 0.05B 的船內滲水，但不小於 0.75 米。

.5 若載運 36 名以上 400 名以下乘客，則用於確定假設破損範圍的破損長度和船內滲水的值，應通過對適用於第.4 項和第.2 項所述的載運 36 名乘客以上 400 名以下乘客的破損長度和滲水值之間線形插入取得。

B–2 部分

分艙、水密和風雨密完整性

第 9 條

客船和液貨船以外的貨船的雙層底

1 雙層底的設置應在適合船舶設計及船舶正常作業要求的情況下儘量自防撞艙壁延伸至尾尖艙艙壁。

2 如需要設置雙層底時，其內底應延伸至船舷兩側，以保護船底至舭部彎曲處。此項保護如能使內底在任何部分都不低於平行於龍骨線的平面，且其位於距龍骨線量起不小於 h 垂直距離處，即認為滿意。有關垂直距離 h 由下列公式計算得到：

$$h=B/20$$

但是，無論如何“h”值不得小於 760mm，也無需大於 2000mm。

3 設於雙層底內且與貨艙排水裝置連接的小阱，不應對於向下延伸至所需的深度，但可以准許軸隧後端的阱延伸至外底。其他的阱（如主機下的潤滑油阱），如其佈置具有等效於本條要求的雙層底的保護作用，則經主管機關同意可予設置。無論如何，此阱阱底至與龍骨線重合的平面的垂直距離不得小於 500mm。

4 對於包括大小適度的乾艙在內的水密艙，當該船的船底或船側破損時不妨礙船舶的安全時，可不設雙層底。

5 適用第 1.5 條規定且在第 III/3.22 條定義的短程國際航行範圍內從事定期運輸的客船，如主管機關認為在該部分設置雙層底將與船舶設計和船舶正常作業不相適應時，其可允許免設雙層底。

6 根據本條第 1 段、第 4 段或第 5 段沒有設置雙層底的客船或貨船的任何部分應能夠承受在船舶該部分發生的第 8 段所述的底艙破損。

7 對於客船或貨船的特殊船底佈置，應證明該船能夠承受第 8 段所述的船底破損。

8 通過證明假定在沿着船底的任何位置出現底艙破損時，若按照第 7－2 條計算，“s_i”在所有營運情況下不小於 1.0，且受影響的船舶部分的程度如下述.2 所述，則可符合第 6 款或第 7 款的要求。

.1 這些處所的浸水不得使該船其他部分的應急電源、照明、內部通訊、信號或其他應急裝置癱瘓。

.2 假設破損範圍如下：

	距船舶首垂線的 *0.3L* 處	**船舶任何其他部分**
縱向範圍	$1/3L^{2/3}$ 或 14.5 米，取小者	$1/3L^{2/3}$ 或 14.5 米，取小者
橫向範圍	B/6 或 10 米，取小者	B/6 或 5 米，取小者
從龍骨線量起的垂直範圍	B/20 或 2 米，取小者	B/20 或 2 米，取小者

.3 如果破損範圍小於第.2 所述的最大破損範圍但其將會導致更加嚴重的狀況，則此破損應予以考慮。

9 對於具有大的低艙的客船，主管機關可以要求增加雙層底高度，但從龍骨線量起不得超過 B/10 或 3 米，取小者。或者，按照第 8 款可以對這些區域進行底艙破損計算，但是應假設增加了的垂直範圍。

第 10 條

水密艙壁的構造

1 每一水密分艙艙壁，無論橫向或縱向，其構造應具有第 2.17 條所述的船材尺度。在任何情況下，水密分艙艙壁應至少能夠支持高達艙壁甲板的水頭壓力。

2 水密艙壁上的階層及壁凹均應與其所在地方的艙壁具有同等強度。

第 11 條

水密艙壁等的初次試驗

1 對於不擬用於裝載液體的水密處所和用於裝載壓載水的貨艙，灌水試驗並非強制。若不進行灌水試驗，則應儘可能進行沖水試驗。此項試驗應在船舶舾裝工作的最後階段進行。若由於對機械、電子設備絕緣或舾裝設備可能的損壞而使沖水試驗不可行，則可以對焊接連接件仔細的檢查，如必要輔之以染色滲透試驗、聲納滲漏試驗或等效試驗等方法進行代替。無論如何，都應對水密艙壁進行徹底的檢查。

2 首尖艙、雙層底（包括箱形龍骨）及內側殼板均應以相當於第 10.1 條要求的水頭作試驗。

3 供裝載液體並是船舶水密分艙組成部分的艙櫃，應以相當於其設計壓力的水頭作密閉性和結構強度的試驗。在任何情況下，水頭不得低於空氣管頂部或該艙頂以上 2.4 米的高度，取其大者。

4 本條第 2 段和第 3 段所述的試驗，其目的是確保分艙結構佈置的水密，並非作為該艙用作儲藏燃油或其他特殊用途的適應性的試驗。對此項適應性試驗，可按照液體進入艙內或其連接部分的高度，要求作較嚴格的試驗。

第 12 條

尖艙及機器處所的艙壁、軸隧等

1 船舶應設有水密高達艙壁甲板的防撞艙壁。此艙壁應位於距首垂線不小於 0.05 船長或 10 米處（取小者）；且除非經主管機關許可，不大於 0.08 船長或 0.05 船長加 3 米（取大者）。

2 如船舶水線以下的任何部分自首垂線向前延伸，例如球鼻首，則應從下列任一點來測量第 1 段所規定的距離：

.1 此類延伸的長度中點；

.2 首垂線前端船長的 0.015L 處；或

.3 首垂線前端的 3 米處；

取最小者。

3 艙壁可以有階層或壁凹，但它們須在第 1 段或第 2 段規定的範圍內。

4 在艙壁甲板以下的防撞艙壁內不得設置門、人孔、通道開口、通風管或任何其他開口。

5.1 除第 5.2 款規定外，防撞艙壁在艙壁甲板以下僅可通過 1 根管子來處理首尖艙內的液體，但是該管子應裝設有能在艙壁甲板以上操作的截止閥，其閥體應設於首尖艙內的防撞艙壁上。如果閥位於在所有營運情況下均可到達之處，且其所位於的處所不是貨物處所，則主管機關可以允許該閥設於防撞艙壁的後側。所有閥應為鋼製、青銅或其他經認可的塑性材質。不得採用普通鑄鐵或類似材質的閥。

5.2 如果首尖艙被分隔用來裝載兩種不同的液體，主管機關可允許防撞艙壁在艙壁以下穿過 2 根管子，每根管子均應按照第 5.1 款的要求進行設置，但應使主管機關確信除裝設第二根管子外無其他切實可行辦法，且認為首尖艙內增加的分艙仍能保持船舶安全。

6 如果船舶設有長的前部上層建築，則防撞艙壁應風雨密地延伸至艙壁甲板的上一層甲板。此延伸部分不必直接設於下面艙壁之上，但其須位於第 1 款或第 2 款規定的範圍內（第 7 款允許的情況除外），且形成階層的甲板部分應有效地風雨密。此延伸部分的佈置應避免在首門發生破損或脫落時，對其造成損壞的可能性。

7 當設有首門且裝貨斜坡道形成艙壁甲板以上的防撞艙壁的延伸部分時，坡道全長範圍內都應風雨密。就貨船而言，高出艙壁甲板 2.3 米的坡道部分可從第 1 款或第 2 款規定的範圍向前延伸。不符合上述要求的坡道不應視為防撞艙壁的延伸。

8 乾舷甲板以上防撞艙壁延伸處的開口數量，應在適應船舶設計和正常作業的情況下減至最少。所有這類開口應能夠關閉成風雨密。

9 應設置艙壁將機器處所與前後貨物和居住處所隔開，該艙壁應水密延伸至艙壁甲板。就客船而言，還應設置尾尖艙艙壁，該艙壁應水密延伸至艙壁甲板。但是，只要不降低船舶分艙的安全程度，尾尖艙艙壁可在艙壁甲板下方作成階層。

10 在任何情況下，在適當容積的一個水密處所或多個水密處所內的尾管應封閉。就客船而言，尾填料函壓蓋應裝設在水密軸隧內或與尾管艙室分開的其他水密處所內，且該處所的容積，在尾填料函壓蓋滲漏而浸水時，將不致淹沒艙壁甲板。就貨船而言，經主管機關酌定

可以採取其他措施，使在尾管佈置受損的情況下向船內滲水的危險減少到最小程度。

第 13 條

客船艙壁甲板以下水密艙壁上的開口

1 水密艙壁上的開口數量應在適應船舶設計和正常工作作業的情況下減至最少，這些開口均應備有可靠的關閉設備。

2.1 凡管子、排水管和電纜等通過水密艙壁時，應設有保證艙壁水密完整性的裝置。

2.2 不是構成管系組成部分的閥門不得設在水密艙壁上。

2.3 鉛或其他易熔材料，不得用於穿過水密艙壁的管系上，因為發生火災時這種管系的損壞將會損害艙壁的水密完整性。

3 分隔相鄰貨艙之間的水密橫艙壁上不得設有門、人孔和出入口，但本條第 9.1 段和第 14 條規定除外。

4 除第 10 段規定外，在主、輔推進機械，包括推進所需的鍋爐的處所內，其每一水密艙壁上，除通往軸隧的門外，只准設置 1 扇門。如裝有 2 根或更多的軸，其軸隧之間應設有一個互通的連接通道。若裝設 2 根軸隧者，在機器處所與軸隧間僅准設 1 扇門；如裝設 2 根軸以上者，則只准設 2 扇門。所有這類門均應為滑動式，且應設置於使其門檻儘可能高之處。艙壁甲板上方操縱這些門的手柄應設置在機器處所以外。

5.1 除本條第 9.1 段和第 14 條規定外，水密門應為符合本條第 7 段規定的動力式滑動門，當船舶正浮時，應能從駕駛室的總控制台於 60 秒內同時關閉這些門。

5.2 任何動力式滑動水密門的操縱裝置，無論是動力式還是手動式，均應能在船舶向任一舷橫傾至 15° 的情況下將門關閉。還應考慮當水從開口處涌入時，在門的任一側受到一個相當於在門的中心線處門檻以上至少 1 米高度的靜水壓頭的作用力。

5.3 水密門的操縱裝置，包括液壓管路和電纜，應可能靠近裝置該門的艙壁，以儘量減少當船舶遭受破損時此類裝置也被損壞的可能性。船舶在按照第 2 條定義的船寬的 1/5 範圍內可能遭受到破損，該距離在最深分艙吃水平面上向中心線垂直量計。水密門與其操縱裝置的設置定位，應能使位於船舶破損部分以外的水密門的操縱不受妨礙。

6 所有動力式滑動水密門應配備指示器，它們在遙控操縱位置上能顯示出這些門的開啟或關閉。遙控操縱位置只能位於本條第 7.1.5 款要求的駕駛室內和本條第 7.1.4 款要求的艙壁甲板上方的手動操縱位置處。

7.1 每一動力式滑動水密門：

.1 應為豎動式或橫動式；

.2 除根據本條第 10 款外，一般應限制門的最大淨開口寬度為 1.2 米。僅當考慮船舶有效操作需要時，主管機關可允許設更寬的門，但應考慮採取包括下列措施在內的其他安全措施：

.1 應特別考慮門的強度及其關閉設備，以防滲漏；

.2 門應位於 B/5 的破損區域之內；

.3 應配置必要的設備，使用電力、液壓或主管機關可接受的其他形式的動力開啟和關閉門；

.4 應設置一套單獨的手動機械裝置，其應能從門的任一側用手開啟和關閉該門。此外還應能在艙壁甲板上方可到達之處，用全周旋轉搖柄轉動或主管機關認為具有同樣安全程度的其他動作關閉該門。旋轉的方向或其他動作的方向應在所有操縱位置上清楚地予以標明。當船舶正浮時，用手動裝置操作將門完全關閉所需的時間不應超過 90 秒鐘。

.5 應設置從門的兩側用動力開啟和關閉門的控制裝置。還應在駕駛室設置從總控制台用動力關閉該門的控制裝置。

.6 應設置一個與該區域內其他警報器不同的聲音警報器，當該門用動力遙控關閉時，這種警報器在門開始移動前至少 5 秒但不超過 10 秒鐘發出音響，且連續發生報警直至該門完全關閉。在手動遙控操作的情況下只要當門移動時音響警報器能發出音響就足夠了。此外，在旅客區域和高環境噪聲區域，主管機關可以要求為聲音報警器增配一個裝在門上的間歇發光信號器；和

.7 用動力關閉門時，關閉速率應大致均勻。當船舶正浮時，從門開始移動至門完全關閉的時間，在任何情況下應不少於 20 秒，但也不應大於 40 秒。

7.2 動力式滑動水密門要求的電源應由應急配電板直接供電，或由位於艙壁甲板上方的專用配電板供電。有關的控制裝置、指示器和報警電路也應由應急配電板直接供電或由位於艙壁甲板上方的專用配

電板供電，且當主電源或應急電源發生故障時，能自動地由第 42.3.1.3 款要求的臨時應急電源供電。

7.3 動力式滑動水密門應具有：

.1 配備兩套獨立動力源的一個集中液壓系統，每一動力源由一台能同時關閉所有門的馬達和泵組成。此外，整個裝置的液壓蓄能器應有足夠的能量，在不利的 15° 橫傾時至少能操作所有的門 3 次，即關閉－開啟－關閉。這個操作循環應能夠在蓄能器處於泵為其加壓時進行。所選用的液體應考慮該裝置工作時可能遇到的溫度。該動力操作系統的設計應使液壓管路中由單一故障而影響 1 扇以上門的操作的可能性降至最小。該液壓系統應配有用於動力操作系統儲液箱的低液位報警器和低壓報警器或其他能監測液壓儲能器內能量損耗的有效裝置。這些報警器應是聲響的或可視的，並且應裝置在駕駛室內的集中控制台上；或

.2 為每扇門配備一套獨立液壓系統，該系統具有能開啟和關閉該門的馬達和泵組成的動力源。此外，還應設有一個有足夠能量的液壓儲能器，在不利的 15° 橫傾時至少能操作該門 3 次，即關閉－開啟－關閉。這個操作循環應能夠在儲能器處於泵為其加壓時進行。所選用的液體應考慮該裝置工作時可能遇到的溫度。在駕駛室的集中控制台上應設置一組低壓報警器或其他能監測液壓儲能器內能量損耗的有效裝置。在每個就地操作位置處還應設置儲藏能量損耗的指示器；或

.3 為每扇門配備一套獨立電力系統，該系統具有一台能開啟和關閉該門的馬達組成的動力源。該動力源在主電源或應急電源發生故障時應能自動地由第 42.4.2 款要求的臨時應急電源供電，且具有足夠的能量，在不利的 15° 橫傾時至少能操作該門 3 次，即關閉－開啟－關閉。

對於第 7.3.1 款、第 7.3.2 款和第 7.3.3 款所規定的系統，應符合下列要求：動力式水密滑動門的動力系統應和任何其他動力系統分開。電力或液壓動力操作系統（不包括液壓執行器）中的某一故障應不妨礙任何門的手動操作。

7.4 控制手柄應裝設在艙壁的兩側地板以上至少 1.6 米的高處，並且其佈置應使要通過該門的人員能在開啟位置控制兩側手柄，而防止操作時意外地啟動動力關閉裝置。開啟和關閉門時手柄的運動方向應與門移動的方向一致，並且應清楚地予以標明。

7.5 水密門的電器設備和部件應儘可能設置於艙壁甲板以上及危險區域和處所之外。

7.6 必須裝設在艙壁甲板以下的電器部件的外殼應具有防止水進入的保護功能。

7.7 電源、控制裝置、指示器和報警電路應被保護以防止故障，即某一扇門的電路中的故障不應引起任何其他門的電路發生故障。一扇門的報警器或指示器電路的短路或其他故障不應導致該門喪失動力操作。其佈置應使位於艙壁甲板以下的電器設備一旦受到水的滲入不會導致門的開啟。

7.8 動力式滑動水密門的動力操作系統或控制系統中的某一電器故障不應導致一扇關閉的門被開啟。應連續監視電路中儘可能靠近第 7.3 款要求的每一台電機的一點上電源供電的有效性。任何這種供電失效時，應在駕駛室的集中控制台上發出音響和圖像報警。

8.1 駕駛室內的集中控制台應有一個“控制模式”開關，它具有兩套控制模式：一套是“就地控制”模式，其應允許任何門不經使用自動關閉裝置而能被就地開啟和就地關閉，另一套是“關閉門”模式，其應自動關閉任何開啟着的門。該“關閉門”模式應自動關閉開啟着的門。該“關閉門”模式應准許門被就地開啟，而當脫開就地控制機械時應能自動重新關閉該門。“控制模式”開關一般應處於“就地控制”模式。“關閉門”模式應僅在緊急情況下或為試驗的目的才使用。應特別重視“控制模式”開關的可靠性。

8.2 駕駛室內的總控制台應設有指明每扇門位置的圖，並附有發光指示器以顯示出每扇門是開啟的還是關閉的。紅燈應表示為一扇門完全開着，而綠燈應表示一扇門被完全關閉。當門被遙控關閉時，紅燈應以閃光表示門處於中間的位置。指示器電路應與每扇門的控制電路相分開。

8.3 應不可以從總控制台遙控開啟任何一扇門。

9.1 如果主管機關認為有必要，則在甲板處所間分隔貨物的水密艙壁上可裝設適當構造的水密門。此類門可以是鉸鏈式、滾動式或滑動式，但不能是遙控的。它們應裝在最高處並應儘可能遠離船殼板，但無論如何其垂直外邊不得位於距船殼板小於按照第 2 條定義的船寬的 1/5 處，此距離是在最深分艙吃水水平面上向縱中剖面方向垂直量計。

9.2 此類門如果在航行中可以通達，則其應配備裝置，防止其被擅自開啟。如擬裝置此類門時，其數量及佈置均應經主管機關特殊考慮。

10 可移式平板門不允許裝在艙壁上，但在機器處所內除外。主管機關可以允許在每一個水密艙壁上設一扇寬度超過第 7.1.2 款規定的動力式滑動水密門取代這些可移動式平板門，但這些門在航行中應保持關閉，但在緊急情況下船長酌定必需者除外。此類門不需滿足第 7.1.4 款關於在 90 秒之內用手動操作裝置完全關閉門的要求。

11.1 凡由船員艙室通至鍋爐艙的圍壁通道或隧道，或用作管子或任何其他用途的圍壁通道或隧道，如穿過水密艙壁，它們應為水密，並應符合第 16–1 條的要求。在航行中用作通路的每一圍壁通道或隧道，至少其一端的出口須通過保持水密到足夠高度的圍壁並使能由艙壁甲板以上出入。圍壁通道或隧道的另一端出入口，可經過一水密門，其型號按其所在位置決定。此類圍壁通道或隧道不得通過在防撞艙壁後的第一個分艙艙壁。

11.2 凡擬裝設穿過水密艙壁的隧道時，應經主管機關的特殊考慮。

11.3 如果連接冷藏貨物處所和通風設備的圍壁通道或被吃水圍壁穿過一個以上水密艙壁時，此類開口的關閉裝置應由動力操作，且應能從位於艙壁甲板以上的集中控制位置處將其關閉。

第 13–1 條

貨船水密艙壁和內部甲板上的開口

1 水密分艙上的開口數量應在適合船舶設計和船舶正常作業的情況下減至最小限度。凡出入口、管子、通風管道、電纜必須通過水密艙壁和內部甲板時，應作出保持水密完整性的佈置。主管機關可以允

許放鬆對乾舷甲板以上開口的水密性要求，但應證明可以容易地控制逐步浸水且不會妨礙船舶安全。

2 用於保證在航行中使用的內部開口的水密完整性的門應為滑動水密門，其能夠從駕駛室遙控關閉並也能從艙壁每側就地操作。在控制位置應設置指示器顯示門開啟或關閉狀態，且在門關閉時應提供聲音報警。在主電源發生故障時，電源、控制和指示器應可以操作。特別要注意將控制系統故障的影響減至最低。每扇動力操作的滑動水密門應配備一單獨的手動操作機械裝置。應可以從門的兩側用手開啟或關閉該門。

3 通常在海上關閉，其目的是保證內部開口的水密完整性的通道門和通道艙口蓋應就地和在駕駛室配備表明這些門或艙口蓋開啟或關閉的指示裝置。每扇這樣的門或艙口蓋應附貼一個通告牌，說明其不得敞開。

4 如主管機關認為水密門或坡道是必須的，則可以設置適當構造的此類門或坡道，以便對大的貨物處所進行內部分艙。這些門或坡道可為鉸鏈式、滾動式或滑動式，但不應為遙控。這些門或坡道如果在航程中是可以到達的，則應裝有裝置防止未經授權的開啟。

5 為保證內部開口水密完整性而在海上保持永久關閉的其他關閉裝置，應在每個裝置上附貼一個通告牌，說明其必須保持關閉。對裝有緊密螺栓蓋子的人孔則無需這樣標明。

第 14 條

載運貨車和隨車人員的客船

1 本條適用於為載運貨車和隨車人員而設計或改建的客船。

2 若這些船上包括隨車人員在內的旅客總數不超過 $12+A_d/25$，其中 A_d 等於用來裝載貨車處所的甲板總面積（平方米）及裝載車輛處和這類處所入口的淨高不低於 4 米，則關於水密門第 13.9.1 條和第 13.9.2 條的規定應適用，但這些門可以設置在分隔裝貨處所的水密艙壁的任何高度上。此外，要求在駕駛室設置指示器以自動顯示何時每扇門關閉和何時所有門閂已扣緊。

3 如果根據本條規定設置了水密門，則船舶不得核准搭載比第 2 款假定人數更多的旅客。

第 15 條

客船艙壁甲板和貨船乾舷甲板以下船殼板上的開口

1 船殼板上的開口數量應在適合船舶設計及船舶正常作業的情況下減至最少限度。

2 船殼板開口的關閉設備的佈置及效用應與其擬定的用途及設置的位置相適應，且一般應經主管機關同意。

3.1 除非根據現行《國際載重線公約》的要求，舷窗的佈置應使舷窗窗檻不得低於平行於艙壁甲板的邊線，且其最低點在最深分艙吃水以上的船寬 2.5%處或 500 毫米，取其大者。

3.2 第 3.1 段允許，凡舷窗窗檻在客船艙壁甲板和貨船乾舷甲板以下者，其構造應能有效地防止任何人未經船長許可而予開啟。

4 所有舷窗均應裝設有效的內部鉸鏈舷窗蓋，其佈置應能便利和有效地關閉和緊固成水密，但在距首垂線 1/8 船長以後，且在平行於艙壁甲板邊線，其最低點在最深分艙吃水以上 3.7 米加 2.5%所繪的線以上者，則除統艙外的乘客艙室的舷窗蓋可為可移式的，但按照現行

《國際載重線公約》要求需固定在相應位置者除外。這些可移式舷窗蓋應存放於其所屬的舷窗附近。

5.1 凡專供載貨或裝煤的處所內不得設置舷窗。

5.2 供交替載貨或載客的處所，可設置舷窗。但是其構造須能有效地防止任何人未經船長許可而打開舷窗或舷窗蓋。

6 除經主管機關特准外，不應在客船艙壁甲板和貨船乾舷甲板以下的船殼板上設置自動通風舷窗。

7 船殼板上的流水口、衛生排泄口和其他類似開口，應採取每個排水口供儘可能多的衛生水管及其他管道共用或以其他適當的辦法減至最少數量。

8.1 船殼板上的所有進水孔和排水孔均應裝設防止海水以外進入船內的有效並可到達的裝置。

8.2.1 除根據現行《國際載重線公約》的要求，且除第 8.3 段規定外，凡客船艙壁甲板和貨船乾舷甲板以下處所穿過船殼板的每一獨立排水孔，應設有一個自動止回閥，此閥應具有由艙壁甲板以上將其關閉的可靠裝置，或者代以兩個無此項關閉裝置的自動止回閥，其較高者應設置在最深分艙吃水以上且能在營運狀態下隨時到達查驗。如果設置具有可靠關閉裝置的閥，其在艙壁甲板以上的操作位置應是隨時易於到達，並應備有指示閥門開啟或關閉的裝置。

8.2.2 現行《國際載重線公約》的要求應適用於從客船艙壁甲板和貨船乾舷甲板以上處所穿過船殼板的排水孔。

8.3 機器處所和與機械操作相關的主、輔海水進水孔及排水孔，應在管系與船殼板之間或管系與附着於船殼板的組合箱之間設置易於接近的閥門。在有人的機器處所內，閥門可以就地控制，並應配有表明其開啟或關閉的指示器。

8.4 穿過最深分艙吃水以下船殼板的移動部分應裝設主管機關認可的水密封閉裝置。內側的壓蓋應位於水密處所內，且其容積如果浸水不會導致艙壁甲板被淹沒。主管機關可以要求若此類艙室浸水，基本或應急電源和照明、內部通訊、信號或其他應急裝置仍須在船舶其他部分獲得。

8.5 本條規定的所有船殼板裝置和閥門均須用鋼、青銅或其他批准的延性材料製造，不得使用普通鑄鐵或類似的材料。本條所述的所有管系應為鋼制或主管機關同意的其他等效材料。

9 客船艙壁甲板和貨船乾舷甲板以下設置的舷門、裝貨口和燃油口應為水密，且其設置在任何情況下均不得使其最低點在最深分艙吃水以下。

10.1 每一出灰管、垃圾管等的內側開口應裝有有效的蓋子。

10.2 如內側開口位於客船艙壁甲板和貨船乾舷甲板以下，此蓋應為水密，此外應在最深分艙吃水以上易於到達的位置裝設一自動止回閥。

第 15–1 條

貨船上的外部開口

1 所有通向在破損分析中假定為完整的且位於最終破損水線以下的艙室的外部開口，應是水密的。

2 根據第 1 款要求為水密的外部開口，除貨艙蓋外，應在駕駛室設有指示器。

3 在限制垂向破損範圍的甲板以下船殼板上的開口，如果在航程中可以接近，則應設置防止未經授權開啟的裝置。

4 為保證外部開口水密完整性而在海上保持永久關閉的其他關閉裝置，應在每個裝置上附貼一個通告牌，說明其必須保持關閉。對裝有緊密螺栓蓋子的人孔則無需這樣標明。

第 16 條

水密門、舷窗等的構造和初次試驗

1 一切船舶：

.1 本條所述的一切水密門、舷窗、舷門、裝貨口、閥門、管子、出灰管和垃圾管的設計、材料和構造均應經主管機關同意。

.2 此類閥門、門和機器應予適當標識，以確保可以恰當使用它們而提供最大限度的安全。

.3 豎動式水密門的門框，其底部不得有可能積聚污穢的槽，以免妨礙門的正常關閉。

2 客船和貨船的水密門應作他們在最後或中間浸水階段可能承受的水頭的水壓試驗。如果由於絕緣或艙裝設備可能的破損而沒有對個別門進行試驗，個別門的試驗可以由每一種類和尺寸的門的原型壓力試驗取而代之，但試驗壓力起碼要與預定位置所要求的水頭相對應。原型試驗應在安裝門之前進行。在船上設置門的安裝方法和程序應與

原型試驗相對應。當在船上設置後，應對艙壁、門框和門之間的恰當位置予以核查。

第 16–1 條

水密甲板、圍壁通道等的構造和初次試驗

1 水密甲板、圍壁通道、隧道、箱形龍骨及通風管道，均應於在同一高度的水密艙壁具有同等的強度。作成水密的措施以及關閉其開口所作的裝置，須經主管機關同意。水密通風管道及圍壁通道應至少向上延伸至客船的艙壁甲板和貨船的乾舷甲板。

2 如穿過某一結構的通風管道穿過艙壁甲板，根據第 7–2 條，在計入各中間浸水階段許用的最大橫傾角後，該通風管道應能承受可能出現於其中的水壓。

3 如果艙壁甲板的穿透結構全部或部分位於滾裝主甲板之上，該通風管道應能夠承受滾裝甲板積水的內部水運動（晃動）引起的衝擊壓力。

4 在完工以後，水密甲板應作沖水或灌水試驗，而水密圍壁通道、隧道和通風管道則作沖水試驗。

第 17 條

艙壁甲板以上客船內部水密完整性

1 主管機關可要求採取一切合理和可行的措施，以限制海水在艙壁甲板以上的進入及漫流。此類措施可包括裝設局部艙壁或桁材。當局部水密艙壁和桁材裝於水密艙壁上方或緊靠其附近的艙壁甲板上時，應與水密船殼板和艙壁甲板連接，以使在船舶破損傾斜的情況下限制海水沿甲板漫流。如局部水密艙壁與其下方的艙壁錯開，則兩者

間的艙壁甲板應作成有效的水密。若開口、管子、排水口、電纜等經過局部水密艙壁或艙壁甲板浸沒部分的甲板時，應作出佈置以確保艙壁甲板以上結構的水密完整性。

2 露天甲板上的所有開口應設有足夠高度和強度的圍板，並須設有能迅速關閉成風雨密的有效設備。應按需要，裝設排水口、欄杆和流水口，以便在任何氣候情況下能迅速排除露天甲板上的積水。

3 在上層建築內終止的空氣管開口端應在船舶橫傾至 15° 或至各中間浸水階段的最大橫傾角時（由直接計算確定，取其大者）至少高於水線 1 米。或者，除油艙以外的其他艙櫃的空氣管殼可通過上層建築的側面排氣。本款的規定不妨礙現行《國際載重線公約》的規定。

4 在艙壁甲板以上船殼板上的舷窗、舷門、裝貨門和燃油門及其關閉開口的其他裝置，應就其所裝設的處所及其相對於最深分艙吃水的位置，作有效設計和構造，並應具有足夠的強度。

5 在艙壁甲板以上的第一層甲板以下處所內所有舷窗，應備有有效的內側舷窗蓋，其佈置須能易於有效地關閉，並緊固成水密。

第 17–1 條

滾裝客船的船體與上層建築的完整性、破損預防和控制

1.1 除非根據第 1.2 段和第 1.3 段，所有通向艙壁甲板以下處所的通道口的最低口至少應高於艙壁甲板 2.5 米。

1.2 如設有通至艙壁甲板以下處所的車輛坡道，則其開口的關閉應能夠保持風雨密，以防止從下面進水，並能向駕駛室作出報警和顯示。

1.3 主管機關可以允許為船上的某些必需的工作（如機器和儲藏品的移動）設置通向艙壁甲板以下處所的特別通道，但是該通道應作成水密，並能在駕駛室作出報警和顯示。

2 駕駛室內應配有所有波門、裝貨門和主管機關認為在未加關閉和正確繫固時會導致特種處所或滾裝裝貨處所浸水的其他關閉設施的指示器。指示器系統應按故障保險原則設計，如果門未完全關閉或任何繫固裝置未就位或未完全鎖閉，則以可視報警顯示；如果此種門或關閉設備成開啟狀態或繫固裝置鬆開，指示器應以聲音報警指示。在駕駛室的指示器板上應設有“港口/海上航行”模式選擇功能，並被佈置成：如在船舶離港時首門、內門、尾坡道或任何其他波門未關閉或任何關閉裝置沒有位於正確位置，則會在駕駛室發出聲音報警。指示器系統的電源應獨立於操作和繫固門的供電。

3 應設有電視監視與水滲漏探測系統，以便向駕駛室與機艙控制站指示通過內、外首門、尾門或任何其他波門可能導致特種處所或滾裝裝貨處所浸水的任何漏水信息。

第 B–3 部分

客船分艙載重線的勘定

第 18 條

客船分艙載重線的勘定、繪劃與記載

1 為了保持所要求的分艙程度，應在船舶兩舷勘定並繪劃對應於所核准的分艙吃水的載重線。若船舶用於交替操作模式，如船舶所有人請求，可以勘定和繪劃一個或數個主管機關核准的交替營運狀態的分艙吃水的附加載重線。每一核准的營運狀態應符合本章第 B–1 部分的要求，獨立於其他營運模式下取得的結果。

2 所勘定和繪劃的分艙載重線應載入客船安全證書，並以 P1 表示主要載客狀態和 P2、P3 等分別表示交替狀態。主要載客狀態應被作為所要求的分艙指數 R 將達到最高值的營運模式。

3 對應於每一載重線的乾舷，應按照現行的《國際載重線公約》確定的乾舷在同一位置上並從同一甲板進行測量。

4 對應於每一經核准的分艙載重線乾舷以及對其所核准的營運條件，均應清楚地記載在客船安全證書中。

5 在任何情況下，任何分艙載重線均不得繪劃在按照船舶強度或現行《國際載重線公約》所確定的海水中最深載重線以上。

6 不論分艙載重線標誌的位置如何，船舶的裝載均不得使按照現行《國際載重線公約》所確定的適合於所在季節和區域的載重線標誌淹沒於水中。

7 船舶的裝載，當其在海水中時，概不得將適合於該特定航次和營運狀態得分艙載重線淹沒於水中。

第 B–4 部分

穩性管理

第 19 條

破損控制資料

1 清晰地表明各層甲板及貨艙的水密艙室界限、其中的開口及其關閉裝置和控制裝置的位置和用來校正浸水傾斜的裝置，以供值班高級船員參考。此外，還應給船上高級船員提供載有上述資料的小冊子。

2 在航行中允許敞開的客船水密門應在船舶穩性資料中予以清楚記載。

3 所包括的一般預防措施應包括主管機關認為在正常船舶操作情況下保持水密完整性所必需的設備、狀態和操作程序清單。

4 所包括的具體預防措施應包括主管機關認為對船舶、旅客和船員生存至關重要的要素清單（如關閉、貨物繫固、報警聲響等）。

5 對於適用第 B–1 部分的破損穩性要求的船舶，破損穩性資料應向船長提供在一艙室或一組艙室破損的所有情況下簡便且易於掌握的評估船舶倖存性的方法。

第 20 條

客船裝載

1 在完成船舶裝載並在其啟航之前，船長應確定船舶縱傾和穩性，也查明並記載船舶符合相關規定的穩性標準。確定船舶的穩性應通過計算得出。主管機關可以在這方面接受使用電子裝載和穩性計算機或等效裝置。

2 壓載水原則上不能裝載在燃油艙內。對於不能避免在燃油艙裝水的船舶，則應設置經主管機關同意的油水分離設備，或者應提供處理含油壓載水的主管機關可接受的其他替代裝置（如向岸上設施排放）。

3 本條規定不應妨礙現行《國際防止船舶造成污染公約》的規定。

第 21 條

客船水密門等的定期操作和檢查

1 水密門、舷窗、閥門以及流水口、出灰管和垃圾管的關閉機械的操作演習，應每周進行一次。對航程超過一周的船舶，在離港前應進行一次全面的演習，此後在航行中至少每周進行一次。

2 水密艙壁上的一切水密門，無論使鉸鏈操作還是動力操作，凡需在航行中使用，應每天進行操作。

3 水密門及其連接的所有機械和指示器、為使艙室水密必須關閉的一切閥門及為海損控制橫貫連通所必須操作的一切閥門，應在航行中定期檢查，每周至少一次。

4 本條要求的所有演習和檢查的記錄應記入航海日誌，並明確記載所發現的任何缺陷。

第 22 條

防止和控制進水等

1 所有水密門在航行途中應保持關閉，但本條第 3 段和第 4 段所規定的在航行中可以開啟的情況除外。第 13.10 條所允許的機艙處所內寬度大於 1.2 米的水密門僅在該款所述的情況下才可以開啟。任何按照本款開啟的門應可以隨時迅速關閉。

2 船舶在海上航行時，位於艙壁甲板以下、最大淨開口寬度大於 1.2 米的水密門應保持關閉，但是經主管機關確定的絕對必須的有限時段除外。

3 在航行途中為准許旅客或船員通行，或因為在緊靠門的附近作業而必需時，可以開啟水密門。當通過該門的通行已結束或必須開啟門的作業已完成，必須立即關閉該門。

4 僅當認為絕對必要時，即確認開啟某些水密門對船舶機械的安全和有效操作時必需的，或對准許旅客正常不受限制地出入旅客區域是必需的，則可以允許這些水密門在航行途中開啟。這樣的決定應由主管機關在仔細考慮了對船舶操作和生存性的影響之後作出。准許保

持這樣開啟的水密門應清楚地記載於船舶穩性資料中，並應處於可隨時迅速關閉的狀態。

5 在船舶離港前艙壁上可移式平板門應就位並不得被移走，在緊急情況下船長認為必須者除外。應採取必要的預防措施把它們回復原處以保證接縫水密。根據第 13.10 條准許在機艙處所內的動力操作滑動水密門應在船舶離港前關閉，並應在航行中保持關閉，但在緊急情況下船長認為必需者除外。

6 根據第 13.9.1 條設置在分隔甲板夾層貨物的水密艙壁上的水密門應在啟航前關閉，並在航行中保持關閉；在港口開啟這些門和在船舶離港前關閉這些門的時間，均應記載於航海日誌中。

7 設置在艙壁甲板以下的舷門、裝貨門和燃油門應在船舶離港前有效關閉，並緊固成水密，且在航行途中保持關閉。

8 位於艙壁甲板以上的下列門，應在船舶進行任何航行之前關閉並鎖緊，且在船舶到達下一個泊位之前應保持關閉並鎖緊：

.1 外板上或封閉的上層建築圍壁上的裝貨門；

.2 裝在本條第 8.1 款所述位置上的罩式船艏門；

.3 防撞艙壁上的裝貨門；和

.4 作為包括本條第 8.1 款至第 8.3 款定義的門的替代關閉的坡道。

9 如果船舶在停泊時某個門不能開啟或關閉，則在該船靠近或拖離泊位時，該門可以開啟或讓其開着，但應儘可能使該門能迅速被操縱。在任何情況下，船艏內側門必須保持關閉。

10 儘管有本條第 8.1 款和第 8.4 款的要求，當船舶位於安全錨地，若其安全不受妨礙，如因為船舶操作或旅客上下船特殊情況的需要，主管機關可以授權船長酌定開啟特定的門。

11 船長應保證對本條第 8 款所述門的關閉和開啟實施有效的監督和報告制度。

12 在船舶進行任何航行之前，船長應確保把最後關閉本條第 13 款所述門的時間和按照本條第 14 款開啟特定門的時間記錄在航海日誌中。

13 本條款所要求的在航行途中保持關閉的鉸鏈式門、可移式平板門、舷窗、舷門、裝貨門、燃油門和其他開口，應在船舶離港前關閉。關閉和開啟這些開口（如果本條款允許）的時間應記載於主管機關所規定的航海日誌中。

14 甲板夾層第 15.3.2 條所述的任何舷窗的窗檻如位於平行於艙壁甲板邊線之下且其最低點在船舶離港前水面以上船寬的 1.4 米加 2.5%，則在甲板夾層的所有舷窗應在船舶離港之前關閉成水密並鎖緊，且在船舶到達下個港之前不得予以開啟。在適用本款規定時，可視情對淡水留出適當的餘量：

.1 在港口開啟這些舷窗的時間和在船舶離港前關閉並鎖緊它們的時間應記載於主管機關規定的航海日誌中。

.2 如某船浮於其最深分艙吃水，且有一或數個舷窗位置適用第 14 款要求時，主管機關可指明其限制平均吃水，在此吃水時這些舷窗窗檻將高於平行於艙壁甲板邊線所繪的線，其最低點在對應於限制平均吃水的水線以上 1.4 米加 2.5%

船寬，則可在限制吃水的情況下，准許該船離港而不必事先將這類舷窗關閉和鎖緊，在開往下一港口的航程中在海上開啟這些舷窗由船長負責。在現行《國際載重線公約》所定義的熱帶地區內，該限制吃水可增加 0.3 米。

15 如舷窗及其舷窗蓋在航行時位於不能到達的地方，則應在船舶離港前關閉並扣牢。

16 如在第 15.5.2 條所述的此類處所裝載貨物，舷窗及其舷窗蓋應在裝貨前關閉成水密並鎖緊，此項關閉和鎖緊應記載於主管機關規定的航海日誌中。

17 如棄灰管等不用時，第 15.10.2 條要求的蓋子和閥門應保持關閉並扣緊。

第 23 條

滾裝客船的特殊要求

1 特種處所和滾裝貨物處所應不斷得到巡查或以有效手段（如電視監視）不斷得到監控，以便在船舶航行期間能夠探測到車輛在惡劣氣候條件下的任何移動和旅客的擅自進入。

2 關閉和繫固所有波門、裝貨門和主管機關認為在未關閉或未作適當繫固的情況下可能導致特種處所或滾裝貨物處所浸水的其他關閉裝置的書面操作程序，應隨船攜帶並張貼在適當的地方。

3 從滾裝甲板和車輛坡道通向艙壁甲板以下處所的所有通道，在船舶每次離泊開航前，均應關閉，並在船舶抵達下一泊位之前保持關閉。

4 船長應保證對第 3 款所述通道的關閉和開啟實施有效的監督和報告制度。

5 在船舶每次離泊開航前，船長應確保把最後關閉第 3 款所述通道的時間，按照第 22.13 條記載於航海日誌中。

6 儘管有第 3 款的要求，主管機關可允許在航行期間開啟某些通道，但開啟時間應僅限於通行和船舶必需工作所需要的時間。

7 所有能有效控制滾裝甲板上積聚的海水的橫艙壁或縱艙壁在船舶離泊前應就位並固定，並保持到船舶抵達下一個泊位。

8 儘管有第 7 款的要求，主管機關仍可允許在航行期間開啟此種艙壁的一些通道，但開啟時間僅限於通行和船舶必需工作所需要的時間。

9 在所有滾裝客船上，船長或指定的高級船員應確保當船舶在航時，任何旅客未經其明確同意，不得進入封閉的滾裝甲板。

第 24 條

防止和控制貨船的進水等

1 位於限制垂直破損範圍的甲板以下船殼板上的開口在海上時應永久關閉。

2 儘管有第 3 款的要求，若船舶安全不受妨礙，因為船舶操作的需要，主管機關可以授權船長酌定開啟特定的門。

3 為內部分隔大的貨物處所所設置的水密門或車輛坡道應在啟航前關閉，並在航行途中保持關閉；在港口開啟這些門的時間和在船舶離港前關閉它們的時間應記載於航海日誌中。

4 擬用於確保內部開口水密完整性的通道門和艙口蓋的使用，應得到值班高級船員的許可。

第 25 條

散貨船以外的單艙貨船上的水位探測器

1 2007 年 1 月 1 日以前建造的散貨船以外的單艙貨船應不晚於 2009 年 12 月 31 日符合本條的要求。

2 長度（L）小於 80 米或 1998 年 7 月 1 日以前建造的長度小於 100 米的船舶，若乾舷甲板以下為單一貨艙，或在乾舷甲板以下的貨艙沒有至少一堵水密至甲板的艙壁隔開，則應在此類處所裝配水位探測器。

3 第 2 款要求的水位探測器應：

.1 當貨艙內底上方的水位高度達到不小於 0.3m，而且當該水位高度達到不小於貨艙平均深度的 15%時，在駕駛台上給出聲光報警；和

.2 安裝在貨艙的尾端，或安裝在不與設計水線相平行的內底最低部分的上方，如腹板或部分水密艙壁是安裝在內底的上方，主管機關可要求安裝附加的探測器。

4 在符合第 XII/12 規定的船上，或在貨艙每側具有至少自內底板至乾舷甲板長度延伸垂直水密邊艙的船上，第 2 款要求的水位探測器不必安裝。”

C 部分

輪機設備

2 原有的第 35 條之後插入下列新的第 35–1 條：

“第 35–1 條

艙底泵佈置

1 本條適用於 2009 年 1 月 1 日或之後建造的船舶。

2 客船和貨船

2.1 應提供有效的艙底泵系統，泵能從除永久性載運淡水、壓載水、燃油或液體貨物處所以外的任何水密艙室抽水和排水，而在所有實際條件下提供其他有效的泵裝置。應為從冷藏艙排水提供有效的裝置。

2.2 污水泵、壓載泵和普通服務泵可以作為獨立電源艙底污水泵予以接受，但應與艙底泵系統進行必要的連接。

2.3 在煤艙或燃料艙或在鍋爐房或機器處所，包括在油－沉澱櫃和燃油泵所在處所使用的所有艙底管，應為鋼或其他適當的材料。

2.4 艙底泵和壓載泵系統的佈置應能防止水可能從海上或從壓載水處所進入貨物或機器處所，或從一艙進入另一艙。應做出規定在裝貨時，或在裝載壓載水時，防止海水從與艙底和壓載艙連接的任何深艙倒灌。

2.5 所有與艙底泵裝置相連的配電箱和手動操作閥門應在平常的情況下處於易接近的位置。

2.6 應為位於客船艙壁甲板和貨船乾舷甲板上的封閉處所提供排水裝置，但主管機關可允許免除在任何船舶或船舶等級的任何具體艙室安裝排水裝置，如果滿意地認為由於那些處所的大小或有內部分艙，船舶的安全不會因此而受到削弱。

2.6.1 如果乾舷到艙壁甲板或乾舷甲板分別為，當船舶橫傾角大於 5º 時，甲板邊沿被浸沒，對於客船應通過按照第 15 條要求安裝適當尺寸的足夠數量的排水孔將水直接排出船外，而對於貨船，排水孔的進水口和排放口的要求，應符合現行的國際載重線公約。

2.6.2 如果當船舶橫傾角等於或小於 5º 時，乾舷到艙壁甲板或乾舷甲板的邊沿分別被浸沒，則艙壁甲板或乾舷甲板上封閉處所的排水，應分別通向有足夠容量、裝有高水位警報器的適當處所，並備有將水排到船外的適當裝置。此外，還應確保：

.1 排水孔的數量，大小和部署能防止自由溢流的水不合理積聚。

.2 對於乘客船或貨船，本條要求的泵裝置，要能適用於任何固定壓力噴水滅火系統的要求；

.3 含有油或其他危險物質的水不會排到機器處所或可能出現着火源的其他處所；和

.4 當由二氧化碳滅火系統保護的封閉處所，甲板排水孔要安裝防止窒息氣體逃逸的裝置。

3 客船

3.1 第 2.1 款要求的艙底泵系統應能在發生事故後，無論是直立還是縱傾，在各種實際狀況下都能操作。為了這個目的，一般應安裝舷邊進水管，船舶末端的狹窄艙室除外，那裏有一根吸管足矣。在不平常形狀的艙室裏，可能需要附加的吸管。應做出這樣的安排，只要艙室裏有水就能找到通向吸管的路。對於特殊艙室，如果主管機關滿意地認為提供排水管可能不理想，則可允許免除這種規定，只要按照第 7 和第 8 條規定的條件計算，表明船舶的幸存能力不會受到影響。

3.2 至少應安裝三台電力泵與艙底主管連接，其中一台由推進機械驅動。如果艙底泵數量為 30 或更多，則應提供一台附加的獨立電動泵。

艙底泵數量應依下列公式計算：

當 Pi 大於 P 時： 艙底泵數量 $= 72 \cdot \left[\frac{M+2P_1}{V+P_1-P}\right]$

在其他情況下： 艙底泵數量 $= 72 \cdot \left[\frac{M+2P}{V}\right]$

式中：

L = 第 2 條所定義的船舶長度（米）；

M = 第 2 條所定義的在艙壁甲板下面機器處所的容積（立方體米）；外加可以位於內底上方和機器處所的前方或後方的永久性燃油艙；

P = 艙壁甲板下面旅客和船員處所的全部容積（立方體米），這是提供給旅客和船員使用的起居處所，不包括行李間、儲藏間、物料間和郵件房；

V = 艙壁甲板下面船舶的全部容積（立方體米）；

P_1 = KN，

式中：

N = 船舶證書核定的旅客人數；和

K = $0.056L$

但如果 KN 的值大於 P 的總數和艙壁甲板上方實際旅客處所的全部容量，則 P_1 的數字應為總數或 KN 的三分之二，取其大者。

3.3 如果可行，艙底動力泵應置於獨立的水密艙室並應佈置成不會因同樣的破損而進水。如果主推進機器、輔機和鍋爐分佈在兩個或更多的水密艙室，則服務於艙底的泵應儘可能分佈在整個艙室。

3.4 在長度為 91.5 米及以上的船上或按照 3.2 款計算的艙底泵數量為 30 或更多者，應這樣佈置，至少有一台電力艙底泵能使船舶經受各種進水狀態：

.1 所需的艙底泵之一應為半潛式可靠的應急泵，電源位於艙壁甲板上面；或

.2 艙底泵和電源應分佈到整個船舶長度，這樣至少在一個未破損的艙室中有一台泵可用。

3.5 除了可能僅為尖艙提供的附加泵之外，每一台艙底泵應按第 2.1 款要求將任何處所的水排乾。

3.6 每一台電力艙底泵應能以至少 2 米/秒的速度將水泵到主艙底管。位於機器處所的獨立電動艙底泵應有通向這些處所的直接吸管，但在任何一個處所不需要多於兩根吸管。如需要提供兩根或兩根以上吸管，則船舶的每一側至少有一根。主管機關可要求位於其他處所的獨立電動泵配備獨立的直接吸管。直接吸管應適合於其直徑不小於艙底總管要求的機器處所的吸管。

3.7.1 除了直接艙底吸入管或 3.6 段所要求的吸入管外，應備有一根自主循環泵引至機器處所的排水口並安裝有止回閥。這種直接吸管的直徑，對於蒸汽機船應至少為泵吸口直徑的三分之二，而對於內燃機船直接吸管的直徑應與泵吸口的直徑相同。

3.7.2 如果主管機關認為主循環泵不適合此用途，則應有一台直接應急吸入泵自最大的獨立電動泵通向機器處所的排水位置；吸管的直徑應與所使用的泵的入口相同。這樣連接的泵的容量超過主管機關認為滿意的艙底泵的容量。

3.7.3 海水進口和直接吸入閥的閥杆應延伸至機艙平台的上方。

3.8 所有與泵相連的艙底吸管應獨立於其他管線。

3.9 艙底主管線的直徑 d 應依照下列公式計算。但艙底主管線的實際內徑可以取至最接近於主管機關可接受的標準尺寸的整數。

$$d = 25 + 1.68\sqrt{L\ (B + D)}$$

式中：

d 是艙底主要部分的內徑（毫米）；

L 和 *B* 是第 2 條所定義的船的長度和寬度（米）；和

D 是到艙壁甲板的船舶型深（米），但按照 2.6.2 款要求在艙壁甲板有封閉貨物處所的內排水和艙壁甲板延伸到船舶全長的船舶，*D* 應量至該艙壁甲板上面的下一個甲板。當封閉的貨物處所涵蓋較小長度，則 *D* 應量至艙壁甲板型深加上 *lh/L*，其中 l 和 h 分別是貨物處所的合計長度和高度（米）。

艙底管的直徑應達到主管機關的要求。

3.10 應做出規定，一旦由於碰撞或擱淺造成管子嚴重受損或其他損害，防止由任何艙底吸管服務的艙室的水進入任何其他艙室。為此目的，如果管子的任何部分位於船側靠近船寬的五分之一（如第 2 條所定義的並量至與最深分艙載重線的中心線成直角的位置），或在管龍骨上，應在含有開敞端點處所的管子上安裝一個止回閥。

3.11 與艙底泵系統相連的分流盒、旋塞和閥門應這樣佈置，一旦發生進水，艙底泵可在任何艙室操作；另外，泵或其與以船寬五分之一處劃的一條線上的艙底外側總管連接的管子的損害，應不會使艙底系統不工作。如果那兒只有一個通向所有泵的公用管系，必須有能從艙壁甲板上方操作的控制艙底吸管的

閥門。如果除了主艙底泵系外還備有應急艙底泵系的話，則應獨立於主系統，並應按 3.1 款的規定佈置成，泵在任何艙室進水的條件下能操作；在那種情況下，只需要打開能從艙壁甲板上方操作的應急系統的閥門。

3.12 在第 3.11 段提到的能從艙壁甲板上面操作的所有旋塞和閥門，應在操作的地方清晰地表明其控制範圍，並備有表明其是開啟還是關閉的指示裝置。

4 貨船

至少應提供兩台電動泵與主艙底系統相連，一台可由推進機械驅動。如果主管機關滿意地認為船舶的安全不會受到損害，艙底泵裝置可以與具體的艙室分開。”

第 II–2 章

構造—防火、探火和滅火

第 4 條－引燃的可能性

3 在 5.2.4 款中，參考“第 II–1/25–9.2 條”改為參考“第 II–1/13–1.2 條”。

第 10 條－滅火

4 在第 2.2.4.1.2 款中，參考“第 II–1/21 條”改為參考“第 II–1/35–1 條”。

第 20 條－車輛處所、特種處所和滾裝處所的保護

5 在第 6.1.4.1.3 款中，參考“第 II–1/21 條”改為參考“第 II–1/35–1 條”，和在第 6.1.4.2 款中，參考“第 II–1/22 條”改為參考“第 II–1/5–1 條”。

第 VI 章
貨物運輸

第 7 條－散裝貨物的裝卸和積載

6 在第 2.1 款中，參考“第 II–1/22 條”改為參考“第 II–1/5–1 條”。

第 IX 章
船舶安全營運管理

第 1 條－定義

7 在第 3 款中，參考“第 II–1/2.12 條”改為參考“第 II–1/2.22 條”。

第 XI–1 章
加強海上保安的特殊措施

第 2 條－加強檢驗

8 參考“第 II–1/2.12 條”改為參考“第 II–1/2.22 條”。

9 在原有的第 3 條之後增加下列新的第 3 - 1 條：

“第 3–1 條

公司和註冊船東的識別號

1 本條適用於第 I 章所適用的船舶的公司和註冊船東。

2 就本條而言，註冊船東應為由主管機關規定的和按第 IX/1 條定義的公司。

3 每一公司和註冊船東應備有符合本組織通過的 IMO 獨特公司和註冊船東的識別機制的識別號。

4 公司識別號應插入按 IX/4 條和國際船舶和港口設施保安規則第 A/19.2 或 A/19.4 節簽發的證書和證書副本中。

5 本條將於 2009 年 1 月 1 日或以後簽發或更換第 4 款中提到的證書時生效。”

第 5 條－連續概要記錄

10 在第 3 款第一句的“信息”之後，插入下列內容：

“（在 2009 年 1 月 1 日或以後簽發或更新證書時，連續概要記錄應含有 3.7 和 3.10 款提到的信息）”；

並在新的.7 和.10 項中插入下列內容：

“.7 註冊船東識別號；”和

“.10 公司識別號；”。

11 在第 3 款中，原有的.7 和.8 項重新編號為.8 和.9，而原有的.9 到.13 項重新編號為.11 到.15 項。

第 XI–2 章

加強海上保安特殊措施

第 1 條－定義

12 在 1.6 款中，參考“第 II–1/2.12 條”改為參考“第 II–1/2.22 條”。

附錄

證書

客船安全證書的格式

13 在 2.1.3 款的表中，在以“茲證明：”字樣開始的一節，參考“第 II–1/13 條”改為參考“第 II–1/18 條”。

RESOLUTION MSC.194(80)

(adopted on 20 May 2005)

AMENDMENTS TO THE INTERNATIONAL CONVENTION FOR THE SAFETY OF LIFE AT SEA, 1974, AS AMENDED

THE MARITIME SAFETY COMMITTEE,

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

RECALLING FURTHER article VIII(b) of the International Convention for the Safety of Life at Sea (SOLAS), 1974 (hereinafter referred to as "the Convention"), concerning the amendment procedure applicable to the Annex to the Convention, other than the provisions of chapter I thereof,

HAVING CONSIDERED, at its eightieth session, amendments to the Convention, proposed and circulated in accordance with article VIII(b)(i) thereof,

1. ADOPTS, in accordance with article VIII(b)(iv) of the Convention, amendments to the Convention, the text of which is set out in the Annexes to the present resolution;

2. DETERMINES, in accordance with article VIII(b)(vi)(2)(bb) of the Convention, that:

(a) the said amendments set out in Annex 1 shall be deemed to have been accepted on 1 July 2006; and

(b) the said amendments set out in Annex 2 shall be deemed to have been accepted on 1 July 2008,

unless, prior to that date, more than one third of the Contracting Governments to the Convention or Contracting Governments the combined merchant fleets of which constitute not less than 50% of the gross tonnage of the world's merchant fleet, have notified their objections to the amendments;

3. INVITES SOLAS Contracting Governments to note that, in accordance with article VIII(b)(vii)(2) of the Convention:

(a) the amendments set out in Annex 1 shall enter into force on 1 January 2007; and

(b) the amendments set out in Annex 2 shall enter into force on 1 January 2009,

upon their acceptance in accordance with paragraph 2 above;

4. REQUESTS the Secretary-General, in conformity with article VIII(b)(v) of the Convention, to transmit certified copies of the present resolution and the text of the amendments contained in the Annexes to all Contracting Governments to the Convention;

5. FURTHER REQUESTS the Secretary-General to transmit copies of this resolution and its Annexes to Members of the Organization, which are not Contracting Governments to the Convention.

ANNEX 1

AMENDMENTS TO THE INTERNATIONAL CONVENTION FOR THE SAFETY OF LIFE AT SEA, 1974, AS AMENDED

CHAPTER II-1

CONSTRUCTION – STRUCTURE, SUBDIVISION AND STABILITY, MACHINERY AND ELECTRICAL INSTALLATIONS

PART A
GENERAL

Regulation 2 – Definitions

1 The following new paragraph 14 is added after the existing paragraph 13:

"14 *Bulk carrier* means a bulk carrier as defined in regulation XII/1.1".

PART A-1
STRUCTURE OF SHIPS

2 The existing text of part A-1 is replaced by the following:

"PART A-1
STRUCTURE OF SHIPS

Regulation 3-1
Structural, mechanical and electrical requirements for ships

In addition to the requirements contained elsewhere in the present regulations, ships shall be designed, constructed and maintained in compliance with the structural, mechanical and electrical requirements of a classification society which is recognized by the Administration in accordance with the provisions of regulation XI-1/1, or with applicable national standards of the Administration which provide an equivalent level of safety.

Regulation 3-2
Corrosion prevention of seawater ballast tanks in oil tankers and bulk carriers

(This regulation applies to oil tankers and bulk carriers constructed on or after 1 July 1998)

All dedicated seawater ballast tanks shall have an efficient corrosion prevention system, such as hard protective coatings or equivalent. The coatings should preferably be of a light colour. The scheme for the selection, application and maintenance of the system shall be approved by the Administration, based on the guidelines adopted by the Organization. Where appropriate, sacrificial anodes shall also be used.

Regulation 3-3
Safe access to tanker bows

1 For the purpose of this regulation and regulation 3-4, tankers include oil tankers as defined in regulation 2, chemical tankers as defined in regulation VII/8.2 and gas carriers as defined in regulation VII/11.2.

2 Every tanker shall be provided with the means to enable the crew to gain safe access to the bow even in severe weather conditions. Such means of access shall be approved by the Administration based on the guidelines developed by the Organization.

Regulation 3-4
Emergency towing arrangements on tankers

1 Emergency towing arrangements shall be fitted at both ends on board every tanker of not less than 20,000 tonnes deadweight.

2 For tankers constructed on or after 1 July 2002:

.1 the arrangements shall, at all times, be capable of rapid deployment in the absence of main power on the ship to be towed and easy connection to the towing ship. At least one of the emergency towing arrangements shall be pre-rigged ready for rapid deployment; and

.2 emergency towing arrangements at both ends shall be of adequate strength taking into account the size and deadweight of the ship, and the expected forces during bad weather conditions. The design and construction and prototype testing of the emergency towing arrangements shall be approved by the Administration, based on the Guidelines developed by the Organization.

3 For tankers constructed before 1 July 2002, the design and construction of emergency towing arrangements shall be approved by the Administration, based on the Guidelines developed by the Organization.

Regulation 3-5
New installation of materials containing asbestos

1 This regulation shall apply to materials used for the structure, machinery, electrical installations and equipment covered by the present Convention.

2 For all ships, new installation of materials which contain asbestos shall be prohibited except for:

.1 vanes used in rotary vane compressors and rotary vane vacuum pumps;

.2 watertight joints and linings used for the circulation of fluids when, at high temperature (in excess of 350°C) or pressure (in excess of 7×10^6 Pa), there is a risk of fire, corrosion or toxicity; and

.3 supple and flexible thermal insulation assemblies used for temperatures above 1,000°C.

Regulation 3-6
Access to and within spaces in, and forward of, the cargo area of oil tankers and bulk carriers

1 Application

1.1 Except as provided for in paragraph 1.2, this regulation applies to oil tankers of 500 gross tonnage and over and bulk carriers, as defined in regulation IX/1, of 20,000 gross tonnage and over, constructed on or after 1 January 2006.

1.2 Oil tankers of 500 gross tonnage and over constructed on or after 1 October 1994 but before 1 January 2005 shall comply with the provisions of regulation II-1/12-2 adopted by resolution MSC.27(61).

2 Means of access to cargo and other spaces

2.1 Each space shall be provided with means of access to enable, throughout the life of a ship, overall and close-up inspections and thickness measurements of the ship's structures to be carried out by the Administration, the company, as defined in regulation IX/1, and the ship's personnel and others as necessary. Such means of access shall comply with the requirements of paragraph 5 and with the Technical provisions for means of access for inspections, adopted by the Maritime Safety Committee by resolution MSC.133(76), as may be amended by the Organization, provided that such amendments are adopted, brought into force and take effect in accordance with the provisions of article VIII of the present Convention concerning the amendment procedures applicable to the Annex other than chapter I.

2.2 Where a permanent means of access may be susceptible to damage during normal cargo loading and unloading operations or where it is impracticable to fit permanent means of access, the Administration may allow, in lieu thereof, the provision of movable or portable means of access, as specified in the Technical provisions, provided that the means of attaching, rigging, suspending or supporting the portable means of access forms a permanent part of the ship's structure. All portable equipment shall be capable of being readily erected or deployed by ship's personnel.

2.3 The construction and materials of all means of access and their attachment to the ship's structure shall be to the satisfaction of the Administration. The means of access shall be subject to survey prior to, or in conjunction with, its use in carrying out surveys in accordance with regulation I/10.

3 Safe access to cargo holds, cargo tanks, ballast tanks and other spaces

3.1 Safe access to cargo holds, cofferdams, ballast tanks, cargo tanks and other spaces in the cargo area shall be direct from the open deck and such as to ensure their complete inspection. Safe access to double bottom spaces or to forward ballast tanks may be from a pump-room, deep cofferdam, pipe tunnel, cargo hold, double hull space or similar compartment not intended for the carriage of oil or hazardous cargoes.

3.2 Tanks, and subdivisions of tanks, having a length of 35 m or more, shall be fitted with at least two access hatchways and ladders, as far apart as practicable. Tanks less than 35 m in length shall be served by at least one access hatchway and ladder. When a tank is subdivided by one or more swash bulkheads or similar obstructions which do not allow ready means of access to the other parts of the tank, at least two hatchways and ladders shall be fitted.

3.3 Each cargo hold shall be provided with at least two means of access as far apart as practicable. In general, these accesses should be arranged diagonally, for example one access near the forward bulkhead on the port side, the other one near the aft bulkhead on the starboard side.

4 Ship structure access manual

4.1 A ship's means of access to carry out overall and close-up inspections and thickness measurements shall be described in a Ship structure access manual approved by the Administration, an updated copy of which shall be kept on board. The Ship structure access manual shall include the following for each space:

.1 plans showing the means of access to the space, with appropriate technical specifications and dimensions;

.2 plans showing the means of access within each space to enable an overall inspection to be carried out, with appropriate technical specifications and dimensions. The plans shall indicate from where each area in the space can be inspected;

.3 plans showing the means of access within the space to enable close-up inspections to be carried out, with appropriate technical specifications and dimensions. The plans shall indicate the positions of critical structural areas, whether the means of access is permanent or portable and from where each area can be inspected;

.4 instructions for inspecting and maintaining the structural strength of all means of access and means of attachment, taking into account any corrosive atmosphere that may be within the space;

.5 instructions for safety guidance when rafting is used for close-up inspections and thickness measurements;

.6 instructions for the rigging and use of any portable means of access in a safe manner;

.7 an inventory of all portable means of access; and

.8 records of periodical inspections and maintenance of the ship's means of access.

4.2 For the purpose of this regulation "critical structural areas" are locations which have been identified from calculations to require monitoring or from the service history of similar or sister ships to be sensitive to cracking, buckling, deformation or corrosion which would impair the structural integrity of the ship.

5 General technical specifications

5.1 For access through horizontal openings, hatches or manholes, the dimensions shall be sufficient to allow a person wearing a self-contained air-breathing apparatus and protective equipment to ascend or descend any ladder without obstruction and also provide a clear opening to facilitate the hoisting of an injured person from the bottom of the space. The minimum clear opening shall not be less than 600 mm x 600 mm. When access to a cargo hold is arranged through the cargo hatch, the top of the ladder shall be

placed as close as possible to the hatch coaming. Access hatch coamings having a height greater than 900 mm shall also have steps on the outside in conjunction with the ladder.

5.2 For access through vertical openings, or manholes, in swash bulkheads, floors, girders and web frames providing passage through the length and breadth of the space, the minimum opening shall be not less than 600 mm x 800 mm at a height of not more than 600 mm from the bottom shell plating unless gratings or other foot holds are provided.

5.3 For oil tankers of less than 5,000 tonnes deadweight, the Administration may approve, in special circumstances, smaller dimensions for the openings referred to in paragraphs 5.1 and 5.2, if the ability to traverse such openings or to remove an injured person can be proved to the satisfaction of the Administration.

Regulation 3-7
Construction drawings maintained on board and ashore

1 A set of as-built construction drawings and other plans showing any subsequent structural alterations shall be kept on board a ship constructed on or after 1 January 2007.

2 An additional set of such drawings shall be kept ashore by the Company, as defined in regulation IX/1.2.

Regulation 3-8
Towing and mooring equipment

1 This regulation applies to ships constructed on or after 1 January 2007, but does not apply to emergency towing arrangements provided in accordance with regulation 3-4.

2 Ships shall be provided with arrangements, equipment and fittings of sufficient safe working load to enable the safe conduct of all towing and mooring operations associated with the normal operation of the ship.

3 Arrangements, equipment and fittings provided in accordance with paragraph 2 shall meet the appropriate requirements of the Administration or an organization recognized by the Administration under regulation I/6.

4 Each fitting or item of equipment provided under this regulation shall be clearly marked with any restrictions associated with its safe operation, taking into account the strength of its attachment to the ship's structure."

PART B
SUBDIVISION AND STABILITY

The following new regulation 23-3 is added after existing regulation 23-2:

"Regulation 23-3
Water level detectors on single hold cargo ships other than bulk carriers

1 Single hold cargo ships other than bulk carriers constructed before 1 January 2007 shall comply with the requirements of this regulation not later than the date of the first intermediate or renewal survey of the ship to be carried out after 1 January 2007, whichever comes first.

2 For the purpose of this regulation, *freeboard deck* has the meaning defined in the International Convention on Load Lines in force.

3 Ships having a length (L) of less than 80 m, or 100 m if constructed before 1 July 1998, and a single cargo hold below the freeboard deck or cargo holds below the freeboard deck which are not separated by at least one bulkhead made watertight up to that deck, shall be fitted in such space or spaces with water level detectors.

4 The water level detectors required by paragraph 3 shall:

.1 give an audible and visual alarm at the navigation bridge when the water level above the inner bottom in the cargo hold reaches a height of not less than 0.3 m, and another when such level reaches not more than 15% of the mean depth of the cargo hold; and

.2 be fitted at the aft end of the hold, or above its lowest part where the inner bottom is not parallel to the designed waterline. Where webs or partial watertight bulkheads are fitted above the inner bottom, Administrations may require the fitting of additional detectors.

5 The water level detectors required by paragraph 3 need not be fitted in ships complying with regulation XII/12, or in ships having watertight side compartments each side of the cargo hold length extending vertically at least from inner bottom to freeboard deck."

PART C
MACHINERY INSTALLATIONS

Regulation 31 – Machinery controls

4 The existing paragraph 2.10 is deleted.

5 The following new paragraph 6 is added after the existing paragraph 5:

"6 Ships constructed on or after 1 July 2004 shall comply with the requirements of paragraphs 1 to 5, as amended, as follows:

.1 a new subparagraph .10 is added to paragraph 2 to read as follows:

".10 automation systems shall be designed in a manner which ensures that threshold warning of impending or imminent slowdown or shutdown of the propulsion system is given to the officer in charge of the navigational watch in time to assess navigational circumstances in an emergency. In particular, the systems shall control, monitor, report, alert and take safety action to slow down or stop propulsion while providing the officer in charge of the navigational watch an opportunity to manually intervene, except for those cases where manual intervention will result in total failure of the engine and/or propulsion equipment within a short time, for example in the case of overspeed.""

ANNEX 2

AMENDMENTS TO THE INTERNATIONAL CONVENTION FOR THE SAFETY OF LIFE AT SEA, 1974, AS AMENDED

CHAPTER II-1

CONSTRUCTION – STRUCTURE, SUBDIVISION AND STABILITY, MACHINERY AND ELECTRICAL INSTALLATIONS

1 The existing text of parts A, B and B-1 of the chapter is replaced by the following:

"PART A
GENERAL

Regulation 1
Application

1.1 Unless expressly provided otherwise, this chapter shall apply to ships the keels of which are laid or which are at a similar stage of construction on or after 1 January 2009.

1.2 For the purpose of this chapter, the term *a similar stage of construction* means the stage at which:

.1 construction identifiable with a specific ship begins; and

.2 assembly of that ship has commenced comprising at least 50 tonnes or one per cent of the estimated mass of all structural material, whichever is less.

1.3 For the purpose of this chapter:

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

.2 the expression *all ships* means ships constructed before, on or after 1 January 2009;

.3 a cargo ship, whenever built, which is converted to a passenger ship shall be treated as a passenger ship constructed on the date on which such a conversion commences;

.4 the expression *alterations and modifications of a major character* means, in the context of cargo ship subdivision and stability, any modification to the construction which affects the level of subdivision of that ship. Where a cargo ship is subject to such modification, it shall be demonstrated that the A/R ratio calculated for the ship after such modifications is not less than the A/R ratio calculated for the ship before the modification. However, in those cases where the ship's A/R ratio before modification is equal to or greater than unity, it is only necessary that the ship after modification has an A value which is not less than R, calculated for the modified ship.

2 Unless expressly provided otherwise, for ships constructed before 1 January 2009, the Administration shall ensure that the requirements which are applicable under chapter II-1 of the International Convention for the Safety of Life at Sea, 1974, as amended by resolutions MSC.1(XLV), MSC.6(48), MSC.11(55), MSC.12(56), MSC.13(57), MSC.19(58), MSC.26(60), MSC.27(61), Resolution 1 of the 1995 SOLAS Conference, MSC.47(66), MSC.57(67), MSC.65(68), MSC.69(69), MSC.99(73), MSC.134(76), MSC.151(78) and MSC.170(79) are complied with.

3 All ships which undergo repairs, alterations, modifications and outfitting related thereto shall continue to comply with at least the requirements previously applicable to these ships. Such ships, if constructed before the date on which any relevant amendments enter into force, shall, as a rule, comply with the requirements for ships constructed on or after that date to at least the same extent as they did before undergoing such repairs, alterations, modifications or outfitting. Repairs, alterations and modifications of a major character and outfitting related thereto shall meet the requirements for ships constructed on or after the date on which any relevant amendments enter into force, in so far as the Administration deems reasonable and practicable.

4 The Administration of a State may, if it considers that the sheltered nature and conditions of the voyage are such as to render the application of any specific requirements of this chapter unreasonable or unnecessary, exempt from those requirements individual ships or classes of ships entitled to fly the flag of that State which, in the course of their voyage, do not proceed more than 20 miles from the nearest land.

5 In the case of passenger ships which are employed in special trades for the carriage of large numbers of special trade passengers, such as the pilgrim trade, the Administration of the State whose flag such ships are entitled to fly, if satisfied that it is impracticable to enforce compliance with the requirements of this chapter, may exempt such ships from those requirements, provided that they comply fully with the provisions of:

.1 the rules annexed to the Special Trade Passenger Ships Agreement, 1971; and

.2 the rules annexed to the Protocol on Space Requirements for Special Trade Passenger Ships, 1973.

Regulation 2
Definitions

For the purpose of this chapter, unless expressly provided otherwise:

1 *Subdivision length (L_s)* of the ship is the greatest projected moulded length of that part of the ship at or below deck or decks limiting the vertical extent of flooding with the ship at the deepest subdivision draught.

2 *Mid-length* is the mid-point of the subdivision length of the ship.

3 *Aft terminal* is the aft limit of the subdivision length.

4 *Forward terminal* is the forward limit of the subdivision length.

5 *Length (L)* is the length as defined in the International Convention on Load Lines in force.

6 *Freeboard deck* is the deck as defined in the International Convention on Load Lines in force.

7 *Forward perpendicular* is the forward perpendicular as defined in the International Convention on Load Lines in force.

8 *Breadth (B)* is the greatest moulded breadth of the ship at or below the deepest subdivision draught.

9 *Draught (d)* is the vertical distance from the keel line at mid-length to the waterline in question.

10 *Deepest subdivision draught (d_s)* is the waterline which corresponds to the summer load line draught of the ship.

11 *Light service draught (d_l)* is the service draught corresponding to the lightest anticipated loading and associated tankage, including, however, such ballast as may be necessary for stability and/or immersion. Passenger ships should include the full complement of passengers and crew on board.

12 *Partial subdivision draught (d_p)* is the light service draught plus 60% of the difference between the light service draught and the deepest subdivision draught.

13 *Trim* is the difference between the draught forward and the draught aft, where the draughts are measured at the forward and aft terminals respectively, disregarding any rake of keel.

14 *Permeability (μ)* of a space is the proportion of the immersed volume of that space which can be occupied by water.

15 *Machinery spaces* are spaces between the watertight boundaries of a space containing the main and auxiliary propulsion machinery, including boilers, generators and electric motors primarily intended for propulsion. In the case of unusual arrangements, the Administration may define the limits of the machinery spaces.

16 *Weathertight* means that in any sea conditions water will not penetrate into the ship.

17 *Watertight* means having scantlings and arrangements capable of preventing the passage of water in any direction under the head of water likely to occur in intact and damaged conditions. In the damaged condition, the head of water is to be considered in the worst situation at equilibrium, including intermediate stages of flooding.

18 *Design pressure* means the hydrostatic pressure for which each structure or appliance assumed watertight in the intact and damage stability calculations is designed to withstand.

19 *Bulkhead deck* in a passenger ship means the uppermost deck at any point in the subdivision length (L_s) to which the main bulkheads and the ship's shell are carried watertight and the lowermost deck from which passenger and crew evacuation will not be impeded by water in any stage of flooding for damage cases defined in regulation 8 and in part B-2 of this chapter. The bulkhead deck may be a stepped deck. In a cargo ship the freeboard deck may be taken as the bulkhead deck.

20 *Deadweight* is the difference in tonnes between the displacement of a ship in water of a specific gravity of 1.025 at the draught corresponding to the assigned summer freeboard and the lightweight of the ship.

21 *Lightweight* is the displacement of a ship in tonnes without cargo, fuel, lubricating oil, ballast water, fresh water and feedwater in tanks, consumable stores, and passengers and crew and their effects.

22 *Oil tanker* is the oil tanker defined in regulation 1 of Annex I of the Protocol of 1978 relating to the International Convention for the Prevention of Pollution from Ships, 1973.

23 *Ro-ro passenger ship* means a passenger ship with ro-ro spaces or special category spaces as defined in regulation II-2/3.

24 *Bulk carrier* means a bulk carrier as defined in regulation XII/1.1.

25 *Keel line* is a line parallel to the slope of the keel passing amidships through:

.1 the top of the keel at centreline or line of intersection of the inside of shell plating with the keel if a bar keel extends below that line, on a ship with a metal shell; or

.2 in wood and composite ships, the distance is measured from the lower edge of the keel rabbet. When the form at the lower part of the midship section is of a hollow character, or where thick garboards are fitted, the distance is measured from the point where the line of the flat of the bottom continued inward intersects the centreline amidships.

26 *Amidship* is at the middle of the length (*L*).

Regulation 3
Definitions relating to parts C, D and E

For the purpose of parts C, D and E, unless expressly provided otherwise:

1 *Steering gear control system* is the equipment by which orders are transmitted from the navigating bridge to the steering gear power units. Steering gear control systems comprise transmitters, receivers, hydraulic control pumps and their associated motors, motor controllers, piping and cables.

2 *Main steering gear* is the machinery, rudder actuators, steering gear, power units, if any, and ancillary equipment and the means of applying torque to the rudder stock (e.g. tiller or quadrant) necessary for effecting movement of the rudder for the purpose of steering the ship under normal service conditions.

3 *Steering gear power unit* is:

.1 in the case of electric steering gear, an electric motor and its associated electrical equipment;

.2 in the case of electrohydraulic steering gear, an electric motor and its associated electrical equipment and connected pump; or

.3 in the case of other hydraulic steering gear, a driving engine and connected pump.

4 *Auxiliary steering gear* is the equipment other than any part of the main steering gear necessary to steer the ship in the event of failure of the main steering gear but not including the tiller, quadrant or components serving the same purpose.

5 *Normal operational and habitable condition* is a condition under which the ship as a whole, the machinery, services, means and aids ensuring propulsion, ability to steer, safe navigation, fire and flooding safety, internal and external communications and signals, means of escape, and emergency boat winches, as well as the designed comfortable conditions of habitability are in working order and functioning normally.

6 *Emergency condition* is a condition under which any services needed for normal operational and habitable conditions are not in working order due to failure of the main source of electrical power.

7 *Main source of electrical power* is a source intended to supply electrical power to the main switchboard for distribution to all services necessary for maintaining the ship in normal operational and habitable conditions.

8 *Dead ship condition* is the condition under which the main propulsion plant, boilers and auxiliaries are not in operation due to the absence of power.

9 *Main generating station* is the space in which the main source of electrical power is situated.

10 *Main switchboard* is a switchboard which is directly supplied by the main source of electrical power and is intended to distribute electrical energy to the ship's services.

11 *Emergency switchboard* is a switchboard which in the event of failure of the main electrical power supply system is directly supplied by the emergency source of electrical power or the transitional source of emergency power and is intended to distribute electrical energy to the emergency services.

12 *Emergency source of electrical power* is a source of electrical power, intended to supply the emergency switchboard in the event of a failure of the supply from the main source of electrical power.

13 *Power actuating system* is the hydraulic equipment provided for supplying power to turn the rudder stock, comprising a steering gear power unit or units, together with the associated pipes and fittings, and a rudder actuator. The power actuating systems may share common mechanical components (i.e. tiller, quadrant and rudder stock) or components serving the same purpose.

14 *Maximum ahead service speed* is the greatest speed which the ship is designed to maintain in service at sea at the deepest seagoing draught.

15 *Maximum astern speed* is the speed which it is estimated the ship can attain at the designed maximum astern power at the deepest seagoing draught.

16 *Machinery spaces* are all machinery spaces of category A and all other spaces containing propelling machinery, boilers, oil fuel units, steam and internal combustion engines, generators and major electrical machinery, oil filling stations, refrigerating, stabilizing, ventilation and air conditioning machinery, and similar spaces, and trunks to such spaces.

17 *Machinery spaces of category A* are those spaces and trunks to such spaces which contain:

.1 internal combustion machinery used for main propulsion;

.2 internal combustion machinery used for purposes other than main propulsion where such machinery has in the aggregate a total power output of not less than 375 kW; or

.3 any oil-fired boiler or oil fuel unit.

18 *Control stations* are those spaces in which the ship's radio or main navigating equipment or the emergency source of power is located or where the fire recording or fire control equipment is centralized.

19 *Chemical tanker* is a cargo ship constructed or adapted and used for the carriage in bulk of any liquid product listed in either:

.1 chapter 17 of the International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk adopted by the Maritime Safety Committee by resolution MSC.4(48), hereinafter referred to as "the International Bulk Chemical Code", as may be amended by the Organization; or

.2 chapter VI of the Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk adopted by the Assembly of the Organization by resolution A.212(VII), hereinafter referred to as "the Bulk Chemical Code", as has been or may be amended by the Organization,

whichever is applicable.

20 *Gas carrier* is a cargo ship constructed or adapted and used for the carriage in bulk of any liquefied gas or other products listed in either:

.1 chapter 19 of the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk adopted by the Maritime Safety Committee by resolution MSC.5(48), hereinafter referred to as "the International Gas Carrier Code", as may be amended by the Organization; or

.2 chapter XIX of the Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk adopted by the Organization by resolution A.328(IX), hereinafter referred to as "the Gas Carrier Code", as has been or may be amended by the Organization,

whichever is applicable.

PART B
SUBDIVISION AND STABILITY

Regulation 4
General

1 The damage stability requirements in parts B-1 through B-4 shall apply to cargo ships of 80 m in length (L) and upwards and to all passenger ships regardless of length but shall exclude those cargo ships which are shown to comply with subdivision and damage stability regulations in other instruments developed by the Organization.

2 The Administration may, for a particular ship or group of ships, accept alternative methodologies if it is satisfied that at least the same degree of safety as represented by these regulations is achieved. Any Administration which allows such alternative methodologies shall communicate to the Organization particulars thereof.

3 Ships shall be as efficiently subdivided as is possible having regard to the nature of the service for which they are intended. The degree of subdivision shall vary with the subdivision length (L_s) of the ship and with the service, in such manner that the highest degree of subdivision corresponds with the ships of greatest subdivision length (L_s), primarily engaged in the carriage of passengers.

4 Where it is proposed to fit decks, inner skins or longitudinal bulkheads of sufficient tightness to seriously restrict the flow of water, the Administration shall be satisfied that proper consideration is given to beneficial or adverse effects of such structures in the calculations.

PART B-1
STABILITY

Regulation 5
Intact stability information

1 Every passenger ship regardless of size and every cargo ship having a length (L) of 24 m and upwards, shall be inclined upon its completion and the elements of its stability determined.

2 The Administration may allow the inclining test of an individual cargo ship to be dispensed with provided basic stability data are available from the inclining test of a sister ship and it is shown to the satisfaction of the Administration that reliable stability information for the exempted ship can be obtained from such basic data, as required by regulation 5-1. A weight survey shall be carried out upon completion and the ship shall be inclined whenever in comparison with the data derived from the sister ship, a deviation from the lightship displacement exceeding 1% for ships of 160 m or more in length and 2% for ships of 50 m or less in length and as determined by linear interpolation for intermediate lengths or a deviation from the lightship longitudinal centre of gravity exceeding 0.5% of L_s is found.

3 The Administration may also allow the inclining test of an individual ship or class of ships especially designed for the carriage of liquids or ore in bulk to be dispensed with when reference to existing data for similar ships clearly indicates that due to the ship's proportions and arrangements more than sufficient metacentric height will be available in all probable loading conditions.

4 Where any alterations are made to a ship so as to materially affect the stability information supplied to the master, amended stability information shall be provided. If necessary the ship shall be re-inclined. The ship shall be re-inclined if anticipated deviations exceed one of the values specified in paragraph 5.

5 At periodical intervals not exceeding five years, a lightweight survey shall be carried out on all passenger ships to verify any changes in lightship displacement and longitudinal centre of gravity. The ship shall be re-inclined whenever, in comparison with the approved stability information, a deviation from the lightship displacement exceeding 2% or a deviation of the longitudinal centre of gravity exceeding 1% of L_s is found or anticipated.

6 Every ship shall have scales of draughts marked clearly at the bow and stern. In the case where the draught marks are not located where they are easily readable, or operational constraints for a particular trade make it difficult to read the draught marks, then the ship shall also be fitted with a reliable draught indicating system by which the bow and stern draughts can be determined.

Regulation 5-1
Stability information to be supplied to the master

1 The master shall be supplied with such information satisfactory to the Administration as is necessary to enable him by rapid and simple processes to obtain accurate guidance as to the stability of the ship under varying conditions of service. A copy of the stability information shall be furnished to the Administration.

2 The information should include:

.1 curves or tables of minimum operational metacentric height (*GM*) versus draught which assures compliance with the relevant intact and damage stability requirements, alternatively corresponding curves or tables of the maximum allowable vertical centre of gravity (*KG*) versus draught, or with the equivalents of either of these curves;

.2 instructions concerning the operation of cross-flooding arrangements; and

.3 all other data and aids which might be necessary to maintain the required intact stability and stability after damage.

3 The stability information shall show the influence of various trims in cases where the operational trim range exceeds +/- 0.5% of L_s.

4 For ships which have to fulfil the stability requirements of part B-1, information referred to in paragraph 2 are determined from considerations related to the subdivision index, in the following manner: Minimum required *GM* (or maximum permissible vertical position of centre of gravity *KG*) for the three draughts d_s, d_p and d_l are equal to the *GM* (or *KG* values) of corresponding loading cases used for the calculation of survival factor s_i. For intermediate draughts, values to be used shall be obtained by linear interpolation applied to the *GM* value only between the deepest subdivision draught and the partial subdivision draught and between the partial load line and the light service draught respectively. Intact stability criteria will also be taken into account by retaining for each draft the maximum among minimum required *GM* values or the minimum of maximum permissible *KG* values for both criteria. If the subdivision index is calculated for different trims, several required *GM* curves will be established in the same way.

5 When curves or tables of minimum operational metacentric height (*GM*) versus draught are not appropriate, the master should ensure that the operating condition does not deviate from a studied loading condition, or verify by calculation that the stability criteria are satisfied for this loading condition.

Regulation 6
Required subdivision index *R*

1 The subdivision of a ship is considered sufficient if the attained subdivision index A, determined in accordance with regulation 7, is not less than the required subdivision index R calculated in accordance with this regulation and if, in addition, the partial indices A_s, A_p and A_l are not less than $0.9R$ for passenger ships and $0.5R$ for cargo ships.

2 For all ships to which the damage stability requirements of this chapter apply, the degree of subdivision to be provided shall be determined by the required subdivision index R, as follows:

.1 In the case of cargo ships greater than 100 m in length (L_s):

$$R = 1 - \frac{128}{L_s + 152}$$

.2 In the case of cargo ships not less than 80 m in length (L_s) and not greater than 100 m in length (L_s):

$$R = 1 - [1/(1 + \frac{L_s}{100} \times \frac{R_o}{1 - R_o})]$$

where R_o is the value R as calculated in accordance with the formula in subparagraph .1.

.3 In the case of passenger ships:

$$R = 1 - \frac{5{,}000}{L_s + 2.5N + 15{,}225}$$

where:

$N = N_1 + 2N_2$
N_1 = number of persons for whom lifeboats are provided
N_2 = number of persons (including officers and crew) the ship is permitted to carry in excess of N_1.

.4 Where the conditions of service are such that compliance with paragraph 2.3 of this regulation on the basis of $N = N_1 + 2N_2$ is impracticable and where the Administration considers that a suitably reduced degree of hazard exists, a lesser value of N may be taken but in no case less than $N = N_1 + N_2$.

Regulation 7
Attained subdivision index *A*

1 The attained subdivision index A is obtained by the summation of the partial indices A_s, A_p and A_l, (weighted as shown) calculated for the draughts d_s, d_p and d_l defined in regulation 2 in accordance with the following formula:

$$A = 0.4A_s + 0.4A_p + 0.2A_l$$

Each partial index is a summation of contributions from all damage cases taken in consideration, using the following formula:

$$A = \Sigma p_i s_i$$

where:

i represents each compartment or group of compartments under consideration,

p_i accounts for the probability that only the compartment or group of compartments under consideration may be flooded, disregarding any horizontal subdivision, as defined in regulation 7-1,

s_i accounts for the probability of survival after flooding the compartment or group of compartments under consideration, and includes the effect of any horizontal subdivision, as defined in regulation 7-2.

2 In the calculation of A, the level trim shall be used for the deepest subdivision draught and the partial subdivision draught. The actual service trim shall be used for the light service draught. If in any service condition, the trim variation in comparison with the calculated trim is greater than 0.5% of L_s, one or more additional calculations of A are to be submitted for the same draughts but different trims so that, for all service conditions, the difference in trim in comparison with the reference trim used for one calculation will be less than 0.5% of L_s.

3 When determining the positive righting lever (GZ) of the residual stability curve, the displacement used should be that of the intact condition. That is, the constant displacement method of calculation should be used.

4 The summation indicated by the above formula shall be taken over the ship's subdivision length (L_s) for all cases of flooding in which a single compartment or two or more adjacent compartments are involved. In the case of unsymmetrical arrangements, the calculated A value should be the mean value obtained from calculations involving both sides. Alternatively, it should be taken as that corresponding to the side which evidently gives the least favourable result.

5 Wherever wing compartments are fitted, contribution to the summation indicated by the formula shall be taken for all cases of flooding in which wing compartments are involved. Additionally, cases of simultaneous flooding of a wing compartment or group of compartments and the adjacent inboard compartment or group of compartments, but excluding damage of transverse extent greater than one half of the ship breadth B, may be added. For the purpose of this regulation, transverse extent is measured inboard from ship's side, at right angle to the centreline at the level of the deepest subdivision draught.

6 In the flooding calculations carried out according to the regulations, only one breach of the hull and only one free surface need to be assumed. The assumed vertical extent of damage is to extend from the baseline upwards to any watertight horizontal subdivision above the waterline or higher. However, if a lesser extent of damage will give a more severe result, such extent is to be assumed.

7 If pipes, ducts or tunnels are situated within the assumed extent of damage, arrangements are to be made to ensure that progressive flooding cannot thereby extend to compartments other than those assumed flooded. However, the Administration may permit minor progressive flooding if it is demonstrated that its effects can be easily controlled and the safety of the ship is not impaired.

Regulation 7-1
Calculation of the factor p_i

1 The factor p_i for a compartment or group of compartments shall be calculated in accordance with paragraphs 1.1 and 1.2 using the following notations:

j = the aftmost damage zone number involved in the damage starting with No.1 at the stern;

n = the number of adjacent damage zones involved in the damage;

k = is the number of a particular longitudinal bulkhead as barrier for transverse penetration in a damage zone counted from shell towards the centre line. The shell has $k = 0$;

$x1$ = the distance from the aft terminal of L_s to the aft end of the zone in question;

$x2$ = the distance from the aft terminal of L_s to the forward end of the zone in question;

b = the mean transverse distance in metres measured at right angles to the centreline at the deepest subdivision loadline between the shell and an assumed vertical plane extended between the longitudinal limits used in calculating the factor p_i and which is a tangent to, or common with, all or part of the outermost portion of the longitudinal bulkhead under consideration. This vertical plane shall be so orientated that the mean transverse distance to the shell is a maximum, but not more than twice the least distance between the plane and the shell. If the upper part of a longitudinal bulkhead is below the deepest subdivision loadline the vertical plane used for determination of b is assumed to extend upwards to the deepest subdivision waterline. In any case, b is not to be taken greater than $B/2$.

If the damage involves a single zone only:

$$p_i = p(x1_j,x2_j) \cdot [r(x1_j,x2_j,b_k) - r(x1_j,x2_j,b_{k-1})]$$

If the damage involves two adjacent zones:

$$\begin{aligned} p_i = {} & p(x1_j,x2_{j+1}) \cdot [r(x1_j,x2_{j+1},b_k) - r(x1_j,x2_{j+1},b_{k-1})] \\ & - p(x1_j,x2_j) \cdot [r(x1_j,x2_j,b_k) - r(x1_j,x2_j,b_{k-1})] \\ & - p(x1_{j+1},x2_{j+1}) \cdot [r(x1_{j+1},x2_{j+1},b_k) - r(x1_{j+1},x2_{j+1},b_{k-1})] \end{aligned}$$

If the damage involves three or more adjacent zones:

$$\begin{aligned} p_i \;=\;& p(x1_j,x2_{j+n-1}) \cdot [r(x1_j,x2_{j+n-1},b_k) - r(x1_j,x2_{j+n-1},b_{k-1})] \\ &- p(x1_j,x2_{j+n-2}) \cdot [r(x1_j,x2_{j+n-2},b_k) - r(x1_j,x2_{j+n-2},b_{k-1})] \\ &- p(x1_{j+1},x2_{j+n-1}) \cdot [r(x1_{j+1},x2_{j+n-1},b_k) - r(x1_{j+1},x2_{j+n-1},b_{k-1})] \\ &+ p(x1_{j+1},x2_{j+n-2}) \cdot [r(x1_{j+1},x2_{j+n-2},b_k) - r(x1_{j+1},x2_{j+n-2},b_{k-1})] \end{aligned}$$

and where $r(x1, x2, b0) = 0$

1.1 The factor $p(x1, x2)$ is to be calculated according to the following formulae:

Overall normalized max damage length:	J_{max}	=	10/33
Knuckle point in the distribution:	J_{kn}	=	5/33
Cumulative probability at J_{kn}:	p_k	=	11/12
Maximum absolute damage length:	l_{max}	=	60 m
Length where normalized distribution ends:	L^*	=	260 m

Probability density at $J = 0$:

$$b_0 = 2\left(\frac{p_k}{J_{kn}} - \frac{1-p_k}{J_{max}-J_{kn}}\right)$$

When $L_s \le L^*$:

$$J_m = \min\left\{J_{max}, \frac{l_{max}}{L_s}\right\}$$

$$J_k = \frac{J_m}{2} + \frac{1-\sqrt{1+(1-2p_k)b_0 J_m + \frac{1}{4}b_0{}^2 J_m{}^2}}{b_0}$$

$$b_{12} = b_0$$

When $L_s > L^*$:

$$J_m{}^* = \min\left\{J_{max}, \frac{l_{max}}{L^*}\right\}$$

$$J_k{}^* = \frac{J_m{}^*}{2} + \frac{1-\sqrt{1+(1-2p_k)b_0 J_m{}^* + \frac{1}{4}b_0{}^2 J_m{}^{*2}}}{b_0}$$

$$J_m = \frac{J_m{}^* \cdot L^*}{L_s}$$

$$J_k = \frac{J_k{}^* \cdot L^*}{L_s}$$

$$b_{12} = 2\left(\frac{p_k}{J_k} - \frac{1-p_k}{J_m - J_k}\right)$$

$$b_{11} = 4\frac{1-p_k}{(J_m - J_k)J_k} - 2\frac{p_k}{J_k^{\,2}}$$

$$b_{21} = -2\frac{1-p_k}{(J_m - J_k)^2}$$

$$b_{22} = -b_{21}J_m$$

The non-dimensional damage length:

$$J = \frac{(x2 - x1)}{L_s}$$

The normalized length of a compartment or group of compartments:

J_n is to be taken as the lesser of J and J_m

1.1.1 Where neither limits of the compartment or group of compartments under consideration coincides with the aft or forward terminals:

$J \le J_k$:

$$p(x1,x2) = p_1 = \frac{1}{6}\mathrm{J}^2\left(\mathrm{b}_{11}\mathrm{J} + 3\mathrm{b}_{12}\right)$$

$J > J_k$:

$$p(x1,x2) = p_2 = -\frac{1}{3}b_{11}J_k^{\,3} + \frac{1}{2}(b_{11}J - b_{12})J_k^{\,2} + b_{12}JJ_k - \frac{1}{3}b_{21}\left(J_n^{\,3} - J_k^{\,3}\right) + \frac{1}{2}(b_{21}J - b_{22})\left(J_n^{\,2} - J_k^{\,2}\right) + b_{22}J(J_n - J_k)$$

1.1.2 Where the aft limit of the compartment or group of compartments under consideration coincides with the aft terminal or the forward limit of the compartment or group of compartments under consideration coincides with the forward terminal:

$J \le J_k$:

$$p(x1,x2) = \frac{1}{2}(p_1 + J)$$

$J > J_k$:

$$p(x1,x2) = \frac{1}{2}(p_2 + J)$$

1.1.3 Where the compartment or groups of compartments considered extends over the entire subdivision length (L_s):

$p(x1, x2) = 1$

1.2 The factor $r(x1, x2, b)$ shall be determined by the following formulae:

$$r(x1,x2,b) = 1 - (1-C)\cdot\left[1 - \frac{G}{p(x1,x2)}\right]$$

where:

$$C = 12 \cdot J_b \cdot \left(-45 \cdot J_b + 4\right), \text{ where}$$

$$J_b = \frac{b}{15 \cdot B}$$

1.2.1 Where the compartment or groups of compartments considered extends over the entire subdivision length (L_s):

$$G = G_1 = \frac{1}{2} b_{11} J_b{}^2 + b_{12} J_b$$

1.2.2 Where neither limits of the compartment or group of compartments under consideration coincides with the aft or forward terminals:

$$G = G_2 = -\frac{1}{3} b_{11} J_0{}^3 + \frac{1}{2}\left(b_{11} J - b_{12}\right) J_0{}^2 + b_{12} J J_0 \text{ , where}$$

$$J_0 = \min\left(J, J_b\right)$$

1.2.3 Where the aft limit of the compartment or group of compartments under consideration coincides with the aft terminal or the forward limit of the compartment or group of compartments under consideration coincides with the forward terminal:

$$G = \frac{1}{2} \cdot \left(G_2 + G_1 \cdot J\right)$$

Regulation 7-2
Calculation of the factor s_i

1 The factor s_i shall be determined for each case of assumed flooding, involving a compartment or group of compartments, in accordance with the following notations and the provisions in this regulation:

θ_e is the equilibrium heel angle in any stage of flooding, in degrees;

θ_v is the angle, in any stage of flooding, where the righting lever becomes negative, or the angle at which an opening incapable of being closed weathertight becomes submerged;

GZ_{max} is the maximum positive righting lever, in metres, up to the angle θ_v;

Range is the range of positive righting levers, in degrees, measured from the angle θ_e. The positive range is to be taken up to the angle θ_v;

Flooding stage is any discrete step during the flooding process, including the stage before equalization (if any) until final equilibrium has been reached.

1.1 The factor s_i, for any damage case at any initial loading condition, d_i, shall be obtained from the formula:

$$s_i = \text{minimum } \{ s_{\text{intermediate,i}} \text{ or } s_{\text{final,i}} \cdot s_{\text{mom,i}} \}$$

where:

$s_{intermediate,i}$ is the probability to survive all intermediate flooding stages until the final equilibrium stage, and is calculated in accordance with paragraph 2;

$s_{final,i}$ is the probability to survive in the final equilibrium stage of flooding. It is calculated in accordance with paragraph 3;

$s_{mom,i}$ is the probability to survive heeling moments, and is calculated in accordance with paragraph 4.

2 The factor $s_{intermediate,i}$ is applicable only to passenger ships (for cargo ships $s_{intermediate,i}$ should be taken as unity) and shall be taken as the least of the s-factors obtained from all flooding stages including the stage before equalization, if any, and is to be calculated as follows:

$$s_{intermediate,i} = \left[\frac{GZ_{max}}{0.05} \cdot \frac{Range}{7}\right]^{\frac{1}{4}}$$

where GZ_{max} is not to be taken as more than 0.05 m and *Range* as not more than 7°. $s_{intermediate} = 0$, if the intermediate heel angle exceeds 15°. Where cross-flooding fittings are required, the time for equalization shall not exceed 10 min.

3 The factor $s_{final,i}$ shall be obtained from the formula:

$$s_{final,i} = K \cdot \left[\frac{GZ_{max}}{0.12} \cdot \frac{Range}{16}\right]^{\frac{1}{4}}$$

where:

GZ_{max} is not to be taken as more than 0.12 m;

Range is not to be taken as more than 16°;

$K = 1$ if $\theta_e \leq \theta_{min}$

$K = 0$ if $\theta_e \geq \theta_{max}$

$K = \sqrt{\frac{\theta_{max} - \theta_e}{\theta_{max} - \theta_{min}}}$ otherwise,

where:

θ_{min} is 7° for passenger ships and 25° for cargo ships; and

θ_{max} is 15° for passenger ships and 30° for cargo ships.

4 The factor $s_{mom,i}$ is applicable only to passenger ships (for cargo ships $s_{mom,i}$ shall be taken as unity) and shall be calculated at the final equilibrium from the formula:

$$s_{mom,i} = \frac{(GZ_{max} - 0.04) \cdot Displacement}{M_{heel}}$$

where:

Displacement is the intact displacement at the subdivision draught;

M_{heel} is the maximum assumed heeling moment as calculated in accordance with paragraph 4.1; and

$s_{mom,i} \leq 1$

4.1 The heeling moment M_{heel} is to be calculated as follows:

M_{heel} = maximum $\{M_{passenger}$ or M_{wind} or $M_{Survivalcraft}\}$

4.1.1 $M_{passenger}$ is the maximum assumed heeling moment resulting from movement of passengers, and is to be obtained as follows:

$$M_{passenger} = (0.075 \cdot N_p) \cdot (0.45 \cdot B) \text{ (tm)}$$

where:

N_p is the maximum number of passengers permitted to be on board in the service condition corresponding to the deepest subdivision draught under consideration; and

B is the beam of the ship.

Alternatively, the heeling moment may be calculated assuming the passengers are distributed with 4 persons per square metre on available deck areas towards one side of the ship on the decks where muster stations are located and in such a way that they produce the most adverse heeling moment. In doing so, a weight of 75 kg per passenger is to be assumed.

4.1.2 M_{wind} is the maximum assumed wind force acting in a damage situation:

$$M_{wind} = (P \cdot A \cdot Z) / 9{,}806 \text{ (tm)}$$

where:

P = 120 N/m^2;

A = projected lateral area above waterline;

Z = distance from centre of lateral projected area above waterline to $T/2$; and

T = ship's draught, d_i.

4.1.3 $M_{Survivalcraft}$ is the maximum assumed heeling moment due to the launching of all fully loaded davit-launched survival craft on one side of the ship. It shall be calculated using the following assumptions:

.1 all lifeboats and rescue boats fitted on the side to which the ship has heeled after having sustained damage shall be assumed to be swung out fully loaded and ready for lowering;

.2 for lifeboats which are arranged to be launched fully loaded from the stowed position, the maximum heeling moment during launching shall be taken;

.3 a fully loaded davit-launched liferaft attached to each davit on the side to which the ship has heeled after having sustained damage shall be assumed to be swung out ready for lowering;

.4 persons not in the life-saving appliances which are swung out shall not provide either additional heeling or righting moment; and

.5 life-saving appliances on the side of the ship opposite to the side to which the ship has heeled shall be assumed to be in a stowed position.

5 Unsymmetrical flooding is to be kept to a minimum consistent with the efficient arrangements. Where it is necessary to correct large angles of heel, the means adopted shall, where practicable, be self-acting, but in any case where controls to equalization devices are provided they shall be operable from above the bulkhead deck. These fittings together with their controls shall be acceptable to the Administration. Suitable information concerning the use of equalization devices shall be supplied to the master of the ship.

5.1 Tanks and compartments taking part in such equalization shall be fitted with air pipes or equivalent means of sufficient cross-section to ensure that the flow of water into the equalization compartments is not delayed.

5.2 In all cases, s_i is to be taken as zero in those cases where the final waterline, taking into account sinkage, heel and trim, immerses:

.1 the lower edge of openings through which progressive flooding may take place and such flooding is not accounted for in the calculation of factor s_i. Such openings shall include air-pipes, ventilators and openings which are closed by means of weathertight doors or hatch covers; and

.2 any part of the bulkhead deck in passenger ships considered a horizontal evacuation route for compliance with chapter II-2.

5.3 The factor s_i is to be taken as zero if, taking into account sinkage, heel and trim, any of the following occur in any intermediate stage or in the final stage of flooding:

.1 immersion of any vertical escape hatch in the bulkhead deck intended for compliance with chapter II-2;

.2 any controls intended for the operation of watertight doors, equalization devices, valves on piping or on ventilation ducts intended to maintain the integrity of watertight bulkheads from above the bulkhead deck become inaccessible or inoperable;

.3 immersion of any part of piping or ventilation ducts carried through a watertight boundary that is located within any compartment included in damage cases contributing to the attained index *A*, if not fitted with watertight means of closure at each boundary.

5.4 However, where compartments assumed flooded due to progressive flooding are taken into account in the damage stability calculations multiple values of $s_{intermediate,i}$ may be calculated assuming equalization in additional flooding phases.

5.5 Except as provided in paragraph 5.3.1, openings closed by means of watertight manhole covers and flush scuttles, small watertight hatch covers, remotely operated sliding watertight doors, side scuttles of the non-opening type as well as watertight access doors and hatch covers required to be kept closed at sea need not be considered.

6 Where horizontal watertight boundaries are fitted above the waterline under consideration the s-value calculated for the lower compartment or group of compartments shall be obtained by multiplying the value as determined in paragraph 1.1 by the reduction factor v_m according to paragraph 6.1, which represents the probability that the spaces above the horizontal subdivision will not be flooded.

6.1 The factor v_m shall be obtained from the formula:

$$v_m = v(H_{j,\ n,\ m},\ d) - v(H_{j,\ n,\ m\text{-}1},\ d)$$

where:

$H_{j,\ n,\ m}$ is the least height above the baseline, in metres, within the longitudinal range of $x_{1(j)}...x_{2(j+n-1)}$ of the m^{th} horizontal boundary which is assumed to limit the vertical extent of flooding for the damaged compartments under consideration;

$H_{j,\ n,\ m\text{-}1}$ is the least height above the baseline, in metres, within the longitudinal range of $x_{1(j)}...x_{2(j+n-1)}$ of the $(m\text{-}1)^{th}$ horizontal boundary which is assumed to limit the vertical extent of flooding for the damaged compartments under consideration;

j signifies the aft terminal of the damaged compartments under consideration;

m represents each horizontal boundary counted upwards from the waterline under consideration;

d is the draught in question as defined in regulation 2; and

x_1 and x_2 represent the terminals of the compartment or group of compartments considered in regulation 7-1.

6.1.1 The factors $v(H_{j,\ n,\ m},\ d)$ and $v(H_{j,\ n,\ m\text{-}1},\ d)$ shall be obtained from the formulae:

$$v(H,d) = 0.8\frac{(H-d)}{7.8}$$, if $(H_m\text{-}d)$ is less than, or equal to, 7.8 m;

$$v(H,d) = 0.8 + 0.2\left[\frac{(H-d)-7.8}{4.7}\right]$$ in all other cases,

where:

$v(H_j, n, m, d)$ is to be taken as 1, if H_m coincides with the uppermost watertight boundary of the ship within the range $(x1_{(j)}...x2_{(j+n-1)})$, and

$v(H_j, n, 0, d)$ is to be taken as 0.

In no case is v_m to be taken as less than zero or more than 1.

6.2 In general, each contribution dA to the index A in the case of horizontal subdivisions is obtained from the formula:

$$dA = p_i \cdot [v_1 \cdot s_{\min 1} + (v_2 - v_1) \cdot s_{\min 2} + \cdots + (1 - v_{m-1}) \cdot s_{\min m}]$$

where:

v_m = the v-value calculated in accordance with paragraph 6.1;
$s_{\min}$ = the least s-factor for all combinations of damages obtained when the assumed damage extends from the assumed damage height H_m downwards.

Regulation 7-3
Permeability

1 For the purpose of the subdivision and damage stability calculations of the regulations, the permeability of each general compartment or part of a compartment shall be as follows:

Spaces	Permeability
Appropriated to stores	0.60
Occupied by accommodation	0.95
Occupied by machinery	0.85
Void spaces	0.95
Intended for liquids	0 or 0.95[1]

[1] Whichever results in the more severe requirement.

2 For the purpose of the subdivision and damage stability calculations of the regulations, the permeability of each cargo compartment or part of a compartment shall be as follows:

Spaces	Permeability at draught d_s	Permeability at draught d_p	Permeability at draught d_l
Dry cargo spaces	0.70	0.80	0.95
Container spaces	0.70	0.80	0.95
Ro-ro spaces	0.90	0.90	0.95
Cargo liquids	0.70	0.80	0.95

3 Other figures for permeability may be used if substantiated by calculations.

Regulation 8
Special requirements concerning passenger ship stability

1 A passenger ship intended to carry 400 or more persons shall have watertight subdivision abaft the collision bulkhead so that $s_i = 1$ for the three loading conditions on which is based the calculation of the subdivision index and for a damage involving all the compartments within $0.08L$ measured from the forward perpendicular.

2 A passenger ship intended to carry 36 or more persons is to be capable of withstanding damage along the side shell to an extent specified in paragraph 3. Compliance with this regulation is to be achieved by demonstrating that s_i, as defined in regulation 7-2, is not less than 0.9 for the three loading conditions on which is based the calculation of the subdivision index.

3 The damage extent to be assumed when demonstrating compliance with paragraph 2, is to be dependent on both N as defined in regulation 6, and L_s as defined in regulation 2, such that:

.1 the vertical extent of damage is to extend from the ship's moulded baseline to a position up to 12.5 m above the position of the deepest subdivision draught as defined in regulation 2, unless a lesser vertical extent of damage were to give a lower value of s_i, in which case this reduced extent is to be used;

.2 where 400 or more persons are to be carried, a damage length of $0.03L_s$ but not less than 3 m is to be assumed at any position along the side shell, in conjunction with a penetration inboard of $0.1B$ but not less than 0.75 m measured inboard from the ship side, at right angle to the centreline at the level of the deepest subdivision draught;

.3 where less than 400 persons are carried, damage length is to be assumed at any position along the shell side between transverse watertight bulkheads provided that the distance between two adjacent transverse watertight bulkheads is not less than the assumed damage length. If the distance between adjacent transverse watertight bulkheads is less than the assumed damage length, only one of these bulkheads shall be considered effective for the purpose of demonstrating compliance with paragraph 2;

.4 where 36 persons are carried, a damage length of $0.015L_s$ but not less than 3 m is to be assumed, in conjunction with a penetration inboard of $0.05B$ but not less than 0.75 m; and

.5 where more than 36, but fewer than 400 persons are carried the values of damage length and penetration inboard, used in the determination of the assumed extent of damage, are to be obtained by linear interpolation between the values of damage length and penetration which apply for ships carrying 36 persons and 400 persons as specified in subparagraphs .4 and .2.

PART B-2
SUBDIVISION, WATERTIGHT AND WEATHERTIGHT INTEGRITY

Regulation 9
Double bottoms in passenger ships and cargo ships other than tankers

1 A double bottom shall be fitted extending from the collision bulkhead to the afterpeak bulkhead, as far as this is practicable and compatible with the design and proper working of the ship.

2 Where a double bottom is required to be fitted the inner bottom shall be continued out to the ship's sides in such a manner as to protect the bottom to the turn of the bilge. Such protection will be deemed satisfactory if the inner bottom is not lower at any part than a plane parallel with the keel line and which is located not less than a vertical distance h measured from the keel line, as calculated by the formula:

$$h = B/20$$

However, in no case is the value of h to be less than 760 mm, and need not be taken as more than 2,000 mm.

3 Small wells constructed in the double bottom in connection with drainage arrangements of holds, etc., shall not extend downward more than necessary. A well extending to the outer bottom is, however, permitted at the after end of the shaft tunnel. Other wells (e.g. for lubricating oil under main engines) may be permitted by the Administration if satisfied that the arrangements give protection equivalent to that afforded by a double bottom complying with this regulation. In no case shall the vertical distance from the bottom of such a well to a plane coinciding with the keel line be less than 500 mm.

4 A double bottom need not be fitted in way of watertight tanks, including dry tanks of moderate size, provided the safety of the ship is not impaired in the event of bottom or side damage.

5 In the case of passenger ships to which the provisions of regulation 1.5 apply and which are engaged on regular service within the limits of a short international voyage as defined in regulation III/3.22, the Administration may permit a double bottom to be dispensed with if satisfied that the fitting of a double bottom in that part would not be compatible with the design and proper working of the ship.

6 Any part of a passenger ship or a cargo ship that is not fitted with a double bottom in accordance with paragraphs 1, 4 or 5 shall be capable of withstanding bottom damages, as specified in paragraph 8, in that part of the ship.

7 In the case of unusual bottom arrangements in a passenger ship or a cargo ship, it shall be demonstrated that the ship is capable of withstanding bottom damages as specified in paragraph 8.

8 Compliance with paragraphs 6 or 7 is to be achieved by demonstrating that s_i, when calculated in accordance with regulation 7-2, is not less than 1 for all service conditions when subject to a bottom damage assumed at any position along the ship's bottom and with an extent specified in subparagraph .2 for the affected part of the ship:

.1 Flooding of such spaces shall not render emergency power and lighting, internal communication, signals or other emergency devices inoperable in other parts of the ship.

.2 Assumed extent of damage shall be as follows:

	For 0.3 L from the forward perpendicular of the ship	Any other part of the ship
Longitudinal extent	1/3 $L^{2/3}$ or 14.5 m, whichever is less	1/3 $L^{2/3}$ or 14.5 m, whichever is less
Transverse extent	*B*/6 or 10 m, whichever is less	*B*/6 or 5 m, whichever is less
Vertical extent, measured from the keel line	*B*/20 or 2 m, whichever is less	*B*/20 or 2 m, whichever is less

.3 If any damage of a lesser extent than the maximum damage specified in subparagraph .2 would result in a more severe condition, such damage should be considered.

9 In case of large lower holds in passenger ships, the Administration may require an increased double bottom height of not more than *B*/10 or 3 m, whichever is less, measured from the keel line. Alternatively, bottom damages may be calculated for these areas, in accordance with paragraph 8, but assuming an increased vertical extent.

Regulation 10
Construction of watertight bulkheads

1 Each watertight subdivision bulkhead, whether transverse or longitudinal, shall be constructed having scantlings as specified in regulation 2.17. In all cases, watertight subdivision bulkheads shall be capable of supporting at least the pressure due to a head of water up to the bulkhead deck.

2 Steps and recesses in watertight bulkheads shall be as strong as the bulkhead at the place where each occurs.

Regulation 11
Initial testing of watertight bulkheads, etc.

1 Testing watertight spaces not intended to hold liquids and cargo holds intended to hold ballast by filling them with water is not compulsory. When testing by filling with water is not carried out, a hose test shall be carried out where practicable. This test shall be carried out in the most advanced stage of the fitting out of the ship. Where a hose test is not practicable because of possible damage to machinery, electrical equipment insulation or outfitting items, it may be replaced by a careful visual examination of welded connections, supported where deemed necessary by means such as a dye penetrant test or an ultrasonic leak test or an equivalent test. In any case a thorough inspection of the watertight bulkheads shall be carried out.

2 The forepeak, double bottom (including duct keels) and inner skins shall be tested with water to a head corresponding to the requirements of regulation 10.1.

3 Tanks which are intended to hold liquids, and which form part of the watertight subdivision of the ship, shall be tested for tightness and structural strength with water to a head corresponding to its design pressure. The water head is in no case to be less than the top of the air pipes or to a level of 2.4 m above the top of the tank, whichever is the greater.

4 The tests referred to in paragraphs 2 and 3 are for the purpose of ensuring that the subdivision structural arrangements are watertight and are not to be regarded as a test of the fitness of any compartment for the storage of oil fuel or for other special purposes for which a test of a superior character may be required depending on the height to which the liquid has access in the tank or its connections.

Regulation 12
Peak and machinery space bulkheads, shaft tunnels, etc.

1 A collision bulkhead shall be fitted which shall be watertight up to the bulkhead deck. This bulkhead shall be located at a distance from the forward perpendicular of not less than $0.05L$ or 10 m, whichever is the less, and, except as may be permitted by the Administration, not more than $0.08L$ or $0.05L + 3$ m, whichever is the greater.

2 Where any part of the ship below the waterline extends forward of the forward perpendicular, e.g. a bulbous bow, the distances stipulated in paragraph 1 shall be measured from a point either:

.1 at the mid-length of such extension;

.2 at a distance $0.015L$ forward of the forward perpendicular; or

.3 at a distance 3 m forward of the forward perpendicular,

whichever gives the smallest measurement.

3 The bulkhead may have steps or recesses provided they are within the limits prescribed in paragraph 1 or 2.

4 No doors, manholes, access openings, ventilation ducts or any other openings shall be fitted in the collision bulkhead below the bulkhead deck.

5.1 Except as provided in paragraph 5.2, the collision bulkhead may be pierced below the bulkhead deck by not more than one pipe for dealing with fluid in the forepeak tank, provided that the pipe is fitted with a screw-down valve capable of being operated from above the bulkhead deck, the valve chest being secured inside the forepeak to the collision bulkhead. The Administration may, however, authorize the fitting of this valve on the after side of the collision bulkhead provided that the valve is readily accessible under all service conditions and the space in which it is located is not a cargo space. All valves shall be of steel, bronze or other approved ductile material. Valves of ordinary cast iron or similar material are not acceptable.

5.2 If the forepeak is divided to hold two different kinds of liquids the Administration may allow the collision bulkhead to be pierced below the bulkhead deck by two pipes, each of which is fitted as required by paragraph 5.1, provided the Administration is satisfied that there is no practical alternative to the fitting of such a second pipe and that, having regard to the additional subdivision provided in the forepeak, the safety of the ship is maintained.

6 Where a long forward superstructure is fitted the collision bulkhead shall be extended weathertight to the deck next above the bulkhead deck. The extension need not be fitted directly above the bulkhead below provided it is located within the limits prescribed in paragraph 1 or 2 with the exception permitted by paragraph 7 and that the part of the deck which forms the step is made effectively weathertight. The extension shall be so arranged as to preclude the possibility of the bow door causing damage to it in the case of damage to, or detachment of, a bow door.

7 Where bow doors are fitted and a sloping loading ramp forms part of the extension of the collision bulkhead above the bulkhead deck the ramp shall be weathertight over its complete length. In cargo ships the part of the ramp which is more than 2.3 m above the bulkhead deck may extend forward of the limit specified in paragraph 1 or 2. Ramps not meeting the above requirements shall be disregarded as an extension of the collision bulkhead.

8 The number of openings in the extension of the collision bulkhead above the freeboard deck shall be restricted to the minimum compatible with the design and normal operation of the ship. All such openings shall be capable of being closed weathertight.

9 Bulkheads shall be fitted separating the machinery space from cargo and accommodation spaces forward and aft and made watertight up to the bulkhead deck. In passenger ships an afterpeak bulkhead shall also be fitted and made watertight up to the bulkhead deck. The afterpeak bulkhead may, however, be stepped below the bulkhead deck, provided the degree of safety of the ship as regards subdivision is not thereby diminished.

10 In all cases stern tubes shall be enclosed in watertight spaces of moderate volume. In passenger ships the stern gland shall be situated in a watertight shaft tunnel or other watertight space separate from the stern tube compartment and of such volume that, if flooded by leakage through the stern gland, the bulkhead deck will not be immersed. In cargo ships other measures to minimize the danger of water penetrating into the ship in case of damage to stern tube arrangements may be taken at the discretion of the Administration.

Regulation 13
Openings in watertight bulkheads below the bulkhead deck in passenger ships

1 The number of openings in watertight bulkheads shall be reduced to the minimum compatible with the design and proper working of the ship, satisfactory means shall be provided for closing these openings.

2.1 Where pipes, scuppers, electric cables, etc., are carried through watertight bulkheads, arrangements shall be made to ensure the watertight integrity of the bulkheads.

2.2 Valves not forming part of a piping system shall not be permitted in watertight bulkheads.

2.3 Lead or other heat sensitive materials shall not be used in systems which penetrate watertight bulkheads, where deterioration of such systems in the event of fire would impair the watertight integrity of the bulkheads.

3 No doors, manholes, or access openings are permitted in watertight transverse bulkheads dividing a cargo space from an adjoining cargo space, except as provided in paragraph 9.1 and in regulation 14.

4 Subject to paragraph 10, not more than one door, apart from the doors to shaft tunnels, may be fitted in each watertight bulkhead within spaces containing the main and auxiliary propulsion machinery including boilers serving the needs of propulsion. Where two or more shafts are fitted, the tunnels shall be connected by an intercommunicating passage. There shall be only one door between the machinery space and the tunnel spaces where two shafts are fitted and only two doors where there are more than two shafts. All these doors shall be of the sliding type and shall be so located as to have their sills as high as practicable. The hand gear for operating these doors from above the bulkhead deck shall be situated outside the spaces containing the machinery.

5.1 Watertight doors, except as provided in paragraph 9.1 or regulation 14, shall be power-operated sliding doors complying with the requirements of paragraph 7 capable of being closed simultaneously from the central operating console at the navigation bridge in not more than 60 s with the ship in the upright position.

5.2 The means of operation whether by power or by hand of any power-operated sliding watertight door shall be capable of closing the door with the ship listed to 15° either way. Consideration shall also be given to the forces which may act on either side of the door as may be experienced when water is flowing through the opening applying a static head equivalent to a water height of at least 1 m above the sill on the centreline of the door.

5.3 Watertight door controls, including hydraulic piping and electric cables, shall be kept as close as practicable to the bulkhead in which the doors are fitted, in order to minimize the likelihood of them being involved in any damage which the ship may sustain. The positioning of watertight doors and their controls shall be such that if the ship sustains damage within one fifth of the breadth of the ship, as defined in regulation 2, such distance being measured at right angles to the centreline at the level of the deepest subdivision draught, the operation of the watertight doors clear of the damaged portion of the ship is not impaired.

6 All power-operated sliding watertight doors shall be provided with means of indication which will show at all remote operating positions whether the doors are open or closed. Remote operating positions shall only be at the navigation bridge as required by paragraph 7.1.5 and at the location where hand operation above the bulkhead deck is required by paragraph 7.1.4.

7.1 Each power-operated sliding watertight door:

.1 shall have a vertical or horizontal motion;

.2 shall, subject to paragraph 10, be normally limited to a maximum clear opening width of 1.2 m. The Administration may permit larger doors only to the extent considered necessary for the effective operation of the ship provided that other safety measures, including the following, are taken into consideration:

.1 special consideration shall be given to the strength of the door and its closing appliances in order to prevent leakages; and

.2 the door shall be located inboard the damage zone *B*/5;

.3 shall be fitted with the necessary equipment to open and close the door using electric power, hydraulic power, or any other form of power that is acceptable to the Administration;

.4 shall be provided with an individual hand-operated mechanism. It shall be possible to open and close the door by hand at the door itself from either side, and in addition, close the door from an accessible position above the bulkhead deck with an all round crank motion or some other movement providing the same degree of safety acceptable to the Administration. Direction of rotation or other movement is to be clearly indicated at all operating positions. The time necessary for the complete closure of the door, when operating by hand gear, shall not exceed 90 s with the ship in the upright position;

.5 shall be provided with controls for opening and closing the door by power from both sides of the door and also for closing the door by power from the central operating console at the navigation bridge;

.6 shall be provided with an audible alarm, distinct from any other alarm in the area, which will sound whenever the door is closed remotely by power and which shall sound for at least 5 s but no more than 10 s before the door begins to move and shall continue sounding until the door is completely closed. In the case of remote hand operation it is sufficient for the audible alarm to sound only when the door is moving. Additionally, in passenger areas and areas of high ambient noise the Administration may require the audible alarm to be supplemented by an intermittent visual signal at the door; and

.7 shall have an approximately uniform rate of closure under power. The closure time, from the time the door begins to move to the time it reaches the completely closed position, shall in no case be less than 20 s or more than 40 s with the ship in the upright position.

7.2 The electrical power required for power-operated sliding watertight doors shall be supplied from the emergency switchboard either directly or by a dedicated distribution board situated above the bulkhead deck. The associated control, indication and alarm circuits shall be supplied from the emergency switchboard either directly or by a dedicated distribution board situated above the bulkhead deck and be capable of being automatically supplied by the transitional source of emergency electrical power required by regulation 42.3.1.3 in the event of failure of either the main or emergency source of electrical power.

7.3 Power-operated sliding watertight doors shall have either:

.1 a centralized hydraulic system with two independent power sources each consisting of a motor and pump capable of simultaneously closing all doors. In addition, there shall be for the whole installation hydraulic accumulators of sufficient capacity to operate all the doors at least three times, i.e. closed-open-closed, against an adverse list of 15°. This operating cycle shall be capable of being carried out when the accumulator is at the pump cut-in pressure. The fluid used shall be chosen considering the temperatures liable to be encountered by the installation during its service. The power operating system shall be designed to minimize the possibility of having a single failure in the hydraulic piping adversely affect the operation of more than one door. The hydraulic system shall be

provided with a low-level alarm for hydraulic fluid reservoirs serving the power-operated system and a low gas pressure alarm or other effective means of monitoring loss of stored energy in hydraulic accumulators. These alarms are to be audible and visual and shall be situated on the central operating console at the navigation bridge; or

.2 an independent hydraulic system for each door with each power source consisting of a motor and pump capable of opening and closing the door. In addition, there shall be a hydraulic accumulator of sufficient capacity to operate the door at least three times, i.e. closed-open-closed, against an adverse list of 15°. This operating cycle shall be capable of being carried out when the accumulator is at the pump cut-in pressure. The fluid used shall be chosen considering the temperatures liable to be encountered by the installation during its service. A low gas pressure group alarm or other effective means of monitoring loss of stored energy in hydraulic accumulators shall be provided at the central operating console on the navigation bridge. Loss of stored energy indication at each local operating position shall also be provided; or

.3 an independent electrical system and motor for each door with each power source consisting of a motor capable of opening and closing the door. The power source shall be capable of being automatically supplied by the transitional source of emergency electrical power as required by regulation 42.4.2 – in the event of failure of either the main or emergency source of electrical power and with sufficient capacity to operate the door at least three times, i.e. closed-open-closed, against an adverse list of 15°.

For the systems specified in paragraphs 7.3.1, 7.3.2 and 7.3.3, provision should be made as follows: Power systems for power-operated watertight sliding doors shall be separate from any other power system. A single failure in the electric or hydraulic power-operated systems excluding the hydraulic actuator shall not prevent the hand operation of any door.

7.4 Control handles shall be provided at each side of the bulkhead at a minimum height of 1.6 m above the floor and shall be so arranged as to enable persons passing through the doorway to hold both handles in the open position without being able to set the power closing mechanism in operation accidentally. The direction of movement of the handles in opening and closing the door shall be in the direction of door movement and shall be clearly indicated.

7.5 As far as practicable, electrical equipment and components for watertight doors shall be situated above the bulkhead deck and outside hazardous areas and spaces.

7.6 The enclosures of electrical components necessarily situated below the bulkhead deck shall provide suitable protection against the ingress of water.

7.7 Electric power, control, indication and alarm circuits shall be protected against fault in such a way that a failure in one door circuit will not cause a failure in any other door circuit. Short circuits or other faults in the alarm or indicator circuits of a door shall not result in a loss of power operation of that door. Arrangements shall be such that leakage of water into the electrical equipment located below the bulkhead deck will not cause the door to open.

7.8 A single electrical failure in the power operating or control system of a power-operated sliding watertight door shall not result in a closed door opening. Availability of the power supply should be continuously monitored at a point in the electrical circuit as near as practicable to each of the motors required by paragraph 7.3. Loss of any such power supply should activate an audible and visual alarm at the central operating console at the navigation bridge.

8.1 The central operating console at the navigation bridge shall have a "master mode" switch with two modes of control: a "local control" mode which shall allow any door to be locally opened and locally closed after use without automatic closure, and a "doors closed" mode which shall automatically close any door that is open. The "doors closed" mode shall automatically close any door that is open. The "doors closed" mode shall permit doors to be opened locally and shall automatically re-close the doors upon release of the local control mechanism. The "master mode" switch shall normally be in the "local control" mode. The "doors closed" mode shall only be used in an emergency or for testing purposes. Special consideration shall be given to the reliability of the "master mode" switch.

8.2 The central operating console at the navigation bridge shall be provided with a diagram showing the location of each door, with visual indicators to show whether each door is open or closed. A red light shall indicate a door is fully open and a green light shall indicate a door is fully closed. When the door is closed remotely the red light shall indicate the intermediate position by flashing. The indicating circuit shall be independent of the control circuit for each door.

8.3 It shall not be possible to remotely open any door from the central operating console.

9.1 If the Administration is satisfied that such doors are essential, watertight doors of satisfactory construction may be fitted in watertight bulkheads dividing cargo between deck spaces. Such doors may be hinged, rolling or sliding doors but shall not be remotely controlled. They shall be fitted at the highest level and as far from the shell plating as practicable, but in no case shall the outboard vertical edges be situated at a distance from the shell plating which is less than one fifth of the breadth of the ship, as defined in regulation 2, such distance being measured at right angles to the centreline at the level of the deepest subdivision draught.

9.2 Should any such doors be accessible during the voyage, they shall be fitted with a device which prevents unauthorized opening. When it is proposed to fit such doors, the number and arrangements shall receive the special consideration of the Administration.

10 Portable plates on bulkheads shall not be permitted except in machinery spaces. The Administration may permit not more than one power-operated sliding watertight door in each watertight bulkhead larger than those specified in paragraph 7.1.2 to be substituted for these portable plates, provided these doors are intended to remain closed during navigation except in case of urgent necessity at the discretion of the master. These doors need not meet the requirements of paragraph 7.1.4 regarding complete closure by hand-operated gear in 90 s.

11.1 Where trunkways or tunnels for access from crew accommodation to the stokehold, for piping, or for any other purpose are carried through watertight bulkheads, they shall be watertight and in accordance with the requirements of regulation 16-1. The access to at least one end of each such tunnel or trunkway, if used as a passage at sea, shall be through a trunk extending watertight to a height sufficient to permit access above

the bulkhead deck. The access to the other end of the trunkway or tunnel may be through a watertight door of the type required by its location in the ship. Such trunkways or tunnels shall not extend through the first subdivision bulkhead abaft the collision bulkhead.

11.2 Where it is proposed to fit tunnels piercing watertight bulkheads, these shall receive the special consideration of the Administration.

11.3 Where trunkways in connection with refrigerated cargo and ventilation or forced draught trunks are carried through more than one watertight bulkhead, the means of closure at such openings shall be operated by power and be capable of being closed from a central position situated above the bulkhead deck.

Regulation 13-1
Openings in watertight bulkheads and internal decks in cargo ships

1 The number of openings in watertight subdivisions is to be kept to a minimum compatible with the design and proper working of the ship. Where penetrations of watertight bulkheads and internal decks are necessary for access, piping, ventilation, electrical cables, etc., arrangements are to be made to maintain the watertight integrity. The Administration may permit relaxation in the watertightness of openings above the freeboard deck, provided that it is demonstrated that any progressive flooding can be easily controlled and that the safety of the ship is not impaired.

2 Doors provided to ensure the watertight integrity of internal openings which are used while at sea are to be sliding watertight doors capable of being remotely closed from the bridge and are also to be operable locally from each side of the bulkhead. Indicators are to be provided at the control position showing whether the doors are open or closed, and an audible alarm is to be provided at the door closure. The power, control and indicators are to be operable in the event of main power failure. Particular attention is to be paid to minimizing the effect of control system failure. Each power-operated sliding watertight door shall be provided with an individual hand-operated mechanism. It shall be possible to open and close the door by hand at the door itself from both sides.

3 Access doors and access hatch covers normally closed at sea, intended to ensure the watertight integrity of internal openings, shall be provided with means of indication locally and on the bridge showing whether these doors or hatch covers are open or closed. A notice is to be affixed to each such door or hatch cover to the effect that it is not to be left open.

4 Watertight doors or ramps of satisfactory construction may be fitted to internally subdivide large cargo spaces, provided that the Administration is satisfied that such doors or ramps are essential. These doors or ramps may be hinged, rolling or sliding doors or ramps, but shall not be remotely controlled. Should any of the doors or ramps be accessible during the voyage, they shall be fitted with a device which prevents unauthorized opening.

5 Other closing appliances which are kept permanently closed at sea to ensure the watertight integrity of internal openings shall be provided with a notice which is to be affixed to each such closing appliance to the effect that it is to be kept closed. Manholes fitted with closely bolted covers need not be so marked.

Regulation 14
Passenger ships carrying goods vehicles and accompanying personnel

1 This regulation applies to passenger ships designed or adapted for the carriage of goods vehicles and accompanying personnel.

2 If in such a ship the total number of passengers which include personnel accompanying vehicles does not exceed $12 + A_d/25$, where A_d = total deck area (square metres) of spaces available for the stowage of goods vehicles and where the clear height at the stowage position and at the entrance to such spaces is not less than 4 m, the provisions of regulations 13.9.1 and 13.9.2 in respect of watertight doors apply except that the doors may be fitted at any level in watertight bulkheads dividing cargo spaces. Additionally, indicators are required on the navigation bridge to show automatically when each door is closed and all door fastenings are secured.

3 The ship may not be certified for a higher number of passengers than assumed in paragraph 2, if a watertight door has been fitted in accordance with this regulation.

Regulation 15
Openings in the shell plating below the bulkhead deck of passenger ships and the freeboard deck of cargo ships

1 The number of openings in the shell plating shall be reduced to the minimum compatible with the design and proper working of the ship.

2 The arrangement and efficiency of the means for closing any opening in the shell plating shall be consistent with its intended purpose and the position in which it is fitted and generally to the satisfaction of the Administration.

3.1 Subject to the requirements of the International Convention on Load Lines in force, no sidescuttle shall be fitted in such a position that its sill is below a line drawn parallel to the bulkhead deck at side and having its lowest point 2.5% of the breadth of the ship above the deepest subdivision draught, or 500 mm, whichever is the greater.

3.2 All sidescuttles the sills of which are below the bulkhead deck of passenger ships and the freeboard deck of cargo ships, as permitted by paragraph 3.1, shall be of such construction as will effectively prevent any person opening them without the consent of the master of the ship.

4 Efficient hinged inside deadlights so arranged that they can be easily and effectively closed and secured watertight, shall be fitted to all sidescuttles except that abaft one eighth of the ship's length from the forward perpendicular and above a line drawn parallel to the bulkhead deck at side and having its lowest point at a height of 3.7 m plus 2.5% of the breadth of the ship above the deepest subdivision draught, the deadlights may be portable in passenger accommodation other than that for steerage passengers, unless the deadlights are required by the International Convention on Load Lines in force to be permanently attached in their proper positions. Such portable deadlights shall be stowed adjacent to the sidescuttles they serve.

5.1 No sidescuttles shall be fitted in any spaces which are appropriated exclusively to the carriage of cargo or coal.

5.2 Sidescuttles may, however, be fitted in spaces appropriated alternatively to the carriage of cargo or passengers, but they shall be of such construction as will effectively prevent any person opening them or their deadlights without the consent of the master.

6 Automatic ventilating sidescuttles shall not be fitted in the shell plating below the bulkhead deck of passenger ships and the freeboard deck of cargo ships without the special sanction of the Administration.

7 The number of scuppers, sanitary discharges and other similar openings in the shell plating shall be reduced to the minimum either by making each discharge serve for as many as possible of the sanitary and other pipes, or in any other satisfactory manner.

8.1 All inlets and discharges in the shell plating shall be fitted with efficient and accessible arrangements for preventing the accidental admission of water into the ship.

8.2.1 Subject to the requirements of the International Convention on Load Lines in force, and except as provided in paragraph 8.3, each separate discharge led through the shell plating from spaces below the bulkhead deck of passenger ships and the freeboard deck of cargo ships shall be provided with either one automatic non-return valve fitted with a positive means of closing it from above the bulkhead deck or with two automatic non-return valves without positive means of closing, provided that the inboard valve is situated above the deepest subdivision draught and is always accessible for examination under service conditions. Where a valve with positive means of closing is fitted, the operating position above the bulkhead deck shall always be readily accessible and means shall be provided for indicating whether the valve is open or closed.

8.2.2 The requirements of the International Convention on Load Lines in force shall apply to discharges led through the shell plating from spaces above the bulkhead deck of passenger ships and the freeboard deck of cargo ships.

8.3 Machinery space, main and auxiliary sea inlets and discharges in connection with the operation of machinery shall be fitted with readily accessible valves between the pipes and the shell plating or between the pipes and fabricated boxes attached to the shell plating. In manned machinery spaces the valves may be controlled locally and shall be provided with indicators showing whether they are open or closed.

8.4 Moving parts penetrating the shell plating below the deepest subdivision draught shall be fitted with a watertight sealing arrangement acceptable to the Administration. The inboard gland shall be located within a watertight space of such volume that, if flooded, the bulkhead deck will not be submerged. The Administration may require that if such compartment is flooded, essential or emergency power and lighting, internal communication, signals or other emergency devices must remain available in other parts of the ship.

8.5 All shell fittings and valves required by this regulation shall be of steel, bronze or other approved ductile material. Valves of ordinary cast iron or similar material are not acceptable. All pipes to which this regulation refers shall be of steel or other equivalent material to the satisfaction of the Administration.

9 Gangway, cargo and fuelling ports fitted below the bulkhead deck of passenger ships and the freeboard deck of cargo ships shall be watertight and in no case be so fitted as to have their lowest point below the deepest subdivision draught.

10.1 The inboard opening of each ash-chute, rubbish-chute, etc., shall be fitted with an efficient cover.

10.2 If the inboard opening is situated below the bulkhead deck of passenger ships and the freeboard deck of cargo ships, the cover shall be watertight and, in addition, an automatic non-return valve shall be fitted in the chute in an easily accessible position above the deepest subdivision draught.

Regulation 15-1
External openings in cargo ships

1 All external openings leading to compartments assumed intact in the damage analysis, which are below the final damage waterline, are required to be watertight.

2 External openings required to be watertight in accordance with paragraph 1 shall, except for cargo hatch covers, be fitted with indicators on the bridge.

3 Openings in the shell plating below the deck limiting the vertical extent of damage shall be fitted with a device that prevents unauthorized opening if they are accessible during the voyage.

4 Other closing appliances which are kept permanently closed at sea to ensure the watertight integrity of external openings shall be provided with a notice affixed to each appliance to the effect that it is to be kept closed. Manholes fitted with closely bolted covers need not be so marked.

Regulation 16
Construction and initial tests of watertight doors, sidescuttles, etc.

1 In all ships:

.1 the design, materials and construction of all watertight doors, sidescuttles, gangway and cargo ports, valves, pipes, ash-chutes and rubbish-chutes referred to in these regulations shall be to the satisfaction of the Administration;

.2 such valves, doors and mechanisms shall be suitably marked to ensure that they may be properly used to provide maximum safety; and

.3 the frames of vertical watertight doors shall have no groove at the bottom in which dirt might lodge and prevent the door closing properly.

2 In passenger ships and cargo ships watertight doors shall be tested by water pressure to a head of water they might sustain in a final or intermediate stage of flooding. Where testing of individual doors is not carried out because of possible damage to insulation or outfitting items, testing of individual doors may be replaced by a prototype pressure test of each type and size of door with a test pressure corresponding at least to the head required for the intended location. The prototype test shall be carried out before the door is fitted. The installation method and procedure for fitting the door on board shall correspond to that of the prototype test. When fitted on board, each door shall be checked for proper seating between the bulkhead, the frame and the door.

Regulation 16-1
Construction and initial tests of watertight decks, trunks, etc.

1 Watertight decks, trunks, tunnels, duct keels and ventilators shall be of the same strength as watertight bulkheads at corresponding levels. The means used for making them watertight, and the arrangements adopted for closing openings in them, shall be to the satisfaction of the Administration. Watertight ventilators and trunks shall be carried at least up to the bulkhead deck in passenger ships and up to the freeboard deck in cargo ships.

2 Where a ventilation trunk passing through a structure penetrates the bulkhead deck, the trunk shall be capable of withstanding the water pressure that may be present within the trunk, after having taken into account the maximum heel angle allowable during intermediate stages of flooding, in accordance with regulation 7-2.

3 Where all or part of the penetration of the bulkhead deck is on the main ro-ro deck, the trunk shall be capable of withstanding impact pressure due to internal water motions (sloshing) of water trapped on the ro-ro deck.

4 After completion, a hose or flooding test shall be applied to watertight decks and a hose test to watertight trunks, tunnels and ventilators.

Regulation 17
Internal watertight integrity of passenger ships above the bulkhead deck

1 The Administration may require that all reasonable and practicable measures shall be taken to limit the entry and spread of water above the bulkhead deck. Such measures may include partial bulkheads or webs. When partial watertight bulkheads and webs are fitted on the bulkhead deck, above or in the immediate vicinity of watertight bulkheads, they shall have watertight shell and bulkhead deck connections so as to restrict the flow of water along the deck when the ship is in a heeled damaged condition. Where the partial watertight bulkhead does not line up with the bulkhead below, the bulkhead deck between shall be made effectively watertight. Where openings, pipes, scuppers, electric cables etc. are carried through the partial watertight bulkheads or decks within the immersed part of the bulkhead deck, arrangements shall be made to ensure the watertight integrity of the structure above the bulkhead deck.

2 All openings in the exposed weather deck shall have coamings of ample height and strength and shall be provided with efficient means for expeditiously closing them weathertight. Freeing ports, open rails and scuppers shall be fitted as necessary for rapidly clearing the weather deck of water under all weather conditions.

3 The open end of air pipes terminating within a superstructure shall be at least 1 m above the waterline when the ship heels to an angle of 15°, or the maximum angle of heel during intermediate stages of flooding, as determined by direct calculation, whichever is the greater. Alternatively, air pipes from tanks other than oil tanks may discharge through the side of the superstructure. The provisions of this paragraph are without prejudice to the provisions of the International Convention on Load Lines in force.

4 Sidescuttles, gangway, cargo and fuelling ports and other means for closing openings in the shell plating above the bulkhead deck shall be of efficient design and construction and of sufficient strength having regard to the spaces in which they are fitted and their positions relative to the deepest subdivision draught.

5 Efficient inside deadlights, so arranged that they can be easily and effectively closed and secured watertight, shall be provided for all sidescuttles to spaces below the first deck above the bulkhead deck.

Regulation 17-1
Integrity of the hull and superstructure, damage prevention and control on ro-ro passenger ships

1.1 Subject to the provisions of paragraphs 1.2 and 1.3, all accesses that lead to spaces below the bulkhead deck shall have a lowest point which is not less than 2.5 m above the bulkhead deck.

1.2 Where vehicle ramps are installed to give access to spaces below the bulkhead deck, their openings shall be able to be closed weathertight to prevent ingress of water below, alarmed and indicated to the navigation bridge.

1.3 The Administration may permit the fitting of particular accesses to spaces below the bulkhead deck provided they are necessary for the essential working of the ship, e.g. the movement of machinery and stores, subject to such accesses being made watertight, alarmed and indicated on the navigation bridge.

2 Indicators shall be provided on the navigation bridge for all shell doors, loading doors and other closing appliances which, if left open or not properly secured, could, in the opinion of the Administration, lead to flooding of a special category space or ro-ro space. The indicator system shall be designed on the fail-safe principle and shall show by visual alarms if the door is not fully closed or if any of the securing arrangements are not in place and fully locked and by audible alarms if such door or closing appliances become open or the securing arrangements become unsecured. The indicator panel on the navigation bridge shall be equipped with a mode selection function "harbour/sea voyage" so arranged that an audible alarm is given on the navigation bridge if the ship leaves harbour with the bow doors, inner doors, stern ramp or any other side shell doors not closed or any closing device not in the correct position. The power supply for the indicator system shall be independent of the power supply for operating and securing the doors.

3 Television surveillance and a water leakage detection system shall be arranged to provide an indication to the navigation bridge and to the engine control station of any leakage through inner and outer bow doors, stern doors or any other shell doors which could lead to flooding of special category spaces or ro-ro spaces.

PART B-3
SUBDIVISION LOAD LINE ASSIGNMENT FOR PASSENGER SHIPS

Regulation 18
Assigning, marking and recording of subdivision load lines for passenger ships

1 In order that the required degree of subdivision shall be maintained, a load line corresponding to the approved subdivision draught shall be assigned and marked on the ship's sides. A ship intended for alternating modes of operation may, if the owners desire, have one or more additional load lines assigned and marked to correspond with the subdivision draughts which the Administration may approve for the alternative service configurations. Each service configuration so approved shall comply with part B-1 of this chapter independently of the results obtained for other modes of operation.

2 The subdivision load lines assigned and marked shall be recorded in the Passenger Ship Safety Certificate, and shall be distinguished by the notation P1 for the principal passenger service configuration, and P2, P3, etc., for the alternative configurations. The principal passenger configuration shall be taken as the mode of operation in which the required subdivision index *R* will have the highest value.

3 The freeboard corresponding to each of these load lines shall be measured at the same position and from the same deck line as the freeboards determined in accordance with the International Convention on Load Lines in force.

4 The freeboard corresponding to each approved subdivision load line and the service configuration, for which it is approved, shall be clearly indicated on the Passenger Ship Safety Certificate.

5 In no case shall any subdivision load line mark be placed above the deepest load line in salt water as determined by the strength of the ship or the International Convention on Load Lines in force.

6 Whatever may be the position of the subdivision load line marks, a ship shall in no case be loaded so as to submerge the load line mark appropriate to the season and locality as determined in accordance with the International Convention on Load Lines in force.

7 A ship shall in no case be so loaded that when it is in salt water the subdivision load line mark appropriate to the particular voyage and service configuration is submerged.

PART B-4
STABILITY MANAGEMENT

Regulation 19
Damage control information

1 There shall be permanently exhibited, or readily available on the navigation bridge, for the guidance of the officer in charge of the ship, plans showing clearly for each deck and hold the boundaries of the watertight compartments, the openings therein with the means of closure and position of any controls thereof, and the arrangements for the correction of any list due to flooding. In addition, booklets containing the aforementioned information shall be made available to the officers of the ship.

2 Watertight doors in passenger ships permitted to remain open during navigation shall be clearly indicated in the ship's stability information.

3 General precautions to be included shall consist of a listing of equipment, conditions, and operational procedures, considered by the Administration to be necessary to maintain watertight integrity under normal ship operations.

4 Specific precautions to be included shall consist of a listing of elements (i.e. closures, security of cargo, sounding of alarms, etc.) considered by the Administration to be vital to the survival of the ship, passengers and crew.

5 In case of ships to which damage stability requirements of part B-1 apply, damage stability information shall provide the master a simple and easily understandable way of assessing the ship's survivability in all damage cases involving a compartment or group of compartments.

Regulation 20
Loading of passenger ships

1 On completion of loading of the ship and prior to its departure, the master shall determine the ship's trim and stability and also ascertain and record that the ship is in compliance with stability criteria in relevant regulations. The determination of the ship's stability shall always be made by calculation. The Administration may accept the use of an electronic loading and stability computer or equivalent means for this purpose.

2 Water ballast should not in general be carried in tanks intended for oil fuel. In ships in which it is not practicable to avoid putting water in oil fuel tanks, oily-water separating equipment to the satisfaction of the Administration shall be fitted, or other alternative means, such as discharge to shore facilities, acceptable to the Administration shall be provided for disposing of the oily-water ballast.

3 The provisions of this regulation are without prejudice to the provisions of the International Convention for the Prevention of Pollution from Ships in force.

Regulation 21
Periodical operation and inspection of watertight doors, etc. in passenger ships

1 Drills for the operating of watertight doors, sidescuttles, valves and closing mechanisms of scuppers, ash-chutes and rubbish-chutes shall take place weekly. In ships in which the voyage exceeds one week in duration a complete drill shall be held before leaving port, and others thereafter at least once a week during the voyage.

2 All watertight doors, both hinged and power-operated, in watertight bulkheads, in use at sea, shall be operated daily.

3 The watertight doors and all mechanisms and indicators connected therewith, all valves, the closing of which is necessary to make a compartment watertight, and all valves the operation of which is necessary for damage control cross connections shall be periodically inspected at sea at least once a week.

4 A record of all drills and inspections required by this regulation shall be entered in the log-book with an explicit record of any defects which may be disclosed.

Regulation 22
Prevention and control of water ingress, etc.

1 All watertight doors shall be kept closed during navigation except that they may be opened during navigation as specified in paragraphs 3 and 4. Watertight doors of a width of more than 1.2 m in machinery spaces as permitted by regulation 13.10 may only be opened in the circumstances detailed in that regulation. Any door which is opened in accordance with this paragraph shall be ready to be immediately closed.

2 Watertight doors located below the bulkhead deck having a maximum clear opening width of more than 1.2 m shall be kept closed when the ship is at sea, except for limited periods when absolutely necessary as determined by the Administration.

3 A watertight door may be opened during navigation to permit the passage of passengers or crew, or when work in the immediate vicinity of the door necessitates it being opened. The door must be immediately closed when transit through the door is complete or when the task which necessitated it being open is finished.

4 Certain watertight doors may be permitted to remain open during navigation only if considered absolutely necessary; that is, being open is determined essential to the safe and effective operation of the ship's machinery or to permit passengers normally unrestricted access throughout the passenger area. Such determination shall be made by the Administration only after careful consideration of the impact on ship operations and survivability. A watertight door permitted to remain thus open shall be clearly indicated in the ship's stability information and shall always be ready to be immediately closed.

5 Portable plates on bulkheads shall always be in place before the ship leaves port, and shall not be removed during navigation except in case of urgent necessity at the discretion of the master. The necessary precautions shall be taken in replacing them to ensure that the joints are watertight. Power-operated sliding watertight doors permitted in machinery spaces in accordance with regulation 13.10 shall be closed before the ship leaves port and shall remain closed during navigation except in case of urgent necessity at the discretion of the master.

6 Watertight doors fitted in watertight bulkheads dividing cargo between deck spaces in accordance with regulation 13.9.1 shall be closed before the voyage commences and shall be kept closed during navigation; the time of opening such doors in port and of closing them before the ship leaves port shall be entered in the log-book.

7 Gangway, cargo and fuelling ports fitted below the bulkhead deck shall be effectively closed and secured watertight before the ship leaves port, and shall be kept closed during navigation.

8 The following doors, located above the bulkhead deck, shall be closed and locked before the ship proceeds on any voyage and shall remain closed and locked until the ship is at its next berth:

.1 cargo loading doors in the shell or the boundaries of enclosed superstructures;

.2 bow visors fitted in positions as indicated in paragraph 8.1;

.3 cargo loading doors in the collision bulkhead; and

.4 ramps forming an alternative closure to those defined in paragraphs 8.1 to 8.3 inclusive.

9 Provided that where a door cannot be opened or closed while the ship is at the berth such a door may be opened or left open while the ship approaches or draws away from the berth, but only so far as may be necessary to enable the door to be immediately operated. In any case, the inner bow door must be kept closed.

10 Notwithstanding the requirements of paragraphs 8.1 and 8.4, the Administration may authorize that particular doors can be opened at the discretion of the master, if necessary for the operation of the ship or the embarking and disembarking of passengers when the ship is at safe anchorage and provided that the safety of the ship is not impaired.

11 The master shall ensure that an effective system of supervision and reporting of the closing and opening of the doors referred to in paragraph 8 is implemented.

12 The master shall ensure, before the ship proceeds on any voyage, that an entry in the log-book is made of the time of the last closing of the doors specified in paragraph 13 and the time of any opening of particular doors in accordance with paragraph 14.

13 Hinged doors, portable plates, sidescuttles, gangway, cargo and bunkering ports and other openings, which are required by these regulations to be kept closed during navigation, shall be closed before the ship leaves port. The time of closing and the time of opening (if permissible under these regulations) shall be recorded in such log-book as may be prescribed by the Administration.

14 Where in a between-decks, the sills of any of the sidescuttles referred to in regulation 15.3.2 are below a line drawn parallel to the bulkhead deck at side and having its lowest point 1.4 m plus 2.5% of the breadth of the ship above the water when the ship departs from any port, all the sidescuttles in that between-decks shall be closed watertight and locked before the ship leaves port, and they shall not be opened before the ship arrives at the next port. In the application of this paragraph the appropriate allowance for fresh water may be made when applicable.

.1 The time of opening such sidescuttles in port and of closing and locking them before the ship leaves port shall be entered in such log-book as may be prescribed by the Administration.

.2 For any ship that has one or more sidescuttles so placed that the requirements of paragraph 14 would apply when it was floating at its deepest subdivision draught, the Administration may indicate the limiting mean draught at which these sidescuttles will have their sills above the line drawn parallel to the bulkhead deck at side, and having its lowest point 1.4 m plus 2.5% of the breadth of the ship above the waterline corresponding to the limiting mean draught, and at which it will therefore be permissible to depart from port without previously closing and locking them and to open them at sea on the responsibility of the master during the voyage to the next port. In tropical zones as defined in the International Convention on Load Lines in force, this limiting draught may be increased by 0.3 m.

15 Sidescuttles and their deadlights which will not be accessible during navigation shall be closed and secured before the ship leaves port.

16 If cargo is carried in spaces referred to in regulation 15.5.2, the sidescuttles and their deadlights shall be closed watertight and locked before the cargo is shipped and such closing and locking shall be recorded in such log-book as may be prescribed by the Administration.

17 When a rubbish-chute, etc. is not in use, both the cover and the valve required by regulation 15.10.2 shall be kept closed and secured.

Regulation 23
Special requirements for ro-ro passenger ships

1 Special category spaces and ro-ro spaces shall be continuously patrolled or monitored by effective means, such as television surveillance, so that any movement of vehicles in adverse weather conditions and unauthorized access by passengers thereto can be detected whilst the ship is underway.

2 Documented operating procedures for closing and securing all shell doors, loading doors and other closing appliances which, if left open or not properly secured, could, in the opinion of the Administration, lead to flooding of a special category space or ro-ro space, shall be kept on board and posted at an appropriate place.

3 All accesses from the ro-ro deck and vehicle ramps that lead to spaces below the bulkhead deck shall be closed before the ship leaves the berth on any voyage and shall remain closed until the ship is at its next berth.

4 The master shall ensure that an effective system of supervision and reporting of the closing and opening of such accesses referred to in paragraph 3 is implemented.

5 The master shall ensure, before the ship leaves the berth on any voyage, that an entry in the log-book, as required by regulation 22.13, is made of the time of the last closing of the accesses referred to in paragraph 3.

6 Notwithstanding the requirements of paragraph 3, the Administration may permit some accesses to be opened during the voyage, but only for a period sufficient to permit through passage and, if required, for the essential working of the ship.

7 All transverse or longitudinal bulkheads which are taken into account as effective to confine the seawater accumulated on the ro-ro deck shall be in place and secured before the ship leaves the berth and remain in place and secured until the ship is at its next berth.

8 Notwithstanding the requirements of paragraph 7, the Administration may permit some accesses within such bulkheads to be opened during the voyage but only for sufficient time to permit through passage and, if required, for the essential working of the ship.

9 In all ro-ro passenger ships, the master or the designated officer shall ensure that, without the expressed consent of the master or the designated officer, no passengers are allowed access to an enclosed ro-ro deck when the ship is under way.

Regulation 24
Prevention and control of water ingress, etc. in cargo ships

1 Openings in the shell plating below the deck limiting the vertical extent of damage shall be kept permanently closed while at sea.

2 Notwithstanding the requirements of paragraph 3, the Administration may authorize that particular doors may be opened at the discretion of the master, if necessary for the operation of the ship and provided that the safety of the ship is not impaired.

3 Watertight doors or ramps fitted to internally subdivide large cargo spaces shall be closed before the voyage commences and shall be kept closed during navigation; the time of opening such doors in port and of closing them before the ship leaves port shall be entered in the log-book.

4 The use of access doors and hatch covers intended to ensure the watertight integrity of internal openings shall be authorized by the officer of the watch.

Regulation 25
Water level detectors on single hold cargo ships other than bulk carriers

1 Single hold cargo ships other than bulk carriers constructed before 1 January 2007 shall comply with the requirements of this regulation not later than 31 December 2009.

2 Ships having a length (*L*) of less than 80 m, or 100 m if constructed before 1 July 1998, and a single cargo hold below the freeboard deck or cargo holds below the freeboard deck which are not separated by at least one bulkhead made watertight up to that deck, shall be fitted in such space or spaces with water level detectors.

3 The water level detectors required by paragraph 2 shall:

.1 give an audible and visual alarm at the navigation bridge when the water level above the inner bottom in the cargo hold reaches a height of not less than 0.3 m, and another when such level reaches not more than 15% of the mean depth of the cargo hold; and

.2 be fitted at the aft end of the hold, or above its lowest part where the inner bottom is not parallel to the designed waterline. Where webs or partial watertight bulkheads are fitted above the inner bottom, Administrations may require the fitting of additional detectors.

4 The water level detectors required by paragraph 2 need not be fitted in ships complying with regulation XII/12, or in ships having watertight side compartments each side of the cargo hold length extending vertically at least from inner bottom to freeboard deck."

PART C
MACHINERY INSTALLATIONS

2 The following new regulation 35-1 is inserted after existing regulation 35:

"**Regulation 35-1**
Bilge pumping arrangements

1 This regulation applies to ships constructed on or after 1 January 2009.

2 Passenger ships and cargo ships

2.1 An efficient bilge pumping system shall be provided, capable of pumping from and draining any watertight compartment other than a space permanently appropriated for the carriage of fresh water, water ballast, oil fuel or liquid cargo and for which other efficient means of pumping are provided, under all practical conditions. Efficient means shall be provided for draining water from insulated holds.

2.2 Sanitary, ballast and general service pumps may be accepted as independent power bilge pumps if fitted with the necessary connections to the bilge pumping system.

2.3 All bilge pipes used in or under coal bunkers or fuel storage tanks or in boiler or machinery spaces, including spaces in which oil-settling tanks or oil fuel pumping units are situated, shall be of steel or other suitable material.

2.4 The arrangement of the bilge and ballast pumping system shall be such as to prevent the possibility of water passing from the sea and from water ballast spaces into the cargo and machinery spaces, or from one compartment to another. Provision shall be made to prevent any deep tank having bilge and ballast connections being inadvertently flooded from the sea when containing cargo, or being discharged through a bilge pump when containing water ballast.

2.5 All distribution boxes and manually operated valves in connection with the bilge pumping arrangements shall be in positions which are accessible under ordinary circumstances.

2.6 Provision shall be made for the drainage of enclosed cargo spaces situated on the bulkhead deck of a passenger ship and on the freeboard deck of a cargo ship, provided that the Administration may permit the means of drainage to be dispensed with in any particular compartment of any ship or class of ship if it is satisfied that by reason of size or internal subdivision of those spaces the safety of the ship is not thereby impaired.

2.6.1 Where the freeboard to the bulkhead deck or the freeboard deck, respectively, is such that the deck edge is immersed when the ship heels more than 5°, the drainage shall be by means of a sufficient number of scuppers of suitable size discharging directly overboard, fitted in accordance with the requirements of regulation 15 in the case of a passenger ship and the requirements for scuppers, inlets and discharges of the International Convention on Load Lines in force in the case of a cargo ship.

2.6.2 Where the freeboard is such that the edge of the bulkhead deck or the edge of the freeboard deck, respectively, is immersed when the ship heels 5° or less, the drainage of the enclosed cargo spaces on the bulkhead deck or on the freeboard deck, respectively, shall be led to a suitable space, or spaces, of adequate capacity, having a high water level alarm and provided with suitable arrangements for discharge overboard. In addition it shall be ensured that:

.1 the number, size and disposition of the scuppers are such as to prevent unreasonable accumulation of free water;

.2 the pumping arrangements required by this regulation for passenger ships or cargo ships, as applicable, take account of the requirements for any fixed pressure water-spraying fire extinguishing system;

.3 water contaminated with petrol or other dangerous substances is not drained to machinery spaces or other spaces where sources of ignition may be present; and

.4 where the enclosed cargo space is protected by a carbon dioxide fire extinguishing system the deck scuppers are fitted with means to prevent the escape of the smothering gas.

3 Passenger ships

3.1 The bilge pumping system required by paragraph 2.1 shall be capable of operation under all practicable conditions after a casualty whether the ship is upright or listed. For this purpose wing suctions shall generally be fitted except in narrow compartments at the end of the ship where one suction may be sufficient. In compartments of unusual form, additional suctions may be required. Arrangements shall be made whereby water in the compartment may find its way to the suction pipes. Where, for particular compartments,

the Administration is satisfied that the provision of drainage may be undesirable, it may allow such provision to be dispensed with if calculations made in accordance with the conditions laid down in regulations 7 and 8 show that the survival capability of the ship will not be impaired.

3.2 At least three power pumps shall be fitted connected to the bilge main, one of which may be driven by the propulsion machinery. Where the bilge pump numeral is 30 or more, one additional independent power pump shall be provided.

The bilge pump numeral shall be calculated as follows:

when P_1 is greater than P: bilge pump numeral $= 72 \cdot \left[\frac{M + 2P_1}{V + P_1 - P} \right]$

in other cases: bilge pump numeral $= 72 \cdot \left[\frac{M + 2P}{V} \right]$

where:

L = the length of the ship (metres), as defined in regulation 2;

M = the volume of the machinery space (cubic metres), as defined in regulation 2, that is below the bulkhead deck; with the addition thereto of the volume of any permanent oil fuel bunkers which may be situated above the inner bottom and forward of, or abaft, the machinery space;

P = the whole volume of the passenger and crew spaces below the bulkhead deck (cubic metres), which are provided for the accommodation and use of passengers and crew, excluding baggage, store, provision and mail rooms;

V = the whole volume of the ship below the bulkhead deck (cubic metres);

P_1 = KN,

where:

N = the number of passengers for which the ship is to be certified; and

$K = 0.056L$

However, where the value of KN is greater than the sum of P and the whole volume of the actual passenger spaces above the bulkhead deck, the figure to be taken as P_1 is that sum or two-thirds KN, whichever is the greater.

3.3 Where practicable, the power bilge pumps shall be placed in separate watertight compartments and so arranged or situated that these compartments will not be flooded by the same damage. If the main propulsion machinery, auxiliary machinery and boilers are in two or more watertight compartments, the pumps available for bilge service shall be distributed as far as is possible throughout these compartments.

3.4 On a ship of 91.5 m in length and upwards or having a bilge pump numeral, calculated in accordance with paragraph 3.2, of 30 or more, the arrangements shall be such that at least one power bilge pump shall be available for use in all flooding conditions which the ship is required to withstand, as follows:

.1 one of the required bilge pumps shall be an emergency pump of a reliable submersible type having a source of power situated above the bulkhead deck; or

.2 the bilge pumps and their sources of power shall be so distributed throughout the length of the ship that at least one pump in an undamaged compartment will be available.

3.5 With the exception of additional pumps which may be provided for peak compartments only, each required bilge pump shall be so arranged as to draw water from any space required to be drained by paragraph 2.1.

3.6 Each power bilge pump shall be capable of pumping water through the required main bilge pipe at a speed of not less than 2 m/s. Independent power bilge pumps situated in machinery spaces shall have direct suctions from these spaces, except that not more than two such suctions shall be required in any one space. Where two or more such suctions are provided, there shall be at least one on each side of the ship. The Administration may require independent power bilge pumps situated in other spaces to have separate direct suctions. Direct suctions shall be suitably arranged and those in a machinery space shall be of a diameter not less than that required for the bilge main.

3.7.1 In addition to the direct bilge suction or suctions required by paragraph 3.6, a direct suction from the main circulating pump leading to the drainage level of the machinery space and fitted with a non-return valve shall be provided in the machinery space. The diameter of this direct suction pipe shall be at least two thirds of the diameter of the pump inlet in the case of steamships, and of the same diameter as the pump inlet in the case of motorships.

3.7.2 Where in the opinion of the Administration the main circulating pump is not suitable for this purpose, a direct emergency bilge suction shall be led from the largest available independent power driven pump to the drainage level of the machinery space; the suction shall be of the same diameter as the main inlet of the pump used. The capacity of the pump so connected shall exceed that of a required bilge pump by an amount deemed satisfactory by the Administration.

3.7.3 The spindles of the sea inlet and direct suction valves shall extend well above the engine-room platform.

3.8 All bilge suction piping up to the connection to the pumps shall be independent of other piping.

3.9 The diameter d of the bilge main shall be calculated according to the following formula. However, the actual internal diameter of the bilge main may be rounded off to the nearest standard size acceptable to the Administration:

$$d = 25 + 1.68\sqrt{L(B + D)}$$

where:

d is the internal diameter of the bilge main (millimetres);

L and B are the length and the breadth of the ship (metres) as defined in regulation 2; and

D is the moulded depth of the ship to the bulkhead deck (metres) provided that, in a ship having an enclosed cargo space on the bulkhead deck which is internally drained in accordance with the requirements of paragraph 2.6.2 and which extends for the full length of the ship, *D* shall be measured to the next deck above the bulkhead deck. Where the enclosed cargo spaces cover a lesser length, *D* shall be taken as the moulded depth to the bulkhead deck plus *lh*/*L* where *l* and *h* are the aggregate length and height respectively of the enclosed cargo spaces (metres). The diameter of the bilge branch pipes shall meet the requirements of the Administration.

3.10 Provision shall be made to prevent the compartment served by any bilge suction pipe being flooded in the event of the pipe being severed or otherwise damaged by collision or grounding in any other compartment. For this purpose, where the pipe is at any part situated nearer the side of the ship than one fifth of the breadth of the ship (as defined in regulation 2 and measured at right angles to the centreline at the level of the deepest subdivision load line), or is in a duct keel, a non-return valve shall be fitted to the pipe in the compartment containing the open end.

3.11 Distribution boxes, cocks and valves in connection with the bilge pumping system shall be so arranged that, in the event of flooding, one of the bilge pumps may be operative on any compartment; in addition, damage to a pump or its pipe connecting to the bilge main outboard of a line drawn at one fifth of the breadth of the ship shall not put the bilge system out of action. If there is only one system of pipes common to all the pumps, the necessary valves for controlling the bilge suctions must be capable of being operated from above the bulkhead deck. Where in addition to the main bilge pumping system an emergency bilge pumping system is provided, it shall be independent of the main system and so arranged that a pump is capable of operating on any compartment under flooding condition as specified in paragraph 3.1; in that case only the valves necessary for the operation of the emergency system need be capable of being operated from above the bulkhead deck.

3.12 All cocks and valves referred to in paragraph 3.11 which can be operated from above the bulkhead deck shall have their controls at their place of operation clearly marked and shall be provided with means to indicate whether they are open or closed.

4 Cargo ships

At least two power pumps connected to the main bilge system shall be provided, one of which may be driven by the propulsion machinery. If the Administration is satisfied that the safety of the ship is not impaired, bilge pumping arrangements may be dispensed with in particular compartments."

CHAPTER II-2
CONSTRUCTION – FIRE PROTECTION, FIRE DETECTION AND FIRE EXTINCTION

Regulation 4 – Probability of ignition

3 In paragraph 5.2.4, the reference to "regulation II-1/25-9.2" is replaced by the reference to "regulation II-1/13-1.2".

Regulation 10 – Fire fighting

4 In paragraph 2.2.4.1.2, the reference to "regulation II-1/21" is replaced by the reference to "regulation II-1/35-1".

Regulation 20 – Protection of vehicle, special category and ro–ro spaces

5 In paragraph 6.1.4.1.3, the reference to "regulation II-1/21" is replaced by the reference to "regulation II-1/35-1", and in paragraph 6.1.4.2, the reference to "regulation II-1/22" is replaced by the reference to "regulation II-1/5-1".

CHAPTER VI
CARRIAGE OF CARGOES

Regulation 7 – Loading, unloading and stowage of bulk cargoes

6 In paragraph 2.1, the reference to "regulation II-1/22" is replaced by the reference to "regulation II-1/5-1".

CHAPTER IX
MANAGEMENT FOR THE SAFE OPERATION OF SHIPS

Regulation 1 – Definitions

7 In paragraph 3, the reference to "regulation II-1/2.12" is replaced by the reference to "regulation II-1/2.22".

CHAPTER XI-1
SPECIAL MEASURES TO ENHANCE MARITIME SAFETY

Regulation 2 – Enhanced surveys

8 The reference to "regulation II-1/2.12" is replaced by the reference to "regulation II-1/2.22".

9 The following new regulation 3-1 is added after the existing regulation 3:

"Regulation 3-1
Company and registered owner identification number

1 This regulation applies to Companies and registered owners of ships to which chapter I applies.

2 For the purpose of this regulation, registered owner shall be as specified by the Administration and Company as defined in regulation IX/l.

3 Every Company and registered owner shall be provided with an identification number which conforms to the IMO Unique Company and Registered Owner Identification Number Scheme adopted by the Organization.

4 The Company identification number shall be inserted on the certificates and certified copies thereof issued under regulation IX/4 and section A/19.2 or A/19.4 of the ISPS Code.

5 This regulation shall take effect when the certificates referred to in paragraph 4 are issued or renewed on or after 1 January 2009."

Regulation 5 – Continuous Synopsis Record

10 In paragraph 3, in the first sentence, after the word "information", the following words are inserted:

"(The Continuous Synopsis Record shall contain the information in paragraphs 3.7 and 3.10 when it is issued or updated on or after 1 January 2009)";

and the following new subparagraphs .7 and .10 are inserted as follows:

".7 the registered owner identification number;" and

".10 the Company identification number;".

11 In paragraph 3, existing subparagraphs .7 and .8 are renumbered as subparagraphs .8 and .9, and existing subparagraphs .9 to .13 are renumbered as subparagraphs .11 to .15.

CHAPTER XI-2
SPECIAL MEASURES TO ENHANCE MARITIME SECURITY

Regulation 1 – Definitions

12 In paragraph 1.6, the reference to "regulation II-1/2.12" is replaced by the reference to "regulation II-1/2.22".

APPENDIX
CERTIFICATES

Form of Safety Certificate for Passenger Ships

13 In the table of paragraph 2.1.3, in the section commencing with the words "THIS IS TO CERTIFY:", the reference to "regulation II-1/13" is replaced by the reference to "regulation II-1/18".