澳門特別行政區

行 政 長 官 辦 公 室

第 30/2014 號行政長官公告

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

國際海事組織海上安全委員會於一九八三年六月十七日修正公約第VII章時，將有關國際散裝運輸危險化學品船舶構造和設備規則的規定作為公約的強制性規定，並透過第MSC.4（48）號決議通過了《國際散裝運輸危險化學品船舶構造和設備規則》；

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

基於此，行政長官根據澳門特別行政區第3/1999號法律第六條第一款的規定，命令公佈包含上指規則的第MSC.4（48）號決議的中文及英文正式文本。

二零一四年八月八日發佈。

行政長官　崔世安

REGIÃO ADMINISTRATIVA ESPECIAL DE MACAU

GABINETE DO CHEFE DO EXECUTIVO

Aviso do Chefe do Executivo n.º 30/2014

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

Considerando igualmente que, em 17 de Junho de 1983, o Comité de Segurança Marítima da Organização Marítima Internacional, procedeu a emendas ao capítulo VII da Convenção para tornar as disposições relativas ao Código Internacional para a Construção e Equipamento de Navios que Transportam Substâncias Químicas Perigosas a Granel obrigatórias nos termos da Convenção, e que, através da resolução MSC.4(48), adoptou o Código Internacional para a Construção e Equipamento de Navios que Transportam Substâncias Químicas Perigosas a Granel;

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

O Chefe do Executivo manda publicar, nos termos do n.º 1 do artigo 6.º da Lei n.º 3/1999 da Região Administrativa Especial de Macau, a resolução MSC.4(48), que contém o referido Código, nos seus textos autênticos em línguas chinesa e inglesa.

Promulgado em 8 de Agosto de 2014.

O Chefe do Executivo, *Chui Sai On*.

決議 MSC.4（48）

通過國際散裝運輸危險化學品船舶構造和設備規則

（國際散化規則）

海上安全委員會，

憶及大會通過決議 A.490（XII）授權它在經修訂的散裝運輸危險化學品船舶構造和設備規則與由決議 A.328（IX）通過的散裝運輸液化氣體船舶構造和設備規則相一致後通過散裝運輸危險化學品船舶構造和設備規則，

注意到它根據決議 MSC.6（48）特別通過了 1974 年國際海上人命安全公約（1974 年安全公約）第 VII 章的修正案，以便把國際散裝運輸危險化學品船舶構造和設備規則（國際散化規則）的規定放入該公約中成為強制性的規定，

審議了所建議的國際散化規則的文本：

1. 通過國際散化規則，其文本見本決議的附件；

2. 注意到，根據經決議 MSC.6（48）修正的 1974 年安全公約第 VII 章 B 部分的規定，國際散化規則的修正案必須按照該公約第八條的規定來通過、生放和實施；

3. 進一步注意到，在經 1978 年議定書修訂的 1973 年國際防止船舶造成海洋污染公約的附則 II 生效之前，要對國際散化規則進行修正，以便把防止污染方面的問題也包括進去；

4. 請秘書長把上述國際散化規則的修正條款分發給所有有關國家，修正條款把新貨品均放入第 17 章中；並建議在這些修正條款生效之前，應由符合修正條款規定的化學品液貨船來運輸這些新貨品；

5. 還請秘書長把本決議連同國際散化規則的文本一同分發給本組織的所有成員國和所有那些雖然並非本組織成員國，但卻是 1974 年安全公約的締約方的政府。

秘書處說明

1. 海上安全委員會於 1983 年 6 月在其第四十八屆會議上通過了 1974 年國際海上人命安全公約（SOLAS）的修正案。公約三十三個締約國的代表出席了該屆會議，所有修正案的文本皆按第八條第二款第（四）項所規定的程序獲得了通過。

2. 該屆會議通過了的修正條款包括第 III 章和第 VII 章的新文本，以及第 II-1 章、第 II-2 章和第 IV 章的修正條款。

3. 在第 II-1 章、第 II-2 章、第 III 章和第 VII 章中採用了十進位編號制。除通用的海制單位被認為更適宜之處外，公制和英制單位均已被國際標準單位所替代。

4. 相互參照皆以簡明形式給出，例如第 II-2/10.4 條意即第 II-2 章第 10 條之 4。

5. 公約及其修正條款中所有的腳註係指公約所附的有關建議及其他國際公認的標準。海上安全委員會指出，這些腳註並不構成公約的一部分，之所以加上，是為了參閱方便。這些腳註可以改動，以反映它們所提及的決議、建議或文件的修改。所提及的將由大會第十三屆常會通過的決議草案，將由大會通過後的決議正式編號替代。

前言

1 本規則的目的是要對在海上安全散裝運輸本規則第 17 章所列危險液態化學品提供一個國際標準；它對從事這種運輸的船舶（不論噸位多少）以及它們所應裝載的設備的設計和構造標準作出了規定，以便最大程度地減少所運貨品的特性對船舶、船員和環境造成的危險。

2 它的基本原理是船型與本規則所列貨品的危險性的相互關係。每一這種貨品都有一個或多個危險特性，它們包括可燃性、毒性、腐蝕性和反應性。

3 在制定本規則的整個過程中，人們都認識到它必須以完善的造船學和工程學的原理，以對規則所列的各種貨品的最為正確的認識作為基礎；認識到化學品液貨船的設計工藝不僅是複雜的，而且是在不斷發展的，因此本規則也不應當是永久不變的。由於這些原因，本組織要考慮到經驗和技術發展這兩者，定期地對規則進行審核。

4 對新貨品的要求及其裝載條件，在本組織的海上安全委員會通過後，但在根據 1974 年國際海上人命安全公約第八條的規定在適當的修正案生效之前，作為一種臨時性的建議書分發下去。

5 規則的主要內容是船舶的設計和設備。為了確保能安全地運輸這些貨品，要對整個系統作出鑑定。本組織正在進一步檢查或將要進一步檢查有關安全運輸這些貨品這個問題的其他重要方面，如培訓、操作、交通控制和港口裝卸等。

6 國際船級社協會和國際電工委員會所做的有關工作對規則的制定有很大的幫助。

7 有關化學品液貨船營運要求的規則第 16 章著重講了有關營運問題的其他章節的條款，提到了化學品液貨船的營運所特有的一些其他重要安全特點。

8 本規則的編排與海上安全委員會第四十八屆會議通過的國際散裝運輸液化氣體船構造和設備規則（國際氣體船規則）是一致的。正如國際氣體船規則所規定的那樣，氣體船也可載運本規則中的散裝液態化學品。

第 1 章

總則

1.1 適用範圍

1.1.1 本規則適用於各種尺寸的（包括不足 500 總噸的在內）從事運載散裝液體危險化學品貨物的船舶，但是運載石油或下列類似的易燃產品的船舶不包括在內：

.1 具有重大火災危險性的貨品，其危險超過石油產品和類似的易燃產品；

.2 具有除易燃性之外還有其他重大危險性的貨品或雖然沒有易燃性但有其他重大危險性的貨品。

目前本規則限於第 17 章最低要求一覽表所示的液體貨物。凡經審查決定不列入本規則範圍內的貨品，見第 18 章。

1.1.2 在本規則中的液體是在温度為 37.8C°時，其蒸氣壓力不超過 2.8 巴的液體。

1.1.3 對於建議散裝運輸的但未列入第 17 章或第 18 章之中的產品，主管機關以及與此類運輸有關的港口當局在考慮散裝化學品危險性估價準則之後，應對初步適於運載的狀況作出規定。並應把考慮將某種產品列入本規則的情況通知本組織。

1.1.4 除另有明文規定外，本規則適用於在 1986 年 7 月 1 日或以後安放龍骨或處於如下階段的船舶：

.1 能識別為該船舶的建造開始；

.2 船舶已開始組裝了至少 50 噸或所有結構材料估計重量的 1 %，取其小者。

1.1.5 不管何時建造的船舶，在 1986 年 7 月 1 日或以後被改建成化學液貨船時，應作為在此改建開始之日建造的化學液貨船對待。

1.1.6 引用本規則某一段時，該標題下的所有分段的規定均應適用。

1.2 危險性

本規則涉及到的產品的危險性包括：

1.2.1 由化學品的閃點、沸點、可燃性範圍和自燃温度確定的火災危險性。

1.2.2 健康危險性是由：

.1 在處於氣體或具有蒸氣壓力的蒸氣狀態下，對皮膚的或對眼、鼻、喉和肺的黏膜所產生的刺激或有毒效應確定；或者

.2 在液體狀態下，對皮膚的刺激效應確定；或者

.3 由毒性效應確定，確定時要考慮到以下值：口服致死劑量 50：在口服時，使 50%的受試驗者死亡的劑量；

皮膚致死劑量 50：施用於皮膚時，使 50%的受試驗者死亡的劑量；

致死濃度 50：在吸入時，使 50%的受試驗者死亡的濃度。

1.2.3 水污染危險性是由對人的毒害性、水溶性、揮發性、氣味或滋味以及相對密度來確定。

1.2.4 空氣污染危險性是由下述情況確定：

.1 緊急情況暴露限度（E.E.L.）或致死濃度 50；

.2 蒸氣壓力；

.3 在水中的可溶性；

.4 液體的相對密度；

.5 蒸氣的相對密度。

1.2.5 反應性危險性是由對下列物質的反應性確定：

.1 其他化學品；或

.2 水；或

.3 化學品本身（包括聚合作用）。

1.3 定義

除另有明文規定外，下列定義適用（附加定義被列入各個章節之中）：

1.3.1 起居處所為公共處所、走廊、盥洗室、住艙、辦公室、醫院、電影院、娛樂室、理髮室、無坎具的配膳室以及類似處所。公共處所為作為大廳、餐室、休息室及類似的永久性圍蔽處所的那些起居處所。

1.3.2.1 主管機關係指船旗國政府。

1.3.2.2 港口當局係指船舶裝貨或卸貨的所在港國家的有權當局。

1.3.3 沸點是指貨品的蒸氣壓力等於大氣壓力時的溫度。

1. 3. 4 船寬（B）係指船舶最大寬度，金屬船殼在船中量至肋骨的型線；其他材料船殼在船中量至船殼外部表面。船寬（B）應用 m 為單位衡量。

1.3.5 貨物區域係指船上包括液貨艙、污水艙、貨泵艙（含泵艙在內）、隔離空艙、鄰近液貨艙的壓載水處所或空位，及船中上述處所之上整個長度和寬度之內的甲板區域在內的那個部分。

1.3.6 貨泵艙是裝有用於裝卸本規則涉及到的產品的泵及其屬具的處所。

1.3.7 貨物服務處所係指貨物區域內用作工作間、物料間和存放貨物裝卸設備而且面積在 $2m^2$ 以上的儲藏室的處所。

1.3.8 液貨艙是設計裝盛貨物的包殼。

1.3.9 化學品液貨船係指為運輸第 7 章所列的任何散裝液體產品而建造或採納用的貨船。

1.3.10 隔離空艙為兩相鄰鋼質艙壁或甲板之間的隔離處所。此處所可以是空位或壓載處所。

1.3.11 控制站是裏面有船舶無線電、主航行設備或應急電源的處所或者是火災記錄設備或火災控制設備的集中控制處所。這些設備不包括能非常有效地放置於貨物區域的專用火災控制設備。

1.3.12 可燃性界限是限定燃油氧化劑混合狀態的條件，在這種條件下，在給定試驗設備裏採用足夠強的外部點燃源僅僅能夠產生可燃性。

1.3.13 閃點是貨品釋放出的可燃蒸氣足以點燃時的攝氏温度。本規則所列數值是由認可的閃點裝置確定的“閉杯試驗”。

1.3.14 貨艙處所為船舶的結構圍蔽而成的用作獨立的液貨艙的處所。

1.3.15 獨立的係指管系或運氣系統（舉例）根本不與另一系統連接並且沒有可與其他系統進行潛在連接的手段。

1.3.16 長度（L）係指從龍骨頂部量起的最小型深 85%處之水線總長度的 96%，或指在該水線處從船艏往最前端至舵杆軸線處的長度，如果這一長度更長一些的話。對於斜龍骨的船舶，測量長度的水線應與設計水線相平行。長度（L）應當用 m 來表示。

1.3.17 A 類機器處所應包括如下施設的處所和通往這些處所的通道：

.1 用於主推進的內燃機；或

.2 總輸出功率不小於 375kW 用於主推進之外的其他用途的內燃機；或

.3 任何燃油鍋爐或油燃料裝置。

1.3.18 機器處所為所有 A 類機器處所和裝有推進機、鍋爐、油燃料裝置、蒸氣機、內燃機、發電機和主要電器機械、加油站、冷藏機、穩定機、通風及空調機器的所有其他處所以及類似處所；以及通向此類處所的通道。

1.3.19 燃油裝置是為燃油鍋爐輸送燃油的準備設備，或者是為內燃機輸送加熱燃油的準備設備，它包括處理油壓超過 1.8 巴的所有油壓泵、濾清器及加熱器。

1.3.20 組織係指國際海事組織（IMO）。

1.3.21 處所的浸水率係指在該處所之內，假設被水佔據的容積與總容積的比率。

1.3.22 泵艙係指位於貨物區域，裝有泵及用於裝卸壓載及燃油的輔助設備的處所。

1.3.23 相對密度係指某一體積貨品的質量與相等體積水的質量之比。

1.3.24 分隔係指例如一貨物管系或貨物透氣系統不與另一貨物管系或貨物透氣系統相連接。此分隔可以用設計或操作方法取得。操作方法不得在貨艙內使用，應由下列型式中的一種構成：

.1 移動閥槽或閥並切斷管端；

.2 佈置兩個串聯的雙環法蘭，在該兩個雙環法蘭之間有探測向管內滲漏的裝置。

1.3.25 服務處所係指作為走廊、具有炊具的配膳室、物料間、郵件艙和貴重物品保管室、儲藏室、不構成機器處所組成部分的工作間及通往此類處所通道。

1.3.26 1974 年公約係指《1974 年國際海上人命安全公約》。

1.3.27 1983 年公約修正條款係指由 1983 年 6 月 17 日本組織第 48 屆海安會的決議 MSC.6（48）通過的 1974 年公約的修正案。

1.3.28 蒸氣密度或蒸氣相對密度係指某一體積的蒸氣或氣體（不含空氣）的質量與相等體積空氣在相同壓力和溫度下的質量之比。

1.3.29 蒸氣壓力係指在一特定温度用絕對巴表示的在液體之上飽和蒸氣的平衡壓力。

1.3.30 空位係指在液貨艙外部的貨物區域內除貨物處所、壓載處所、燃油艙、液貨泵艙、泵艙或人員作一般使用的任何處所之外的圍蔽處所。

1.4 等效

1.4.1 凡本規則要求船上應裝設或配備某一專門屬具、材料、裝置、器具、設備或其型式，或本規則要求應採取某一特別措施，或應符合某一程序或佈置，主管機關可准許在該船上裝設或配備任何其他的屬具材料、裝置、器具、設備或其型式，或採取其他措施、程序或佈置；但須通過試驗或其他方法認定這些代替的屬具、材料、裝置、器具、設備或其型式，或任何其他的專門措施、程序或佈置，至少與本規則所要求者具有同等效能。主管機關不得允許用操作辦法或程序來取代由本規則闡明的某一專門屬具、材料、裝置、器具、設備或其型式，除非本規則明文規定允許此類代替。

1.4.2 當主管機關准許採取代替某一材料、裝置、器具、設備或其型式，或措施、程序或佈置，或新穎設計或應用，應將其細節連同所作的證據報告交送海協組織以便使本組織將這些文件轉知 1974 年海上人命安全公約的其他締約國政府，以供其官員參考。

1.5 檢驗與發證

1.5.1 檢驗程序

1.5.1.1 凡是事關各規則之規定的執行和這種執行的免除，船舶的檢驗應由主管部門的官員來進行。但是主管機關可以把這種檢驗委託給為此目的而指定的驗船師或由它認可的機構。

1.5.1.2 指定驗船師或認可檢驗機構的主管機關至少應當授與任何被指定的驗船師或被認可的機構以下權力：

.1 要求對船舶進行修理；和

.2 如果有關的港口國當局*提出要求的話，進行檢驗。

主管機關應將授與被指定驗船師或被認可機構的權力的具體責任和條件通知本組織，以便分發給各締約國政府。

1.5.1.3 當一被指定的驗船師或被認可的機構得出的結論為該船或其設備的條件根本不符合證書的細目或者因此船舶不適宜繼續航行，否則會給船舶或船上人員帶來危險時，該驗船師或機構應立即確保採取糾正措施並及時通知主管機關。如果不採取這種糾正措施的話，便應撤回有關證書，立即通知主管機關；如果該船是在另一締約國政府的港口之中的話，也應立即通知有關的港口國當局。

1.5.1.4 在任何情況下，主管機關要保證檢驗的完整性和有效性，確保履行這一職責所必須的安排。

1.5.2 檢驗要求

1.5.2.1 化學品液貨船的構造、設備、屬具、佈置和材料（但不包括“貨船安全結構證書”、“貨船安全無線電報證書”或“貨船安全無線電話證書”的頒發所需檢查的那些項目）應受到下列檢驗：

.1 初期檢驗。 該檢驗在船舶投入營運之前或在第一次得到“國際散裝運輸危險化學品合格證書”之前進行，只要該船是本規則所適用的檢驗應包括對構造、設備、屬具、佈置和材料的全面檢查。初期檢驗要確保構

* “港口國當局”的含義載於 1974 年安全公約 1978 年議定書第十九條的第 I 章。

造、設備、屬具、佈置和材料完全符合本規則的適用的規定。

.2 定期檢驗。 該檢驗的間隔期由主管機關決定，但不得超過 5 年。定期檢驗要確保構造、設備、屬具、佈置和材料均符合本規則的適用的規定。

.3 中期檢驗。 該檢驗在“國際散裝運輸危險化學品合格證書”的有效期內至少進行一次。如果在任何一段證書有效期內只進行了一次中期檢驗的話，檢驗應在證書有效期的中間日期之前和之後的 6 個月內進行。中期檢驗應確保安全設備、其他設備及有關的泵系和管系符合本規則的適用的規定，並處於良好工作狀態。這種檢驗應在國際散裝運輸危險化學品合格證書中進行背書。

.4 強制性年度檢驗。 該檢驗應在國際散裝運輸危險化學品合格證書頒發一周年之日的之前或之後的三個月內進行。年度檢驗應包括一全面檢查，以確保構造、設備、屬具和材料在所有方面均適合該船預期的營運。這種檢驗應在國際散裝運輸危險化學品安全證書中進行背書。

.5 補充檢驗。 該檢驗可以是全面的，也可以是部分的，視情況而定。在根據 1.5.3.3 進行的調查後提出要求時，或在進行了重要修理或更新時，應進行該檢驗。這種檢驗要確保已有效地進行了必要的修理和更新；此種修理或更新的材料和工藝是令人滿意的；船舶適合於繼續航行，不會給船舶或船上人員帶來危險。

1.5.3 檢驗後狀況的保持

1.5.3.1 船舶及其設備的狀況要保持符合本規則的規定，以確保船舶始終適合繼續航行，不會給船舶或船上人員帶來危險。

1. 5.3.2 在完成了 1.5.2 中的任何船舶檢驗後，非經主管機關批准經檢驗過的構造、設備、屬具、佈置和材料不得有任何改變，除非這種改變是直接的替代。

1.5.3.3 每當船舶發生了事故，或出現了缺陷，而這種事故或缺陷影響了船舶的安全，影響了其救生設備或其他設備的有效性或完整性時，該船的船長或船東應儘早向負責頒發有關證書的主管機關、被指定的驗船師或被認可的機構提交報告；主管機關、被指定的驗船師或被經認可的機構應進行調查來決定 1.5.2.5 所說的檢驗是否必要。如果該船是在另一締約國政府的港口內的話，船長或船東也應立即向有關的港口國當局報告。被指定的驗船師或經認可的機構應確保提交了這種報告。

1.5.4 國際合格證書的頒發

1.5.4.1 在對符合本規則有關要求的化學品液貨船進行了初期或定期檢驗後，應頒發一份名為國際散裝運輸危險化學品合格證書的證書，其標準格式列在附件中。

1.5.4.2 按本節規定頒發的證書應放在船上，以供隨時檢查。

1.5.5 由另一政府頒發或背書國際合格證書

1.5.5.1 在另一締約國政府的請求下，一締約國政府可要懸掛另一締約國國旗的船舶接受檢驗。如果它認為該船是符合本規則的要求

的，可向該船頒發，或命令向其頒發證書，如有必要，可根據本規則對船上的證書進行背書或命令對其進行背書。在這樣頒發的證書中，要有一聲明說它是根據船旗國政府的要求頒發的。

1.5.6 國際合格證書的持續時間和有效性

1.5.6.1 國際散裝運輸危險化學品合格證書的持續時間由主管機關決定，但從初期檢驗或從定期檢驗之日算起不得超過 5 年。

1.5.6.2 不得允許把證書的這 5 年持續時間加以延長。

1.5.6.3 在下列情況下，證書停止有效：

.1 在 1.5.2 中規定的時間內沒有進行檢驗；

.2 船舶更換船旗國。 只有當頒發新證書的政府完全確認船舶是符合 1.5.3.1 和 1.5.3.2 的要求時才能頒發新證書。當這種更換是在締約國政府之間進行時，該船原先的船旗國政府，如果在更換進行後的 12 個月內收到請求的話，應儘快把更換船旗國前該船所持有的證書的副本和（如果有的話）有關檢驗報告的副本儘快轉給主管機關。

第 2 章

船舶抗沉性*及貨艙位置*

2.1 通則

2.1.1 適用於本規則的船舶，在由某種外力引起的假設船體破損之

* 參看”統一應用散裝化學品規則及氣體運輸船規則的抗沉性要求指南”。

後，應能經受進水的通常效應。此外，為了保護船舶及環境，某種類型船舶的液貨艙應受保護，以防對船舶因與例如碼頭或拖輪接觸而產生的微小破損而引起的滲漏，並且採取保護措施以防因碰撞或擱淺引起的破損，即置貨艙於距艙殼板之內規定的最小距離。假設的破損及貨艙與船殼的接近程度都取決於要裝運貨品的危險程度。

2.1.2 適用於本規則的船舶應按照下列標準之一設計：

.1 1 型船舶是用於運輸第 17 章中對環境或安全有非常嚴重危險的貨品的化學品船，它需用最大的預防措施來消除其漏逸。

.2 2 型船舶是用於運輸第 17 章中對環境或安全有可感知的嚴重危險的貨品的化學品船，它需用重大的預防措施來消除其漏逸。

.3 3 型船舶是用於運輸第 17 章中對環境或安全有足夠的嚴重危險貨品的化學品船，它需用一中等程度的圍護來增加破艙條件下的抗沉能力。

因此，1 型船舶是用於運輸被看作是具有最大全面危險的貨品的化學品船；2 型和 3 型船舶是用於運輸危險性相繼減少的貨品的化學品船。相應地，1 型船應能經受得住最嚴重的破損標準，其貨艙應置於船殼板後最大的規定距離上。

2.1.3 各個貨品要求的船型在第 17 章“c”欄中表示出來。

2.1.4 如果一艘船用於裝運一種以上第 17 章表列貨品，則破艙標準應與有最嚴格船型要求的那種貨品相一致。但是，各個貨艙位置的要求是對於裝運各種貨品的船型的要求。

2.2 乾舷與完整穩性

2.2.1 適用於本規則的船舶可以指定生效的國際載重線公約允許的最小乾舷。但是與乾舷指定有關的吃水不可大於本規則另外要求的最大吃水。

2.2.2 船舶在所有海上運輸狀態的穩性應達到為主管機關所接受的標準。

2.2.3 當計算可耗液體的自由液面效應來確定裝載狀況時，對每一型式的液體應假設至少一對橫向艙或單個中艙有一自由液面並且要計算的艙或組合艙為自由液面效應最大的艙。未破損艙室的自由液面效應應使用主管機關可接受的方法進行計算。

2.2.4 固體壓載一般不應使用於貨物區域的雙層底艙。但是，當在此類處所出於穩性考慮的原因不可避免使用固體壓載的設置時，那麼其分佈應根據需要控制，以確保因底部破損造成的衝擊負荷不會直接傳遞到貨艙結構。

2.2.5 應為船長提供一本《裝載與穩性資料》手冊。手冊應包括典型營運和壓載狀態、估算其他裝載狀態的規定以及船舶抗沉能力的總結等詳細資料。此外，該手冊應包含足夠資料使船長能用安全而且適航的方式裝載並操縱船舶。

2.3 乾舷甲板以下船舷的排放水

2.3.1 為自乾舷甲板以下的處所或自設有風雨密門在乾舷甲板上的上層建築及甲板室內的處所引過船殼進行排放的閥門的設置與控制應滿足生效的國際載重線公約有關規則的要求，但是閥門的選擇應局限於：

.1 帶有能自乾舷甲板上方關閉閥門的確定手段的一個自動止回閥；或

.2 當自夏季載重線至排放管船內端的垂直距離超過 0.01L 時，兩個沒有確定關閉手段的自動止回閥。但船內的閥在營運狀態下總是能夠得到檢查才行；

2.3.2 在本章內，“夏季載重水線”及“乾舷甲板”與生效的國際載重線公約所規定的意思相同。

2.3.3 在 2.3.1.1 和 2.3.1.2 中提到的自動止回閥應為主管機關可接受的型式，應能完全有效地防止水進入船內，並考慮到 2.9 中抗沉要求中的下沉、縱傾和橫傾。

2.4 裝載狀態

應根據呈送主管機關的有關所有預期裝載狀態及吃水與縱傾的變化的裝載資料，對破艙抗沉能力進行調查研究。當化學品船不裝載本規則所涉及的貨品或僅裝載規則涉及貨品的殘餘物時，不必考慮壓載狀況。

2.5 破損假設

2.5.1 假設破損的最大程度應為：

.1 舷側破損：

.1.1 縱向範圍： $1/3L^{2/3}$ 或 14.5m，取小者

.1.2 橫向範圍(自船舷內直角量至夏季載重水線水準上的中心線)： B/5 或 11.5m，取小者

.1.3 垂直範圍：（從中心線上船底殼板的型線量起）	向上沒有限制
.2 底部破損：	
自船艏垂線 0.3L 處量起	船舶任何其他部位
.2.1 縱向範圍：	
$1/3L^{2/3}$ 或 14.5m，取小者	$1/3L^{2/3}$ 或 5m，取小者
.2.2 橫向範圍：	
B/6 或 10.0m，取小者	B/6 或 5m，取小者
.2.3 垂直範圍：	
B/15 或 6 m，取小者，量自中線船底殼板的型線（見 2.6.2）	B/15 或 6m，取小者，量自中線船底殼板的型線（見 2.6.2）

2.5.2 其他破損：

.1 若任何破損範圍雖小於在 2.5.1 內規定的最大破損，卻會引起更嚴重的狀態的話，則此類破損應予以考慮。

.2 對於 1 型和 2 型船艙，如若在貨物區域的局部船側破損以直角從船殼量起向船內延伸達 760mm 的話，應考慮這種破損。當 2.8.1 的適用的分段也要求橫向艙壁的話，還要另外假設橫向艙壁的破損。

2.6 液貨艙位置

2.6.1 液貨艙應位於下述船內距離：

.1 1 型船舶：量自舷側殼板時不小於 2.5.1.1.2 規定的橫向破損範圍，量自中心線上底殼板的型線時不小於 2.5.1.2.3 規定的垂直破損範圍，但量自船殼板時都不得小於 760mm。

.2 2 型船舶：量自中心線上底殼板的型線時不得小於 2.5.1.2.3 規定的垂直破損範圍，量自船殼板時不得小於 760mm。

.3 3 型船舶：無要求。

2.6.2 除 1 型船舶外，安裝於液貨艙的吸水井可以突出到 2.5.1.2.3 規定的底部破損的垂直範圍，但此類吸水井應儘量小並且在內底板以下突出部分不應超過雙層底高度的 25%或 350mm，取小者。若無雙層底時，在底部破損上限以下獨立液貨艙的吸水井的突出部分應不超過 350mm。根據本段要求設置的吸水井在計算受破損影響艙室時可以忽略不計。

2.7 浸水假設

2.7.1 2.9 的要求應通過計算來證實，計算中應考慮船舶的設計特性；破損艙室的佈置、形狀及所載物體；液體的分配、相對密度及自由液面的效應；以及所有裝載狀態的吃水和縱傾。

2.7.2 假設受破損處所的滲透率如下：

處所	滲透率
用作貯藏室	0.60
居住佔據處所	0.95
機器佔用處所	0.85
空位	0.95
用於裝消耗液體	0 至 0.95*
用於裝其他液體	0 至 0.95*

* 部分充裝艙室的滲透率與該艙室裝載液體量應該是一致的。

2.7.3 只要破損穿透裝載液體的液貨艙，則應假設貨品完全從該艙流失並由達到最後平衡平面高度的鹽水代替。

2.7.4 在 2.5.1 中規定的最大破損範圍之內的每一水密分隔和被認為在 2.8.1 段所述位置已遭受破損的每一水密分隔應被假設為進水。當小於最大破損範圍的破損被認為是符合 2.5.2 時，則應假設只有在此類較小破損的範圍內的水密分隔或水密分隔的組合走進水的。

2.7.5 船舶的設計應以有效的佈置使不對稱浸水減小到最小的程度。

2.7.6 如若裝有需要諸如閥門或橫通調平管之類的機械輔助設備的平衡裝置的話，該裝置不應被當成用作減小橫傾角或為了達到 2.9 的要求來取得最小剩餘穩性範圍的；在需要使用平衡的所有階段，均應保持足夠的剩餘穩性。用大截面導管連接的處所應被視為正常。

2.7.7 若管子、導管、通道或隧道位於 2.5 規定的假設破損滲透範圍之內，佈置應為累進進水不能延伸到每種破損狀態假設要進水的艙室之外的艙室。

2.7.8 直接在舷側破損之上的任何上層建築的浮力應不考慮。然而超出破損範圍之外的上層建築未進水部分也可以考慮，但是：

.1 它們必須由水密分隔與破損處所分開，並且關於這些完整處所的 2.9.3 的要求必須滿足；及

.2 這些分隔上的開口要能用遙控操作滑動水密門進行關閉，並且在 2.9 中要求的最小剩餘穩性之內，未保護的開口不被浸沒；但是能關閉成風雨密的其他任何開口的浸沒是允許的。

2.8 破艙標準

2.8.1 在 2.7 所述的進水假設情況下，船舶應能經受 2.5 所述的破損。進水假設的程度由船型依下列標準決定：

.1 應假設 1 型船舶在其長度範圍內任何部位上受到破損；

.2 應假設長度大於 150m 的 2 型船舶在其長度範圍內任何部位上經受破損；

.3 應假設長度為 150m 或以下的 2 型船舶在其長度範圍內除艉機型機艙兩邊均界艙壁之外經受破損；

.4 應假設長度大於 225m 的 3 型船舶在其長度範圍內經受破損；

.5 應假設船長為 125m 或以上但小於 225m 的 3 型船舶在其長度範圍內除艉機型機艙兩邊的界艙壁之外經受破損；

.6 應假設船長小於 125m 的 3 型船舶在其長度範圍內除艉機型機艙破損之外經受破損。但主管機關應考慮機艙進水的抗沉能力。

2.8.2 對於不是在所有方面滿足 2.8.1.3 及 2.8.1.6 適當要求的小型 2 型及 3 型船舶，只有當採取了能保持同樣安全程度的替代措施時，主管機關才可考慮特別免除。替代措施的性質必須獲准及得到清楚地闡述並為港口國當局所能得到。任何此類免除必須在 1.5.4 提及的國際適合證書上作適當記錄。

2.9 抗沉要求

2.9.1 適用於本規則的船舶應能按 2.8 的標準，在穩定平衡的狀況下經受住 2.5 所說的假設破損，並應能對下達標準感到滿意。

2.9.2 在任何進水階段：

.1 考慮到下沉、橫傾和縱傾，水線應低於經此能發生累積進水或向下進水的任何開口。此類開口應包括空氣管和以風雨密門或艙口蓋關閉的開口，可以不包括那些用水密人孔蓋和水密甲板艙口蓋關閉的開口、保持甲板高度整體性的小型水密液貨艙艙口蓋、遙控操作的水密滑門和非開口型舷窗；

.2 由於不對稱進水引起的橫傾最大角度不應超過 25°，但是若無甲板浸沒發生，則此角度可增加到 30°；

.3 在進水中間階段期間的剩餘穩性應為主管機關所滿意。但決不允許很大地低於 2.9.3 的要求。

2.9.3 在進水後的最後均衡情況下：

.1 復原力臂曲線超過平衡位置處應有一個 20°的最小範圍，以及在 20°範圍內至少有一個 0.1^{m} 的最大剩餘復原力臂；在此範圍內該曲線下的面積應不小於 $0.0175^{m/rad}$。在此範圍內未保護的開口不應浸沒，除非有關處所假定要進水。在這個範圍內，2.9.2.1 所列的任何開口及能水密關閉的其他開口可以允許浸沒；

.2 應急電源能夠運行。

第 3 章

船舶佈置

3.1 貨物分隔

3.1.1 除本規則另外規定者外，應該用隔離艙、空位、貨物泵艙、泵艙、空艙櫃、燃油艙或其他類似處所，把盛有本規則所適用的貨物或剩餘貨物的艙室與起居處所、服務處所、機器處所、飲用水和生活消耗貯藏室分隔開。

3.1.2 與其他貨物起危險反應的貨物應：

.1 用隔離艙、空位、貨物泵艙、泵艙、空艙或盛有互相相容的物貨艙與此類其他貨物分隔；

.2 有獨立的不通過盛有此類貨物的其他液貨艙的泵系和管系，除非它們是被包圍在一隧道內的；

.3 有分開的液貨艙室透氣系統。

3.1.3 液貨管系不應通過任何起居處所、服務處所或貨物泵艙或泵艙之外的機器處所。

3.1.4 適用本規則的貨物不應裝載於艏尖艙或艉尖艙。

3.2 起居、服務和機器處所以及控制站

3.2.1 起居住所或服務處所或控制站不得設置在符合 1983 年安全公約修正條款第 II-2 章第 56 條的貨物泵艙壁龕或泵艙壁龕之上部位以外的貨物區域；液貨艙或污水艙不應設置在任何住艙的前端之後。

3.2.2 為了防護危害性蒸氣的危險，應充分考慮與貨物管系和貨艙透氣系統相關的居住處所、服務處所和機器處所的空氣入口和開口的位置。

3.2.3 起居處所、服務處所、機器處所和控制站的入口、進氣口和開口不應面向貨物區域。它們應安置於不面向貨物區域的端艙壁和／或離上層建築或甲板室面朝貨物區域一端至少為船長的 4%但不少於 3m 的上層建築或甲板室的舷外側。但本距離不必超過 5m。在上述範圍之內不得有門，但主管機關可允許不通往居住處所、服務處所和控制站的那些處所（如貨物控制站和儲藏室）有門。如果裝有這種門的話，該處所的邊界的絕熱要達到“A-60”標準。移動機器用的螺栓板可在上述範圍內安裝。只要操舵室的門和窗子在設計上能確保對操舵室進行快速和有效的氣密和蒸氣密，便能設在上述的範圍之內。面向貨物區域和上層建築以及甲板室在上述範圍內之側部上的窗子和舷窗應當是固定式的（不能打開的）。甲板上的第一排舷窗應裝有鋼質或相等材料的裏蓋。

3.3 貨物泵艙

3.3.1 貨物泵艙的佈置應確保：

.1 在任何時候從扶梯平台或從艙底地板能不受約束地通行；及

.2 穿著人身保護設備的人能不受約束地達到貨物裝卸所必需的一切閥門。

3.3.2 應裝有能用救生繩把受傷人員吊出來的永久性裝置，並避免受任何凸出物的阻礙。

3.3.3 所有扶梯和平台上都應設有欄杆。

3.3.4 正常的出入口扶梯不應垂直設置，應在適當的間隔設平台。*

3.3.5 在貨物泵艙內應有處理貨泵和閥門的放泄物或其可能的泄漏的裝置。為貨物泵艙服務的艙底管系應能從貨物泵艙之外操作。應設有一個或幾個污水艙用以儲存污染的艙底水或洗艙水。還應備有帶有標準聯接器的通岸接頭或其他設備，以便把污液移注到岸上的污液櫃去。

3.3.6 泵的排出壓力錶應裝在貨物泵艙之外。

3.3.7 由穿過艙壁或甲板的軸驅動機器時，應有用有效潤滑的氣密封或能確保永久氣封的其他措施佈置於艙壁或甲板處。

3.4 貨物區域處所的通入

3.4.1 在貨物區域內隔離艙、壓載艙、液貨艙和其他處所的通道應直接通到開敞甲板並且能確保上述艙室的完全檢驗。雙層底處所的通道可以通過泵艙、隔離深艙、管隧或類似艙室，但必須對通風方面予以考慮。

3.4.2 通過水平開口、艙口或人孔，其尺寸應足夠能讓攜帶呼吸器及防護衣的人員上下扶梯而毫無阻礙。並且還應提供一淨開口以便從處所底部把受傷人員提升起來。該淨開口最小尺寸不得小於 600mm x 600mm。

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* 參考由決議 A.330（IX）修正的《安全出入大液貨艙以及在大液貨艙內安全工作》的建議（決議 A.272（VIII））。

3.4.3 對於通過垂直開口或人孔提供以處所長度和寬度為通道的出入口，最小淨開口不得小於 600mm x 800mm，離底板的高度不大於 600mm，除非設有格柵或其他立足點。

3.4.4 如果通過此類開口或搬移受傷人員的能力能夠證明為主管機關所滿意，則主管機關在特殊情況下可以批准較小的尺寸。

3.5 艙底及壓載佈置

3.5.1 泵、壓載管路、透氣管及為永久壓載艙服務的類似設備必須獨立於為液貨艙服務的類似設備和貨艙本身。緊接液貨艙的永久壓載艙的排放裝置應在機器處所和起居處所的外面。充注裝置可設置在機器處所內，但此類裝置應確保從艙頂部充注並設置止回閥。

3.5.2 可從甲板水平上用為永久壓載艙服務的泵將壓載水注入液貨艙，但注入管線與液貨艙或管系要沒有永久聯接，而且要裝有止回閥。

3.5.3 用於貨物泵艙、泵艙、空位、污水艙、雙層底艙及類似處所的艙底水泵裝置應完全位於貨物區域，但由雙層艙壁將其與裝有貨物或貨物殘物的液貨艙相隔開的空位、雙層底液貨艙和壓載水艙不在此例。

3.6 泵和管系的識別

對於泵、閥門及管路區別符號應有規定，以鑑別其用途及其服務的液貨艙。

3.7 船艏或船艉裝載和卸載裝置

3.7.1 經主管機關批准可設置貨物管系以允許船艏或船艉裝卸。便攜式裝置不准使用。

3.7.2 艏艉裝卸管路不得用於轉注要求裝載在 1 型船舶的貨品。除非由主管機關特別批准，艏艉裝卸管路不得用於駁運要求符合 15.12.1 規定的散發有毒的蒸氣的貨物。

3.7.3 除 5.1 的要求以外，下列規定也適用：

.1 貨艙區域以外的管路的設置在開敞甲板上應至少在船內 760mm。此類管路必須清楚好認並且在其與貨物區域之內貨物管系聯接處設置一個停止閥門。在這一位置，當不使用時，管路可以用可移短管和盲板法蘭進行分隔。

.2 岸接頭應裝置一個停止閥門和一個盲板法蘭。

.3 管子必須全透對接焊，並且進行了完全的射線探傷。在管路中，法蘭接頭只准在貨物區域內及在岸接頭上使用。

.4 應在 3.7.3.1 中規定的接頭處裝置防濺板及帶有消除泄放設施的足夠容量的收集盤。

.5 管路應為自我泄放到貨物區域並且最好泄入貨艙。泄放管路替代裝置可以由主管機關批准。

.6 應設裝置以使此類管路在使用後得到清洗並且在不使用時保持氣體安全。與清洗相連的透氣管應位於貨物區域。管路的有關接頭應設有停止閥門及盲板法蘭。

3.7.4 通向居住、服務和機器處所及控制站的入口、空氣入口及開口不應面對艏艉裝卸裝置的貨物岸接頭位置。它們必須位於上層建築

或甲板室舷側離面對艏艉裝卸裝置的貨物岸接頭位置的室端距離至少為船長（L）的 4%但不得小於 3m。然而此距離不必超過 5m。面對岸接頭位置並且在上層建築或甲板室在上述距離之內的舷窗應為固定（非開啓）式舷窗。另外，在艏艉裝卸裝置使用期間在有關的上層建築或甲板室舷側上的所有的門、舷窗及其他開口都處於關閉狀態。當為小型船舶時，若不可能滿足 3.2.3 和本節時，則主管機關可以批准對上述要求放鬆條件。

3.7.5 通向未列入 3.7.4 的圍閉處所的空氣管及其他開口應遮屏以防來自破開的軟管或接頭的任何飛濺。

3.7.6 逃生通路不應終止在 3.7.7 要求的圍板之內或超出圍板 3m 的距離之內。

3.7.7 應設置適當高度的連續圍板以使溢漏被保持在甲板上並使其與起居和服務區域隔開。

3.7.8 在 3.7.7 要求的圍板之內或在超出圍板 3m 距離之內的任何電氣設備應符合第 10 章的要求。

3.7.9 艏艉裝卸區域的消防佈置應符合 11.3.16 的規定。

3.7.10 若有必要，應在貨物控制站與貨物岸接頭位置之間提供聯絡手段，並應證明這些手段是安全的。應設置適當的設施自貨物岸接頭位置來遙控切斷貨物泵。

第 4 章

貨物圍護

4.1 定義

4.1.1 獨立液貨艙係指不與船體結構相鄰或不是其組成部分的載貨容器。建造和安裝獨立液貨艙是為了在所有可能的時刻消除（或至少最大地減少）因相鄰船體結構的應力或移動所造成的應力。獨立液貨艙對船體結構的完整性不是必不可少的。

4.1.2 整體液貨艙係指這樣一種載貨容器：該容器是船殼的一個組成部分；它可能受到與鄰近船體結構所受到的應力在負荷方面相等，在方式方面相同的應力；它通常是船體結構完整性所不可缺少的。

4.1.3 重力液貨艙係指在艙頂設計壓力不大於 0.7 巴的液貨艙。重力液貨艙可以是獨立或整體液貨艙重力液貨艙的建造和試驗應符合主管機關的標準並考慮到貨物運輸温度和相對密度。

4.1.4 壓力液貨艙係指設計壓力大於 0.7 巴的艙。壓力液貨艙應為獨立液貨艙，並構造應使按主管機關標準應用壓力容器設計標準成為可能。

4.2 各種貨品的艙型要求

各種貨品的艙型安裝和設計的要求都在第 17 章“d”欄列出。

第 5 章

貨物移注

5.1 管系尺寸*

5.1.1 按 5.1.4 規定的條件，管子的壁厚（t）應不小於：

$$t = \frac{t_0 + b + c}{1 - \frac{a}{100}} \ (mm)$$

式中：

t_0 = 理論厚度

t_0 = PD/（20 Ke + P）（mm）

其中：

P = 5.1.2 中的設計壓力（巴）

D = 外徑（mm）

K = 5.1.5 中的許用應力（N/mm^2）

e = 有效係數；對於無縫管和由經認可的焊管廠商所交貨的、被主管機關看作是等同於無縫管的縱向或螺旋式焊接的管子，e 等於 1.0。對於其他管子，e 的值由主管機關根據製造工藝和試驗程序來確定。

b = 彎曲公差（mm）。 b 值的選取應使僅由於內部壓力造成的，彎曲部位的計算應力不超過許用應力。當沒有給出此理由時，b 應不小於：

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* 參考已出版的《國際船級社協會（IACS）的會員及聯繫會員的規則》。

$$b = \frac{Dto}{2.5r} \ (mm)$$

其中：

r = 彎曲的平均半徑（mm）

c = 腐蝕公差（mm）。如果有腐蝕或侵蝕，則管子的壁厚應超過其他設計要求的需要量。

a = 厚度的負製造公差（%）。

5.1.2 考慮到該系統上任何釋放閥的最高設定壓力，在 5.1.1 中 t_o 的公式中設計壓力 P 是該系統在工作中可以受到的最大測量壓力。

5.1.3 未受釋放閥保護的或已隔離於釋放閥的管路或管系的部件，應被設計至少為下列的最大值：

.1 對於可能有一些液體的管系或部件，於 45°C 時的飽和蒸氣壓力；

.2 有關泵的排放安全閥的設定壓力；

.3 當不裝設泵排放安全閥時，有關泵的出口的最大可能的總和水頭壓力。

5.1.4 設計壓力不應小於 10 巴；只有開口端管的設定壓力可小於 10 巴，但不應小於 5 巴。

5.1.5 對於管路，5.1.1 中求 t_o 值的公式要考慮的許用應力低於下列之值：

$$\frac{R_m}{A} \text{ or } \frac{R_e}{B}$$

式中：

Rm = 在環境温度下最小規定抗拉強度（N/mm^2）

Re = 在環境温度下最小規定屈服應力（N/mm^2）。如果應力——張力曲線沒有表明規定屈服應力的話，0.2 % 的屈服點便適用了。

A 和 B 的值應至少為：

A = 2.7 和 B = 1.8

5.1.6.1 最小厚度應符合經認可的標準。*

5.1.6.2 當需用機械強度來防止因管子和管內物的重量以及來自支撐、船舶偏斜或其他原因的疊加負荷所引起的管子的損壞、塌坍、過度下陷或彎曲時，壁厚應超過 5.1.1 所要求的厚度，或者，若這樣做不可能或會引起過度局部應力的話，則用其他設計方法來減少、防止或消除這些負荷。

5.1.6.3 法蘭、閥門和其他設備應為主管機關所接受的標準型式，同時要考慮 5.1.2 規定的設計壓力。

5.1.6.4 對於不符合標準型的法蘭，法蘭及有關螺栓的尺寸應為主管機關所滿意。

5.2 管系製造與連接細則

5.2.1 本節要求適用於液貨艙的內外管路。然而，主管機關可以接

* 本章中所說的經認可的標準是指由主管機關認可的船級社所製定和使用的標準。

受對端部開口的管子及對貨艙內的管子放鬆要求，但為其他貨艙服務的貨物管子除外。

5.2.2 貨物管路應由焊接連接，下述情況除外：

.1 到中斷閥的認可接頭和膨脹接頭；

.2 由主管機關特別認可的其他例外的情況。

5.2.3 可以考慮下列管長而且無法蘭的直接連接：

.1 在所有設施中可以使用在根部全透對接焊接。

.2 尺寸為主管機關所滿意的帶有套袖及有關焊接物的滑動焊接接頭應只能使用於外徑為 50mm 以下的管子。當裂隙腐蝕會發生時則不應使用這一型式的連接。

.3 主管機關可接受的螺栓接頭只能用於外徑為 25mm 或以下的輔助管路和儀錶設備管路。

5.2.4 為應付管系的擴張，要在管系中設置膨脹圈或膨脹彎管。

.1 伸縮風箱可以由主管機關在每一情況下進行特殊考慮。

.2 滑動連接不應使用。

5.2.5 焊接、焊後熱處理及無損探傷應按認可的標準進行。

5.3 <u>法蘭連接件</u>

5.3.1 法蘭應為焊接頸、套裝或插口焊接型。但插口焊接型法蘭在公稱尺寸大於 50mm 時不得使用。

5.3.2 法蘭的型式製造和試驗應符合主管機關接受的標準。

5.4 管系試驗要求

5.4.1 本段試驗要求適用於貨艙內外的管路。對於貨艙內的管路及端部開口的管路，主管機關可以放鬆這些要求。

5.4.2 安裝完畢之後，每一貨物管路系統應承受至少 1.5 倍設計壓力的靜水壓力試驗。然而，當管系或部分系統完全製造好並裝配了所有的配件時，靜水壓力試驗的進行可以先於船舶上的安裝。船上焊接的接頭應以 1.5 倍設計壓力進行靜水壓力試驗。

5.4.3 在船上安裝完畢之後，每一管系都應進行泄漏試驗，其壓力視使用方法而定。

5.5 管系佈置

5.5.1 貨物管路不應安裝在貨物圍護處所的舷邊與船殼之間的甲板之下， 除非保持破損保護（見 2.6）要求的間隙；但是，當管子的破損不會引起貨物的釋放時，若保持檢驗要求的間隙，此距離可以減少。

5.5.2 位於主甲板以下的物貨管路，可以從其所服務的液貨艙穿過液貨艙壁或穿過縱向或橫向相鄰的液貨艙、壓載艙、空液貨艙或泵艙的共同艙壁，但是在其所服務的液貨艙內的管路要裝有能在露天甲板上操作的截止閥，並且當管路受損時要確保貨物的相容性。作為一個例外，當液貨艙與貨物泵艙相鄰時，能在露天甲板上操作的截止閥可位於貨物泵艙一側的液貨艙壁上。然而，主管機關也可接受安裝在貨艙外面的全封閉液力操縱閥，但是該閥門應：

.1 在設計上能排除滲漏危險；

.2 安裝在其服務的液貨艙艙壁上；

.3 適當地保護，以防機械損傷；

.4 距船殼的距離按破損保護要求；

.5 能在露天甲板上操作。

5.5.3 在一個泵服務於兩個或更多個液貨艙的任何貨泵艙內時，在每一艙的管路上應裝設一個截止閥。

5.5.4 安裝在管隧內的貨物管路也應滿足 5.5.1 和 5.5.2 的要求。管隧應滿足有關結構、位置和通風等所有液貨艙要求以及防止電氣危險要求。在管路失效時應確保貨物的相容性。該隧道除通向露天甲板和貨物泵艙或泵艙外不得設有任何開口。

5.5.5 穿過艙壁的管路應佈置成能防止在艙壁產生過度的應力，不得使用以螺栓通過艙壁固定起來的法蘭。

5.6 貨物移注控制系統

5.6.1 為適當控制貨物，貨物移注控制系統應該：

.1 在每一液貨艙充注和排出管上可以人工操作而且位於液貨艙貫穿件附近提供一個截止閥；若用獨立深井泵來排放液貨艙的貨物，則在該艙的排放管路上不要求設置截止閥；

.2 在每個貨物軟管接頭處提供一個截止閥；

.3 對所有貨物泵和類似設備提供遙控截斷裝置。

5.6.2 移注或運載本規則中的貨物所需要的控制裝置(不包括本規則在其他地方已經講過的貨物泵艙中的控制裝置)不應設置在露天甲板之下。

5.6.3 對於某些貨品，第 17 章的表格的“m”欄中列出其附加的貨物移注控制要求。

5.7 船舶貨物軟管

5.7.1 用於移注氣體和液體貨物的軟管應與貨物相容，並且適合於貨物温度。

5.7.2 承受液貨艙壓或泵的排放壓力的軟管的設計，其爆破壓力應不小於在貨物移注期間軟管將經受的最大壓力的 5 倍。

5.7.3 每一新型的備有端部設備的貨物軟管應進行原型試驗，其壓力不小於其規定的最大工作壓力的 5 倍。在原型試驗期間的軟管温度應達到要求的最高營運温度。原型試驗的軟管不得用於貨物輸送。以後在投入營運之前，所生產的每一段新軟管都應在環境温度下進行靜水試驗，其壓力不小於規定最大工作壓力的 1.5 倍，但不必大於其爆破壓力的五分之二。軟管應印有或另外標上其最大工作壓力和其最大和／或最小營運温度（如果要在非環境温度下工作的話）。規定的最大工作壓力應不小於 10 巴。

第 6 章

構造材料

6.1 通則

6.1.1 貨艙建造所用的材料，連同相聯的管路、泵、閥門、透氣管及其接合材料，應適合於所載貨物的裝載温度和壓力，並經主管機關同意。鋼是作為構造的正常材料。

6.1.2 在選用結構材料時，應視需要注意下列性能：

.1 在操作温度下的缺口韌性；

.2 貨物的腐蝕作用；

.3 貨物與結構材料之間產生危險反應的可能性；

.4 覆蓋層的適宜性。

6.2 材料的特別要求

6.2.1 對於某些貨品，第 17 章一覽表中“k”欄中所標的材料需執行，6.2.2、6.2.3 和 6.2.4 中的特殊規定。

6.2.2 下列結構材料不得應用於第 17 章“k”欄中提到的可能與貨品或其蒸氣接觸的貨艙、管路、泵、裝置及其他設備：

N1 鋁、銅、銅合金、鋅、鍍鋅鋼或汞。

N2 銅、銅合金、鋅或鍍鋅鋼。

N3 鋁、鎂、鋅、鍍鋅鋼或鋰。

N4 銅和銅軸承合金。

N5 鋁或銅或銅鋁任一合金。

N6 銅、銀、汞鎂和形成乙炔的其他金屬及其合金。

N7 銅和大於 1%銅含量的銅軸承合金。

N8 鋁、鋅，鍍鋅鋼或汞。

6.2.3 在電器裝置內通常使用的材料例如銅、鋁、絕緣應儘量採用密封來保護，以防與第 17 章“k”欄以 Z 標出的貨品蒸氣接觸。

6.2.4 可以與某些貨品或其蒸氣接觸的下列結構材料可以用於貨艙、管路、閥門、裝置或其他設備，在第 17 章“k”欄中所列符號如下：

Y1 鋁、不鏽鋼或有適當保護的襯套或鍍層的鋼。

Y2 鋁或不鏽鋼用於 98%或以上純度的貨物。

Y3 特殊抗酸不鏽鋼用於小於 98%濃度的貨物。

Y4 固體奧氏不鏽鋼。

Y5 不鏽鋼或有適當保護襯套或鍍層的鋼。

6.2.5 溶點低於 925°C 的結構材料，如鋁及其合金，不得用作在船上裝運閃點不超過 60°C（閉杯試驗）的貨物的外部管路，除非第 17 章“k”欄有規定。與貨艙連接的短的外部管路，如果設有防火絕緣，主管機關可以允許使用。

第 7 章

貨物溫度控制

7.1 通則

7.1.1 任何貨物加熱或冷卻系統的建造、設置和試驗應使主管機關滿意。用於建造溫度控制系統的材料應適合於將裝運的產品。

7.1.2 加熱或冷卻介質應被認可用於特種貨物的裝運。應對加熱旋管或通道的表面溫度給予考慮，以避免貨物局部過熱或過冷引起的危險反應。（另見 15.13.6）

7.1.3 加熱或冷卻系統應設閥門使每一貨艙隔離於該系統，並且允許人工節制流量。

7.1.4 在加熱或冷卻系統中，除空艙情況外，在任何其他情況下，應有設施來保證在管系中保持的壓力高於艙內貨物作用於管系的最大壓力。

7.1.5 應備有測量貨物溫度的設備。

.1 當第 17 章表“h”欄中所示的各種物質要求用限制式或封閉式儀錶裝置時，測量貨物溫度的設施應分別為限制式或封閉式的。

.2 限制式的溫度測量裝置應符合 13.1.1.2 中對限制式儀錶裝置的定義，例如可攜式溫度應降放在限制式表管之內。

.3 封閉式溫度測量裝置符合 13.1.1.3 中對封閉式儀錶裝置的定義，例如：感應器裝在艙內的遙控讀數的溫度計。

.4 當過熱或過冷可導致危險狀態時，應設置可監視貨物温度的報警系統。（另見 16.6 中的操作要求。）

7.1.6 當第 17 章“m”欄中列出的 15.12、15.12.1 或 15.12.3 的貨品加熱或冷卻時，加熱或冷卻介質所應在內運行的回路：

.1 應獨立於其他船舶服務（另一貨物加熱或冷卻除外），並不進入機器處所；

.2 在裝運有毒貨品的貨艙之外；

.3 在介質再循環到船舶其他營運業務處所或進入機器處之前取樣，檢查有無貨物存在。取樣設備應位於貨物艙區域內，並能探測任何被加熱或被冷卻的有毒貨物的存在。如使用本方法，管路回路必須進行測試，不僅在加熱或冷卻有毒品貨品開始之時，而且在已裝運不加熱或不冷卻的有毒貨物之後第一次使用管路之時。

7.2 附加要求

對於某些貨品，第 15 章中包括的附加要求在第 17 章在“m”欄中列出。

第 8 章

貨艙透氣系統

8.1 通則

8.1.1 所有貨艙應設置適合於所裝運貨物的透氣系統。貨艙透氣系統的設計應減小貨物蒸氣在甲板集聚、進入起居、服務和機器處所及控制站，對於可燃蒸氣，減小其進入任何有點火源的處所的可能性。他們也必須設計成減少向甲板噴射的可能性。透氣出口的佈置應防止水進入貨艙，並且同時應使蒸氣以不受阻氣流形式向上排放。

8.1.2 應有設施確保任何艙室的液體壓力不超過該艙的試驗壓力。為此目的，適當的高位報警、溢流控制系統或調節閥及儀錶和貨艙充注程序都可以接受。當限制貨艙過壓設施中包含一個自動關閉閥時，該閥應滿足 15.19 的要求。

8.1.3 對於裝設關閉式或限制式計量儀的艙室，應規定透氣系統的尺寸，允許設有防火網（如設有時），以至在設計速率裝載時貨艙不致超壓。特別是在飽和貨物氣體以最大裝載速率通過透氣系統排放時，貨艙蒸氣空間與大氣壓的壓力差不應超過 0.2 巴，或對於獨立艙來說，不超過貨艙的最大工作壓力。

8.1.4 任何裝設在透氣系統排放開口的防火網應易於到達和取出，以便清潔。

8.1.5 應有適當的設施，以排空透氣管路。

8.1.6 透氣管系如與抗腐蝕材料建成的貨艙相連接，或者與按本規則要求加有覆蓋層或塗層用來裝載特殊貨物的貨艙相連接，則透氣管系也要同樣如有覆蓋層或塗層，或者用抗腐蝕材料製成。

8.2 貨艙透氣系統的形式*

8.2.1 開式透氣系統係指在正常操作中，對貨物蒸氣進出貨艙的自由流，除摩擦和如裝有防火網時而產生的損失外，無任何限制的系統。此系統僅可用於閃點在 60°C 以上（閉杯試驗）無明顯吸入健康危害的貨物。開式透氣系統可以由每個貨艙的獨立透氣管組成，或者這些獨立透氣管會合於一個或幾個集管箱內，並適當注意貨物的分隔問題。但在任何情況下，在獨立透氣管上或集管箱上均不應設關閉閥。

8.2.2 控制式透氣系統係指每艙均有壓力／真空泄放閥以限制貨艙中壓力和真空的系統，並應用於不准採用開式透氣方式的貨物。控制式透氣系統可以由每個貨艙的獨立透氣管組成，或者這些獨立透氣管在壓力一側可以會合於一個或幾個集合管箱內，並適當注意貨物的分隔問題。在任何情況下，在壓力／真空泄放閥的上面或下面均不應裝設關斷閥，但在某些操作條件下，可採取對壓力／真空泄放閥加裝旁通的裝置。

.1 透氣管出口在露天甲板上的高度應不小於 4m，如透氣管裝設在離步橋 4m 以內，其高度應在前、後步橋之上不小於 4 m。

.2 如果裝設主管機關認可型的高速透氣閥引導蒸氣／空氣混合體以出口至少為 30m/s 的速度向上自由噴射時，甲板或縱向步橋之上的高度可分別減小到 3m。

.3 透氣管出口的佈置還應離開居住、服務和機器處所及有火源處所的最近空氣入口或開口至少 10m 之外。易燃

* 請注意 1974 年安全公約 1983 年修正條款的第 II-2/59 條。

蒸氣的出口應設有易於更新和有效的防火網或認可型的安全頂部。對於惡劣天氣時貨物蒸氣凍結或結冰引起裝置阻塞的可能性，在設計壓力／真空閥、防火網及透氣頂部時應予適當注意。

8.2.3 在 8.2.1 和 8.2.2 內對於透氣管路內使用的關閉閥的規定，應延伸到所有其他切斷設施（包括雙孔盲板和盲板法蘭）。

8.3 個別貨品的透氣要求

個別貨品的透氣要求列在第 17 章“e”欄中及“m”欄的附加要求中。

第 9 章

環境控制

9.1 通則

9.1.1 貨艙內蒸氣處所及某些情況下的貨艙周圍的處所可以要求有特別控制的大氣。

9.1.2 有以下四種不同型式的貨艙控制：

.1 惰性法——用不助燃的或不與貨物反應的氣體或蒸氣，對貨艙和有關管系及第 15 章規定的貨艙周圍的處所進行充注並維持此狀態。

.2 填料法——用分隔貨物與空氣接觸的液體、氣體或蒸氣對貨艙和有關管系進行充注並維持此狀態。

.3 乾燥法——用在大氣壓下露點為-40°C 或以下的乾燥氣體或蒸氣來充注貨艙及有關管系，並維持此狀態。

.4 通風法——強行或自然。

9.1.3 當貨艙要求用惰性法或填料法時：

.1 除非岸上的供應隨時可利用，應攜帶足夠的惰性氣體以供貨艙充注或卸貨時使用，或在船上就地製造。另外船上應有足夠的惰性氣體來補償運輸中的正常損耗。

.2 船上惰性氣體系統在圍護系統內任何時候都必須能夠保持至少為 0.07 巴的表壓力。另外，惰性氣體系統不得將貨艙壓力提高到超出貨艙釋放閥的調定值。

.3 當使用填料法時，如上述.1 和.2 兩段對惰性氣體的要求，對提供填料介質要作類似的佈置。

.4 為確保維持正確的氣壓，應提供設施來監控包含一個氣體墊的液面空間。

.5 用於易燃貨物的惰性和／或填料的裝置應能在接納惰性介質時儘量減少靜電荷的產生。

9.1.4 當使用乾燥法並且以乾氮作介質時，提供乾燥劑的類似安排要求同 9.1.3 的要求。在所有進入貨艙的空氣進口用乾燥劑作為乾燥介質時，在考慮了一日溫度範圍及預期的濕度後，在航行期內應攜帶足夠的介質。

9.2 各種貨品的環境控制要求

某些貨品環境控制的要求形式列在第 17 章表中的“f”欄內。

第 10 章

電氣裝置

10.1 通則

10.1.1 本章規定適用於裝載其本身或其與其他物質反應後可燃或對電器設備有腐蝕性的貨物的船舶，並且海上安全公約 1983 年修正條款第 II-1 章第 D 部分的電氣要求一起聯用。

10.1.2.1 電器設備應能盡量減少易燃貨物發生火災和爆炸的危險。考慮到 10.1.4 的要求，符合本章要求的電器裝置，用於 8.2.2.3 的要求時不應被看作是火源。

10.1.2.2 當特種貨物有可能對通常在電器設備中應用的材料造成損壞時，對於選擇用作導體、絕緣、金屬部件等的材料的特別特性應給予適當的考慮。只要有必要，這些部件應設防護，以防可能與氣體或蒸氣接觸。

10.1.3 主管機關應採取適當措施，以確保執行及應用本章有關電氣裝置的條文的統一性。*

10.1.4 電器設備和線路不得安裝於在 10.2 中列出的危險部位，除非在 10.2.3 中列出的例外許可對營運目的是必要時才行。

10.1.5 本節允許安裝於危險處所的電器設備應使主管機關滿意，並且由主管機關承認的有關當局發證，證明可在易燃環境中工作，如第 17 章“g”欄所示。

10.1.6 第 17 章“g”欄中缺少溫度級和設備組的資料，係指現在

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* 參閱國際電器技術委員會出版的建議，尤其是出版物 92-502。

尚無數據。這不得與表示某些物質不燃的（NF）符號相混淆。作為指導參考，如果一物質的閃點達到 60°C 時（閉杯試驗），則給出指示。對於加熱貨的運輸，可能要訂出裝運條件，並且應用 10.2.2 的要求。

10.2 危險部位和設備及線路的類型

10.2.1 本節的限制不排除在包括貨物管系在內的所有危險部位使用本身安全的系統和回路。特別建議將本身安全的系統和回路用於測量、監視、控制和通信目的。

10.2.2 閃點超過 60°C 的貨物（閉杯試驗）

.1 對於第 17 章“m”欄內無規定的這一類貨物，僅僅貨艙和貨物管系為危險部位。適當地考慮了貨品的化學和物理特性之後，對特定貨物或明確規定範圍的貨物，在例外環境下，主管機關可以允許採用浸沒的貨泵馬達和其有關的電纜。為了在可燃氣體空氣混合狀態時防止連通馬達和電纜及在低液位狀態時切斷馬達和電纜，應作好佈置。這一種關閉應在貨物控制站由一報警顯示。

.2 當電氣設備位於貨物泵艙內時，應適當考慮使用設備的類型，確保在正常營運狀態下不產生電弧或火花和熱點，或者使用合格的安全型裝置。

.3 當貨物加熱到其閃點 15°C 之內時，貨物泵艙應被視為危險區域，如此加熱的貨物貨艙開口 3m 之內的區域及通向貨物泵艙的入口或通風開口 3m 之內的區域都應視為危險區域。在這類部位中裝設的電氣設備應為核證安全型的設備。

.4 當貨物加熱到高於其閃點時，10.2.3 的要求適用。

10.2.3 對於閃點不超過 60°C（閉杯試驗）的貨物，第 17 章“m”欄中無要求時，危險區域的位置見下文。另外，除本身安全的系統和回路之外，在危險部位允許採用的電氣裝置如下：

.1 貨艙及貨物管系：

不允許設置額外的電氣設備。

.2 完整艙鄰近的、上方的或下方的空艙：

.2.1 連續電纜。此類電纜應設置在氣密接頭的厚鋼管內。在此類處所內不得設置膨脹彎管。

.2.2 電測深裝置或記錄裝置和外加電流陰極保護系統的陽極或電板。

這些裝置應設置在氣密圍蔽處所內；對有關電纜按 10.2.3.2.1 進行保護。

.3 包括獨立貨艙在內的貨艙空間：

.3.1 無任何附加保護的連續電纜。

.3.2 有加壓外殼或防火焰型照明裝置。照明系統應在至少兩個支回路間分割開來。所有開關和保護裝置都應切斷所有的極或相，並且應佈置在無危險部位。

.3.3 電測深裝置或記錄裝置和外加電流陰極保護系統的陽極或電板。這些裝置應設置在氣密圍蔽處所內。

.4 貨物泵艙及位於貨物區域內的泵艙：

.4.1 有加壓外殼或防火焰型照明裝置。照明系統應在至少兩個支回路間分割開來。所有開關和保護裝置都應切斷所有的極或相，並且應佈置在無危險部位。

.4.2 應該由氣密艙壁或甲板來把用來驅動貨物泵及任何有關輔助泵的電動馬達和這些處所分隔開來。保持對中的彈性聯軸或保持聯接的其他設施應安裝於被驅動的設備和其馬達之間的軸系上，另外，為軸系穿過艙壁或甲板時，填料函壓蓋的設置應使主管機關滿意。此類電馬達應設置在有正壓通風的艙室內。

.4.3 防火總報警聲響指示器。

.5 開敞甲板區或開敞甲板半圍蔽處所，在任何貨艙出口、氣體或蒸氣出口、貨管法蘭、貨物閥門或貨物泵艙入口及透氣開口 3m 之內；在所有貨艙和貨艙艙室之上的開敞甲板之上貨物區域，包括貨物區域內的全部壓載艙和隔離空艙，至艙舶的全寬，加上前後 3m 及至甲板上方 2.4m 的高度：

.5.1 合格的安全型設備，適合在開敞甲板上使用；

.5.2 連續電纜。

.6 裝有含貨物的管路的封閉或半封閉處所；緊連貨艙上方的封閉或半封閉處所（例如在甲板之間）或在貨艙艙壁之上並且與其在一個剖面上有艙壁；緊接貨物泵艙上方或者與貨艙相連的垂直隔離空艙之上的封閉或半封閉處所，具有氣密甲板分隔或良好通風者除外；以及貨物軟管艙室：

.6.1 合格的安全型照明裝置。照明系統應至少在兩條分線路之間分開。所有開關及保護裝置都應切斷所有的極或相並且都應佈置於非危險部位。

.6.2 連續電纜。

.7 有一個通向上述任何危險部位的直接開口的封閉或半封閉處所應設有符合開口通向處所或區域要求的電氣設備。

10.3 接地

獨立的貨櫃應與船殼進行電氣連接。所有的墊圈貨物管的接頭和軟管連接都應進行電氣連接。

10.4 各種貨品的電氣要求

各種貨品的電氣要求在第 17 章“g”欄內示出。

第 11 章

防火與滅火

11.1 適用範圍

11.1.1 1974 年國際海上人命安全公約 1983 年修正條款第 II-2 章對油輪的要求應對本規則所涉及的船舶適用，不管其噸位如何，包括小於 500 總噸的船舶，除非：

.1 第 60、61、62 和 63 條不適用；

.2 第 56 條之 2（即：主要貨物控制站位置的要求）不必適用；

.3 第 4 條（適用於貨船）和第 7 條應適用，因為它們適合 2,000 總噸位及以上的油輪；

.4 11.3 的規定應適用而替代第 61 條；及

.5 11.2 的規定應適用而替代第 63 條。

11.1.2 儘管有 11.1.1 的規定要求，僅裝載苛性碳酸鉀溶液、磷酸或苛性鈉溶液的船舶，如滿足安全公約 1983 年修正條款第 II-2 章第 C 部分的要求，就不必滿足該章第 D 部分的要求，除了第 53 條不必適用這類船舶並且以下的 11.2 和 11.3 不必應用以外。

11.2 貨物泵艙

11.2.1 任何船舶的貨物泵艙應設置如下固定滅火系統：

.1 安全公約 1983 年修正條款第 II-2 章第 5 條之 1 和 2 規定的二氧化碳系統。應於控制處標明此系統僅用於滅火而不用於惰性法的目的，因為存在有靜電起火的危險。

安全公約 1983 年修正條款第 II-2 章第 5 條之 1.6 要求的報警在可燃貨物蒸氣／空氣混合氣體中的使用應確保安全。根據本要求，應設置適合於機器處所使用的滅火系統。在各種情況下，應攜帶充足的自由氣體，其氣體量應等於貨物泵艙總容積的 45%；或

.2 安全公約 1983 年修正條款第 II-2 章第 5 條之 1 和 3 規定的鹵化烴系統。應於控制處標明此系統僅用於滅火而不用於惰性法的目的，因為存在有靜電起火的危險。安全公約 1983 年修正條款第 II-2 章第 5 條之 1.6 要求的報警在可燃貨物蒸氣／空氣混合氣體中的使用應確保安全。根據本要求，應設置適合於機器處所使用的滅火系統，但是基於貨物泵艙的容積，使用如下最小設計量：

鹵化烴 1301	7%
鹵化烴 1211	5.5%
鹵化烴 2402	0.3kg/m^3

11.2.2 用於專門裝載有限種類貨物的船舶的貨物泵艙，應得到主管機關批准的適當滅火系統的保護。

11.2.3 如果可以向主管機關證明要裝載的貨物不適宜採用二氧化碳或鹵化烴進行滅火，則可對貨物泵艙提供一個固定壓力噴水系統或者高倍泡沫系統的滅火系統。國際散裝危險化學品適航證書，應反映出此條件的要求。

11.3 貨物區域*

11.3.1 根據 11.3.2 至 11.3.12 的要求，每一條都應裝置固定甲板泡沫系統。

11.3.2 僅應提供一種泡沫濃縮物，所以該濃縮物應對要裝載的最大可能種類數的貨物有效。對於其他用泡沫不奏效或者與之不相容的貨物，則要設置為主管機關所滿意的附加裝置。一般的蛋白泡沫不得使用。

11.3.3 提供泡沫的裝置應能輸送泡沫到整個貨艙甲板區域，也能輸入任何貨艙艙室，假設其甲板斷裂。

11.3.4 甲板泡沫系統的操作應該簡單、迅速。系統主控站應適當地位於貨物區域之外，鄰近起居處所，便於在受保護區域內萬一失火時隨時進入和操作。

11.3.5 泡沫溶液的供應率不應小於下列的最大者：

.1 貨艙甲板面積 2 $l/m^2/min$，貨艙甲板面積係指船舶最大寬度乘以貨艙處所總縱向範圍；

.2 具有最大水平剖面面積的單艙的這種剖面面積 20 $l/m^2/min$；

.3 最大泡沫炮保護的面積 10 $l/m^2/min$，這個面積在該泡沫炮之前但不得小於 1,250 l/min。對小於 4,000 總噸的船舶， 的最小能力應獲主管機關認可。

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* 參見對化學液貨輪泡沫系統計算方法提出指南的工作文件 MSC/Circ.314，該文件可在應用本規則滅火劑的要求時加以使用。

11.3.6 當使用 11.3.5.1、11.3.5.2 和 11.3.5.3 中規定的最大溶液速率時，應提供足夠的泡沫濃縮物以確保至少能在 30min 內一直產生泡沫。

11.3.7 應通過泡沫炮和泡沫發生器提供來自固定泡沫系統的泡沫。11.3.5.1 或 11.3.5.2 要求的泡沫速率，至少 50%應通過每個泡沫炮輸出。任何泡沫炮提供泡沫的能力應至少能為由該泡沫炮保護的甲板區域提供每平方米 10*l*/min 的泡沫溶液。這種能力應不小於 1,250 *l*/min。對於小於 4,000 總噸的船舶，泡沫炮的最小能力應為主管機關所滿意。

11.3.8 自泡沫炮至該泡沫炮所保護區域的最遠邊緣的距離應不大於泡沫炮在平靜空氣中射程的 75%。

11.3.9 泡沫發生器的泡沫炮和軟管連接應位於艉樓前部或面對貨艙區域的起居處所的左、右舷。

11.3.10 發生器應在消防作業中具有操作的靈活性，並且應覆蓋泡沫炮屏障區域。任一發生器的容量應不小於 400 *l*/min，而且發生器在靜空氣狀態的射程應不小於 15m。裝設的泡沫發生器數量應不少於 4 個。泡沫主輸出口的數量和位置應該是至少有兩個發生器的泡沫可以噴向貨艙甲板區域的任何部位。

11.3.11 在泡沫總管及與甲板泡沫系統連為一體的消防總管上，應設置閥門，使之位於每一泡沫炮前部，以隔斷破損的總管節段。

11.3.12 按其要求的輸出量來操作甲板泡沫系統，應允許在所要求的消防總管的壓力下同時使用所要求的最低數量的水噴口。

11.3.13 用於裝載有限貨物種類的船舶，應由使主管機關滿意的替代設施進行保護，其對有關貨品的效應相同於對甲板泡沫系統所要求的對一般易燃貨物的效應。

11.3.14 應配備適於所裝貨品的手提式滅火設備並保持良好操作狀態。

11.3.15 當裝載易燃貨物時，所有點火源應排除在 10.2 涉及到的危險部位之外。

11.3.16 裝設有船艏或船艉裝卸裝置的船舶應額外設置一個符合 11.3.7 要求的泡沫炮及一個符合 11.3.10 要求的發生器。附加泡沫炮應位於保護船艏或船艉裝卸裝置的位置。貨物區域前後的貨物管線應由上述發生器保護。

11.4 特殊要求

被認為適合於某些產品的滅火介質列在第 17 章“j”欄內，以供參考。

第 12 章

貨物區域的機械通風

對本規則所適用的船舶，用本章的要求替代安全公約 1983 年修正條款第 II-2 章第 59 條之 3 的要求。

12.1 裝卸貨物過程中經常進入的處所

12.1.1 貨物泵艙和包括貨物裝卸設備的其他圍蔽處所以及在裏面在貨物上進行工作的類似處所應裝設機械通風系統，並使得能從此類處所外部進行控制。

12.1.2 應作出在進入艙室和操作設備之前應對此類處所進行通風的規定，並且要求進行此類通風的警告牌應放置在艙室之外。

12.1.3 機械通風的進口和出口應佈置成確保足夠的空氣流經這些處所，以避免有毒蒸氣和／或可燃蒸氣（考慮其蒸氣密度）集聚並且為提供安全工作環境確保足夠的氧氣，但不管怎樣，基於處所的總容積，通風系統應具有每小時不小於 30 次的空氣交換能力。對於某些貨品，對貨物泵艙的增加的通風率闡述於 15.17 之中。

12.1.4 通風系統應為永久的並且一般應為排出型的。應可以從花鐵板上和下抽放。在裝有驅動貨物泵馬達的艙室內通風應為正壓型。

12.1.5 來自貨物區域內處所的通風排氣管道應向上排放，其位置距離通風進口和起居、服務和機器處所和控制台站的開口以及貨物區外部的其他處所的開口在水平方向上應至少 10m。

12.1.6 通風進口的佈置應減小來自任何通風排氣口的危險蒸氣再循環的可能性。

12.1.7 通風管道不得穿過機器處所、起居處所、服務處所或其他類似處所。

12.1.8 如果裝運易燃貨品，驅動風扇的電動馬達應裝置在通風筒的外部。在第 10 章內提到的危險區域中的通風機和風扇筒中的扇體應為防火花結構，其規定如下：

.1 非金屬結構的葉輪和罩殼，要考慮減少靜電作用；

.2 非亞鐵材料的葉輪和罩殼；

.3 奧氏（不鏽）鋼葉輪和罩殼；

.4 亞鐵葉輪和罩殼設計頂齒間隙不小於 13mm。鋁合金或錳合金的固定或轉動部件和亞鐵的固定或轉動部件的任何組合應被認為有火花危險，在這些處所不得使用。

12.1.9 本章所要求的船上每一種扇型應備有足夠的備件。

12.1.10 應在通風筒外部開口處設置不小於 13mm 平方的網篩保護屏障。

12.2 經常進入的泵艙及其他封閉處所

在 12.1.1 中未包括的經常進入的泵艙和其他圍蔽處所應設置機械通風系統，並能從此類處所外部操作，而且符合 12.1.3 的要求，但基於處所的總容量，每小時空氣交換次數不得少於 20 次。在進入之前應規定對此類處所進行通風。

12.3 不經常進入的處所

雙層底、隔離空艙、箱型龍骨、管道、貨艙及貨物可能集聚的其他處所應能通風以確保在必須進入處所時環境是安全的。當對此類處

所不設有永久通風系統時，應備有認可型的便攜式機械通風裝置。當由於處所佈置必要時，例如在貨艙，這種通風的必要通道應永久設置。對於永久裝置，應提供每小時 8 次的空氣交換，對便攜式系統則為每小時 16 次的空氣交換。風機或風扇應離開人員出入口，並且應符合 12.1.8 的規定。

第 13 章

測量儀器

13.1 測量

13.1.1 貨艙應裝設下列型式之一的測量設備：

.1 開敞式設備——該設備利用貨艙上的開口，儀錶可露置於貨物或其蒸氣中。例如液面測量孔。

.2 限制式設備——該設備穿入貨艙，當使用時，允許少量貨物蒸氣或液體暴露於大氣。當不使用時，這種設備是完全封閉的。其設計應保證在打開這種設備時，艙內物質（液體或噴霧）不會危險地溢出。

.3 封閉式設備——該設備穿入貨艙，它是封閉系統的一部分，能防止艙內物質泄出。例如浮式系統、電子探測器、磁性探測器和安全觀察玻璃等。或者用不穿過貨艙外殼而與貨艙獨立的間接式設備。例如貨物的磅稱、管子流量計等。

13.1.2 測量儀器應獨立於 15.19 所要求的設備。

13.1.3 只有在下列情況下才允許用開敞式測量和限制式測量：

.1 本規則允許開敞式透氣時，或

.2 在操作儀錶之前可採取措施以釋放貨艙壓力。

13.1.4 對各種貨品的測量方式見第 17 章表中的“h”欄。

13.2 蒸氣探測

13.2.1 載運有毒和／或易燃貨物的船舶，至少應備有兩種設計和經核准用來測試該種特殊蒸氣的儀器。如果這種儀器不能兼用於試驗毒性濃度和易燃濃度，則應備有兩套分開的儀器。

13.2.2 蒸氣探測儀器可以是可攜型的或國定型的。若裝有一個固定系統，則至少還要備有一種可攜型儀器。

13.2.3 當對某些貨品的有毒蒸氣沒有適用的探測設備時（如第 17 章的“i”欄所示），則主管機關可以免除對該船舶的要求，但在國際適合證書上應有適當的記錄。當批准這一免除時，主管機關應認識到增加呼吸空氣供應的必要性，並且在國際適合證書上應記載以使注意 14.2.4 和 16.4.2.2 的規定。

13.2.4 對各種貨品的蒸氣探測要求見第 17 章表中的“i”欄。

第 14 章

人員保護

14.1 保護設備

14.1.1 為保護從事裝卸作業的船員，船上應備有適宜的保護設備，包括大圍裙、帶有長袖的特別手套、適用的鞋襪、用抗化學性材料製成的連衣褲工作服以及帶用緊密的護目鏡和／或面罩等。用於保護人身的衣服和設備應圍罩人全身的皮膚，使人體全部受到保護。

14.1.2 工作服和保護設備應保存於容易取用的地方，並放在專門的儲存櫃內。這些設備不准存放在起居處所內，新的、沒有用過的設備及經徹底洗淨後沒有用過的設備除外。如果與生活處所（例如艙室、過道、餐廳、浴室等）適當地隔離，主管機關也可批准在起居處所內的此類設備的儲存室。

14.1.3 在一切可能對人員產生危險的作業中，應使用保護設備。

14.2 安全設備

14.2.1 裝載第 17 章表中“m”欄裏列出的 15.12、15.12.1 或 15.12.3 規定的貨物的船舶，在船上應有足夠數量的（但不少於 3 整套）安全設備，每套設備允許人員進入充滿瓦斯的艙室並在內工作至少 20min。此類設備應為安全公約 1983 年修正條款第 II.2/17 條所要求的設備之補充。

14.2.2 一整套安全設備應包括：

.1 獨立式空氣呼吸器一具（不使用儲存的氧氣）；

2 保護衣服、鞋、手套和緊密的護目鏡；

.3 帶有腰帶的不受所載貨物影響的防火救生繩；

.4 防爆燈。

14.2.3 對於 14.2.1 要求的安全設備，所有船舶都應攜帶下列要求的一種：

.1 為每具呼吸器配備一套滿注備用空氣瓶；

.2 一台能供應所需純度的高壓空氣的特殊空氣壓縮機；

.3 能為足夠的備用呼吸具氣瓶充注的充氣複式接頭；或

.4 超過安全公約 1983 年修正條款第 II-2/17 條的要求時，船上每具呼吸具配備的滿注備用氣瓶裝有至少相當於 6,000 *l* 自由空氣的壓縮空氣。

14.2.4 裝載執行 15.18 要求的貨物或第 17 章 "i" 欄所列的貨物的船舶的貨物泵艙，當要求有有毒蒸氣探測設備而無適用設備時，應有：

.1 適合 14.2.1 所要求的呼吸器使用的有軟管接頭的低壓管系。該系統應有充足的高壓氣量，並通過減壓裝置來提供足夠低壓的空氣量以供兩個人在瓦斯危險處所至少工作一小時而不用呼吸器的氣瓶。應採取措施用適於提供所要求純度的高壓氣量的空氣壓縮機對固定空氣瓶和呼吸具氣瓶再充氣；或

.2 等量的備用瓶裝空氣，以替代低壓空氣管。

14.2.5 應至少有一套 14.2.2 所要求的安全設備，在泵艙附近易於到達的地方，存放於明顯標示的儲藏間內。其他幾套安全設備也應放在適當的有明顯標示的和易於到達的地方。

14.2.6 呼吸器應由負責的駕駛員每個月至少檢查一次並把檢查記錄在船舶航海日誌裏。該設備應由專門檢驗人員每年檢查和試驗一次。

14.2.7 適用於從貨物泵艙等處所吊出受傷人員的擔架，應放置在易於取用的地方。

14.2.8 從事裝運某些貨物的船舶應配備適當的足夠船上每一人員在應急逃生而用的呼吸和眼睛保護裝置，受下列要求限制：

.1 只有當一個過濾器適合船舶可裝運的所有指明的貨物時，過濾式呼吸保護器才能被接受；

.2 獨立式呼吸器一般應至少能使用 15min；

.3 應急逃生呼吸保護裝置不得用於消防或裝卸貨物的目的，並應打上相應的標誌。

本節要求適用的各種貨物在第 17 章“I”欄內表示。

14.2.9 船上應有醫藥急救設備，包括輸氧設備和對所載貨物的消毒藥品。

14.2.10 在甲板上方便的地方，應有適當標明的消除沾染的淋浴和洗眼設備。淋浴和洗眼設備在所有環境下都應能操作。

第 15 章

特殊要求

第 17 章表中的“m”欄中有具體指示時，本章的要求適用。這些要求是本規則一般要求的補充。

15.1 丙酮氰醇

丙酮氰醇須用無機酸加以穩定，以防分解。製造廠應提供穩定證書，證書上須載明：

.1 所加穩定劑的名稱與數量；

.2 穩定劑加入日期與有效期；

.3 改變穩定劑有效期的任何温度界限；

.4 航程超過穩定劑有效期對應採取的行動。

15.2 93%或 93%以下的硝酸銨溶液

15.2.1 硝酸銨溶液應至少含有 7%的水分。該溶液在以十份水與一份溶液稀釋時，酸度（pH）應在 5.0 和 7.0 之間。溶液中所含的氯化物離子和鐵離子均不超過 10ppm 並不得含有其他雜質。

15.2.2 裝載硝酸銨溶液的貨艙和設備，應獨立於裝載其他貨物或可燃貨品的貨艙和設備。不得使用那些可能在使用中或在有故障時會將可燃貨物（如滑油）釋放至貨物中的設備。貨艙不得用於海水壓載。

15.2.3 除主管機關另有認可外，硝酸銨溶液不得裝運在以前裝過其他貨物的貨艙裏，但貨艙及其設備經清洗至主管機關滿意者除外。

15.2.4 貨艙加熱系統中熱交換介質的温度不能超過 160°C。該加

熱系統應設有控制裝置，使散裝貨物的平均温度保持在 140°C。 應設有 145°C 和 150°C 的高温報警裝置和 125°C 的低温報警裝置。在熱交換介質的温度超過 160°C 時，也應報警。温度報警裝置及其控制器應位於駕駛室內。

15.2.5 如果散裝貨物的温度達到 145°C，應取貨物試樣，並以十份蒸餾水或軟水和一份試樣加以稀釋，其酸度（pH）應以具有精確量程的試紙或試棒確定之。酸度（pH）應每隔 24 小時測量一次。一旦酸度（pH）低於 4.2，應將氨氣注入貨物，直到酸度（pH）達到 5.0 為止。

15.2.6 應設有能將氨氣注入貨物的固定裝置。該裝置的控制器應位於駕駛室內。為此，船上每 1,000 噸硝酸銨溶液應備 300*kg* 氨。

15.2.7 貨泵應為離心深潛式或離心水封式泵。

15.2.8 透氣管系應設有經認可的風雨帽蓋，以防障礙物阻塞。此種帽蓋應能予以檢查和清洗。

15.2.9 凡是與硝酸銨溶液接觸過的貨艙、管系和設備，只有在內外徹底清除所有硝酸銨的痕迹後，方可進行熱加工。

15.3 二硫化碳

15.3.1 貨艙在裝載、卸載和移載時，應採取措施以使艙內保持一層水襯墊。此外，在移載時，在貨艙空檔內應保持一個惰性氣體的襯墊。

15.3.2 所有開口應在甲板以上的貨艙頂上。

15.3.3 裝載管路端頭應接近液貨艙底。

15.3.4 備有標準的空檔開口，以便應急測深。

15.3.5 貨物管系和透氣管路應獨立於其他貨物的管系和透氣管路。

15.3.6 泵可以用來卸貨，但這種泵應為深潛式或液壓驅動的半潛式泵。驅動深潛式泵的裝置不應產生點燃二硫化碳的火源，並且不得採用温度可能超過 80°C 的設備。

15.3.7 如果採用卸貨泵，要把它放入一個從艙頂伸到近於艙底某點的圓柱形井狀圍欄內。在打算把泵取出之前，除非證明該貨艙內已無瓦斯之外，井狀圍欄內應形成一層水襯墊。

15.3.8 如果貨物系統設計的壓力和温度適合需要，則水或惰性氣體的位移法可以用來卸貨。

15.3.9 安全釋放閥應以不鏽鋼製成。

15.3.10 由於二硫化碳的低著火温度和需用較小的間隙來阻止火焰的傳播，所以在 10.2.3 中所述的危險位置只許設有固有的安全系統的回路。

15.4 乙醚

15.4.1 除非艙內充有惰性氣體，船舶在航行中對貨艙周圍的留空處所應能自然通風。如果設置機械通風系統，所有鼓風機應為無火花型結構。機械通風設備不得置於貨艙周圍的留空處所內。

15.4.2 壓力釋放閥的調節，對於重力貨艙不得小於 0.2 巴。

15.4.3 如果貨物系統的設計壓力適合需要，則惰性氣體的位移法可以用來對壓力貨艙進行卸貨。

15.4.4 為防止發生火災，在貨物區域內應採取措施，以免有任何火源和／或產生熱度。

15.4.5 泵可以用來卸貨，但這種泵的設計型式須能避免對泵軸壓蓋產生液體壓力，或者採用液壓驅動的潛式泵，並適用於這種貨物。

15.4.6 貨艙在裝載、卸載和移載時，應採取措施以使艙內保持惰性氣體墊。

15.5 60%以上但不超過 70%的過氧化氫溶液

15.5.1 過氧化氫溶液只能用專用船載運，並不得載運其他貨物。

15.5.2 貨艙及其設備應以純鋁（99.5%）或全不鏽鋼（304 L、316、316 L 或 316 Ti）製成，並按經認可的程序純化。甲板上不得採用鋁制管系。所有非金屬材料製造的容器系統，既不能同過氧化氫起化學反應，也不能有助於分解。

15.5.3 泵艙不得用於貨物過駁操作。

15.5.4 貨艙應與燃油艙或裝有易燃或可燃材料的任何其他處所用隔離空艙加以隔開。

15.5.5 擬載過氧化氫的貨艙不得用於海水壓載。

15.5.6 貨艙的頂上和底部應設置感温器。駕駛室內應設有温度遙測讀出器並能連續監控。如果艙內温度超過 35°C，駕駛室內應發出聲光報警。

15.5.7 於貨艙鄰接的留空處所內應設有固定式氧氣監控器（或瓦斯取樣管路）以探測貨物是否泄漏到這些處所內。駕駛室內也應設有遙測讀出器、連續監控（如果採用瓦斯取樣管路，則以間歇取樣為好）

以及類似感温器所需的聲光報警裝置。在這些留空處所內，如果氧氣濃度超過容量的 30%，應發出聲光警報。應設兩個可攜式氧氣監控器作為備用裝置。

15.5.8 為防止發生不能控制的分解情況，應設置貨物投棄系統，以使將分解貨物排到船外。如果貨物温升在 5 小時內以每小時超過 2°C， 或者在艙內温度超過 40°C 時，該貨物應予以投棄。

15.5.9 貨艙的通風系統，對於正常通風，應設有壓力／真空安全閥，對於應急通風，應設有安全膜或類似裝置，以防貨艙壓力迅速升高以致引起無法控制的分解。安全膜的尺寸應根據貨艙設計壓力、貨艙大小和預期的分解率確定。

15.5.10 應設有固定式噴水系統，以便稀釋並洗掉溢漏在甲板上的任何濃縮的過氧化氫溶液。噴水器所覆蓋的區域應包括支管／軟管接頭和載運過氧化氫溶液的專用貨艙的頂部。最小應用率應符合下列標準：

.1 貨品應在溢漏 5min 之內把其原來的濃度稀釋到 35%。

.2 溢漏率和估計溢漏的大小應根據預計的最大裝卸率、貨艙注滿或管系／軟管故障時停止貨物流通所需的時間以及從貨物控制站或駕駛室啓動稀釋水噴灑裝置所需的時間而定。

15.5.11 過氧化氫溶液應予以穩定，以防分解。製造廠應提供穩定證書，證書應存放在船上，上面載明：

.1 所加穩定劑的名稱與數量；

.2 穩定劑加入日期與有效期；

.3 改變穩定劑有效期的任何温度界限；

.4 一旦航程時間超過穩定劑有效期時應採取的行動。

15.5.12 只能載運那些在 25°C 時具有每年 1%的最小分解率的過氧化氫溶液。託運人用以說明貨品符合本標準的證書應送交船長並保存於船上。製造廠應派技術代表上船監控裝貨操作，所派代表應有能力檢驗過氧化物的穩定性。技術代表應向船長證明，貨物是在穩定狀況下裝載的。

15.5.13 涉及貨物裝載操作的每一個船員，均應配備能抵抗過氧化氫溶液的防護衣。防護衣應包括不燃的工作服、適宜的手套、靴子和眼睛保護裝置。

15.6 內燃機燃油（含有烷基鉛的）防爆化合物

15.6.1 用於這些貨物的貨艙，除了用於運輸製造內燃機燃油的含有烷基鉛的防爆化合物貨品之外，不得用於運輸任何其他貨物。

15.6.2 如果貨泵艙按 15.18 的規定置於甲板平面上，則通風裝置應符合 15.17 的要求。

15.6.3 用於運輸這些貨物的貨艙非經主管機關認可不得進入。

15.6.4 在允許人員進入貨泵艙或貨艙周圍的留空處所之前，應進行空氣分析，以測定含鉛量是否合格。

15.7 磷（黃色或白色）

15.7.1 必須使磷在裝載、運輸和卸載的任何時候都處於最小深度

為 760mm 的水層之下。在卸載作業中，應設有裝置以保證水能佔據已卸去的磷的體積。從磷艙排出的水，只能回到岸上裝置中去。

15.7.2 貨艙的設計和試驗，在設計的裝載條件下，並考慮到磷的深度、比重和裝卸方法，應至少經受高出貨艙頂 2.4m 的水頭。

15.7.3 貨艙的設計，應儘量減少液體磷與其水層之間的交界面積。

15.7.4 在水層上面應至少保持 1%的空檔。空檔應充以惰性氣體，或以兩個不同高度的具有通風帽的立管進行自然通風，立管高出甲板至少為 6 m，高出泵艙頂至少為 2m。

15.7.5 貨艙的所有開口都要位於艙頂上，其附屬零件應使用能抵抗五氧化二磷的材料製成。

15.7.6 磷應在温度不應超過 60°C 的條件下裝卸。

15.7.7 貨艙加熱裝置應設在貨艙之外，並有適當的温度控制方法以保證磷的温度不超過 60°C。應裝有高温報警器。

15.7.8 在所有貨艙周圍的留空處所內，均應設有主管機關認可的水淋系統。當磷逸出時，該系統能自動開啓。

15.7.9 15.7.8 所述的留空處所，應備有有效的機械通風裝置，倘遇緊急情況能夠迅速封閉。

15.7.10 磷的裝載和卸載，應由船上中央系統予以控制，該系統除裝有高液位報警器外，應能保證貨艙不會溢流，而且當遇有緊急情況時，裝卸作業能夠從船上或岸上予以迅速停止。

15.7.11 在貨物裝卸中，甲板上要備有與水源連接的水龍帶，並保持在整個作業中有水流通，以保證任何磷的漏逸可以立刻用水洗去。

15.7.12 船上到岸上裝卸貨的管子接頭應經主管機關認可。

15.8 環氧丙烷

15.8.1 依照本節規定運輸的環氧丙烷，必須不含有乙炔。

15.8.2 凡裝過上述三種已知能與下列任何貨品起催化聚合作用的貨物之一的貨艙，除非該艙業經適當清洗，否則不得裝運環氧丙烷：

.1 無機酸（如硫酸、鹽酸、硝酸）；

.2 羧酸和酐（如甲酸、醋酸）；

.3 鹵代羧酸（如氯醋酸）；

.4 磺酸（如苯磺酸）；

.5 苛性鹼（如氫氧化鈉、氫氧化鉀）；

.6 氨及氨溶液；

.7 銨及銨溶液；

.8 氧化物質。

15.8.3 貨艙在裝運環氧丙烷之前，應徹底地有效地予以清洗，以便清除貨艙及其管道工程上前次所裝貨物的所有痕迹，但前次所裝貨物是環氧丙烷者例外。在非不鏽鋼建造的鋼艙內有氨氣時應予特別注意。

15.8.4 在任何情況下，應以適當的試驗或檢驗來檢查貨艙及其管道工程的清洗程序是否有效，以確定不存在酸或鹼材料痕迹，因為這些餘留痕迹在裝進環氧丙烷時可能會引起危險的情況。

15.8.5 在貨艙裏，每當首次裝載環氧丙烷之前，應進去加以檢查，以保證沒有污染、嚴重的鐵鏽澱積物和明顯的結構缺陷。當貨艙連續運輸環氧丙烷時，則上述檢驗的間隔應不超過兩年。

15.8.6 載運環氧丙烷的貨艙應以鋼或不鏽鋼製成。主管機關可以接受適當的貨艙塗層，並在國際散裝運輸危險化學品合格證書上註明。

15.8.7 裝過環氧丙烷的貨艙，只要貨艙及有關管道系統經過徹底清洗以後，仍可裝運其他貨物。

15.8.8 所有閥門、法蘭、配件和附屬設備，其型式必須適用於環氧丙烷，並應由鋼或不鏽鋼或其他經主管機關允許的材料製成。所有材料的化學成分，應在製造之前提交主管機關認可。閥門的閥盤或閥盤面、閥座和其他摩擦部件應用含鉻不少於 11%的不鏽鋼製成。

15.8.9 所有填料應用不會同環氧丙烷起反應，不會溶解在環氧丙烷裡，也不會降低環氧丙烷的自然溫度的材料製成，這種材料還應耐火和具有適當的機械性能。接觸貨物的表面應為聚四氟乙烯（PTFE）或由於其惰性而具有相同安全程度的材料製成。主管機關可以接受具有聚四氟乙烯填料或類似氟化聚合物的螺旋纏繞不鏽鋼材料。

15.8.10 如果使用絕緣和填料，其材料應不會同環氧丙烷起反應，不會溶解在環氧丙烷裏，也不會降低環氧丙烷的自燃溫度。

15.8.11 下列材料一般認為不適宜用於環氧丙烷容器系統上的填料、襯墊和類似用途，若要使用，須在主管機關批准之前作試驗：

.1 氯丁橡膠或天然橡膠（如果與環氧丙烷接觸）；

.2 石棉或與石棉混合使用的粘接料；

.3 含有鎂氧化物的材料，如礦渣絨。

15.8.12 在貨物液體和蒸氣管路中，禁止使用螺紋連接。

15.8.13 裝載和卸載的管路應伸到離艙底或任何聚液的井狀圍欄的底部 100 毫米之內。

15.8.14 裝載環氧丙烷貨艙的容器系統應設有閥門控制的蒸氣回路接頭。

15.8.15 貨艙在裝卸環氧丙烷時不要向外通風。如在貨艙裝載時須將蒸氣回送到岸上，則連接環氧丙烷容器系統的蒸氣回路裝置應同所有的其他容器系統分離開。

15.8.16 在卸載作業期間，貨艙內的壓力必須保持在 0.07 巴以上。

15.8.17 裝載環氧丙烷的貨艙，其透氣管系應與裝載其他產品的貨艙分開。應設有在不打開貨艙的情況下能夠取樣的設施。

15.8.18 卸下貨物時只可使用深井泵、液壓操縱半潛式泵或惰性氣體位移法。每一貨泵的佈置，應保證在關閉或阻塞泵的排放管路時不致產生很大的熱量。

15.8.19 裝卸環氧丙烷的軟管上應標明“環氧丙烷裝卸專用”。

15.8.20 相鄰於整體重力貨艙的貨艙、留空處所和其他封閉處所，應裝載能相容的貨物（15.8.2 列舉的貨物為不相容貨物的例子）或充滿適當的惰性氣體。設有獨立貨艙的任何封閉處所應充以惰性氣體。充有惰性氣體的處所和貨艙應能監控環氧丙烷和氧氣。可移式取樣設備應符合要求。這些處所內的氧氣成分應保持在 2%以下。

15.8.21 當貨泵或管系存有環氧丙烷時，則在任何情況下禁止空氣進入其內。

15.8.22 在拆開岸上管路之前，液體和蒸氣管路內的壓力應通過裝於裝載端管上的適當閥門予以泄放。這些管路內的液體和蒸氣不准排入大氣。

15.8.23 環氧丙烷可以裝載在壓力貨艙或獨立重力貨艙或整體重力貨艙內。貨艙的設計應能經受在貨物裝載、運輸和卸載中預計會遇到的最大壓力。

15.8.24 設計壓力小於 0.6 巴的貨艙，需要有一個冷卻系統來保持環氧丙烷低於其標準温度。此標準温度係指環氧丙烷在壓力釋放閥調定值時相應於環氧丙烷的蒸氣壓力時的温度。

15.8.25 如果船舶營運於有限航區或從事有限航行，主管機關可以放棄設計壓力小於 0.6 巴的貨艙的製冷要求，但可以考慮該貨艙在此種情況下的任何絕緣措施。允許上述運輸的航區和每年次數應在國際散裝運輸危險化學品合格證書的載運條件中加以標明。

15.8.26 任何冷卻系統應保持液體温度低於抑制壓力的沸點温度。至少應備有兩整套冷卻裝置，按貨艙內温度的變化自動調節。每套要配齊正常作業所必需的輔助設備，其控制系統還要能夠人工操作。應設有報警器，用來指示温度控制失靈。每個冷卻系統的能力應足以使液體貨物的温度保持在該系統的標準温度以下。

15.8.27 另一種辦法是包括三個冷卻裝置，其中任何兩個應足以使液體温度保持在標準温度以下。

15.8.28 僅用單壁同環氧丙烷隔開的冷卻介質應為不與環氧丙烷起反應的介質。

15.8.29 禁止使用需要壓縮環氧丙烷的冷卻系統。

15.8.30 壓力釋放閥的調定，對壓力艙來說，應不小於 0.2 巴，不大於 7.0 巴。

15.8.31 用於裝載環氧丙烷貨艙的管系，應與所有其他貨艙（包括空艙）和所有貨物壓縮器的管系分開（見 1.3.24 的規定）。若所裝貨艙的管系並非獨立的（見 1.3.15 的規定），則以可移短管件、閥件或其他管段來達到所需的管系獨立，並在這些位置上安裝盲斷法蘭。所需的獨立適用於所有液體和蒸氣管系、液體和蒸氣透氣管路以及任何其他可能的連接，例如公用惰性氣體供給管路等。

15.8.32 只有按照主管機關認可的貨物裝卸計劃，才可運輸環氧丙烷。每一擬定的裝載佈置應在單獨的貨物裝卸計劃上標明。貨物裝卸計劃應標明需要符合上述管系分開要求的整個貨物管系和盲斷法蘭的安裝位置。船上應保存每一經認可的貨物裝卸計劃的副本一份。應簽署國際散裝運輸危險化學品合格證書，其中包括經認可的貨物裝卸計劃。

15.8.33 在每次裝載環氧丙烷之前，應從主管機關認可的主管機構那裏獲得證明業已達到所需管系分開的證書，並存於船上。盲斷法蘭和管路法蘭之間的每一連接應設置金屬線，並由主管人員密封，以保證盲斷法蘭不被無意移動。

15.8.34.1 貨艙在標準温度（R）下所裝液體不得超過 98%。

15.8.34.2 貨艙所載的最大容積（V_L）應為：

$$V_L = 0.98V\frac{\rho_R}{\rho_L}$$

式中： V = 貨艙容積

P_R = 貨物在標準温度時的相對密度

P_L= 貨物在裝載温度和壓力下的相對密度

R = 貨物在壓力釋放閥開啓壓力下相應於蒸氣壓力的標準温度。

15.8.34.3 對於可能適用的每一裝載温度和最大的標準温度，每一貨艙最大許可的充注極限應在主管機關認可的表上標明。該表的副本應由船長長期保存在船上。

15.8.35 貨物應在適宜的氮氣保護層之下載運。應裝有自動制氮系統，以便在由於環境情況或製冷系統的不正確操作而致使貨品温度下降時，能夠防止貨艙壓力低於 0.07 巴。船上應能獲得充足的氮氣，以便滿足壓力自動控制的要求。用於保護層的氮應為工業用的純度為 99.9% 的氮氣。在此方面，通過降壓閥與貨艙連接的一排氮氣瓶可滿足“自動”一詞的要求。

15.8.36 在裝載前後應測試貨艙的蒸氣空間，以證實其含氧量為 2% 或以下。

15.8.37 在進行裝卸作業的區域內，應設有噴水滅火系統，其能力和佈置應能有效地覆蓋環氧丙烷裝載支管、有關貨物裝卸的露天甲板管道和貨艙圓頂的周圍區域。當每分鐘出水率為 10 l/m^2 時，管路和噴嘴的佈置應能對所保護的全部區域均勻地分佈。該噴水滅火系統應

能進行就地和遙控人工操作，而且其佈置應保證能把任何泄漏的貨物沖洗掉。此外，如果大氣温度許可，應裝一條給噴嘴以壓力的水龍軟管，以便在進行裝卸作業時可以立即使用。

15.8.38 在貨物裝卸時所使用的每個貨物軟管接頭上，都要備有一個能遙控的控制關閉速率的關閉閥。

15.9 50%或 50%以下的氯酸鈉溶液

15.9.1 裝過本貨品的液貨艙及其附屬設備，只要經過徹底的清洗，仍可裝運其他貨物。

15.9.2 本貨品一旦發生泄漏，所有泄漏的液體應立即徹底地沖洗掉，不得延遲。為使火災危險減至最小，因此，不許讓泄漏物變乾。

15.10 液態硫

15.10.1 在一切載運情況下，應使貨艙通風，使全部貨艙蒸氣空間內保持硫化氫的濃度低於其爆炸下限的一半，即體積在 1.85%之下。

15.10.2 如果使用機械通風系統來使貨艙內保持氣體低濃度，應裝有一個報警系統，在機械通風失效時報警。

15.10.3 通風系統的設計和佈置，應能排除硫在該系統內的積存。

15.10.4 在貨艙鄰近的留空處所的開口，其設計和裝置應能防止進入水、硫或貨物蒸氣。

15.10.5 應裝有能對留空處所內的蒸氣取樣和進行分析的連接件。

15.10.6 應備有貨物温度控制裝置，以保證硫的温度不超過 155° C。

15.11 酸

15.11.1 船殼板不得作為裝載礦物酸的貨艙的界限板。

15.11.2 主管機關可以考慮用抗腐蝕材料來對鋼的貨艙和有關管系加襯裏的建議。襯裏的彈性應不低於起支撐作用的界限板的彈性。

15.11.3 除非完全用抗腐蝕材料建成，或者裝有經認可的襯裏，否則應考慮到貨艙板厚度受到的貨物的腐蝕。

15.11.4 裝卸支管接頭的法蘭盤處應設有可移動的防護罩，以防貨物噴出的危險；此外，還應備有滴盤，以防貨物滴漏到甲板上。

15.11.5 裝載這種物質時，由於其產生氫的危險，所以電氣設備應符合 10.2.3.1、10.2.3.2、10.2.3.3、10.2.3.4、10.2.3.6 和 10.2.3.7 的規定。應採用適於在氫氣和空氣的混合氣體中使用的經認可的安全型設備，而且其處所內不得有其他火源。

15.11.6 受本節約束的貨物，除遵守 3.1.1 的分隔要求外，尚須與燃油艙分隔。

15.11.7 應備有適當的儀器，以探測貨物漏逸到鄰近處所。

15.11.8 貨泵艙的艙底泵裝置及其放泄裝置應用抗腐蝕材料製成。

15.12 有毒貨品

15.12.1 貨艙透氣系統的排出口位置應為：

.1 風雨甲板以上高度為 B/3 或 6 m，取其大者；或者，對於甲板貨艙，以出入步橋為基準；

.2 如設在步橋 6 m 之內，則須在前後步橋以上不少於 6 m； 及

.3 離開任何居住和服務處所的任何開口或空氣入口 15m；

.4 適用時，透氣管高度可減至甲板或前後步橋以上 3m 處，但應設置經主管機關認可型式的高速透氣閥，該閥應使蒸氣／空氣混合物以至少 30 m/s 的出口速度垂直向上無阻擋地噴出去。

15.12.2 貨艙透氣系統應備有一個接頭，用以連接把蒸氣回送到岸上設備的管路。

15.12.3 貨品應該：

.1 不裝載在燃油艙的鄰接艙內；

.2 具有分開的管系，及

.3 具有與裝載無毒貨品的貨艙分開的貨艙透氣系統。（亦見 3.7.2）。

15.12.4 貨艙安全閥開啓壓力最小應為 0.2 巴。

15.13 需要制止自行反應的貨物

15.13.1 某些貨物，如第 17 章“m”欄中所列舉的，由於它們所具的化學性質，在一定濕度條件下暴露於空氣或與催化劑接觸時，具有化學聚合的趨向。要減輕這種趨向，可在液體貨物內加入少量阻化劑，或者控制貨艙環境。

15.13.2 裝載這種貨物的船舶，其設計應在貨艙和貨物裝卸系統內消除一切可能起催化作用或可能破壞阻化劑的任何結構材料或污染物。

15.13.3 應注意使這些貨物在全部航程時間內保證受到抑制，以防化學聚合。裝載這種貨物的船舶應備有製造廠的抑制證書，證書上載明：

.1 所加阻化劑的名稱和數量；

.2 阻化劑加入的日期及其有效期；

.3 改變阻化劑有效期的任何温度界限；

.4 一旦航程超過阻化劑有效期時應採取的行動。

15.13.4 在船上使用排除空氣作為防止貨物自行反應的方法，應符合 9.1.3 的要求。

15.13.5 透氣系統的設計應能消除由於化學聚合物增多而造成的阻塞。透氣設備的型式應能定期檢查其功用是否適當。

15.13.6 貨物通常以熔化狀態載運時，其結晶或凝固可能導致貨艙容量中此部分的阻化劑消失，隨後的重新溶化可能產生無其他物質的液體囊，並帶來聚合的危險。為防止上述現象，應注意保證該貨物在貨艙的任何部分和任何時候不會產生全部或局部的結晶或凝固現象。任何所需的加熱裝置應保證貨艙內的任何部分不使貨物過分加熱到可能產生危險的聚合反應的程度。若蒸氣盤的温度可能導致過分加熱時，應採用間接低温加熱系統。

15.14 <u>在 37.8°C 時蒸氣壓力超過 1.013 標準巴的貨物</u>

15.14.1 第 17 章表中“m”欄內的本節所述的貨物，除非該貨物系統的設計能承受貨物在 45°C 時的蒸氣壓力，否則應設有機械製冷系統。如該貨物系統的設計能承受貨物在 45°C 時的蒸氣壓力並毋須設有製冷系統時，則應在國際適航證書的載運情況上作出標誌，以指明貨艙所需的安全閥開啓壓力。

15.14.2 機械製冷系統在貨艙設計壓力下應能保持液體温度低於沸點温度。

15.14.3 倘若船舶在有限季節裏營運於有限航區或從事有限航程，主管機關可以同意放棄關於製冷系統的要求。這種同意（包括載運區域的限制和季節及航程的限制）應包括在國際散裝運輸危險化學品證書的運載條件之中。

15.14.4 應備有在裝載作業中把逐出的氣體送回岸上的管子接頭。

15.14.5 每個貨艙應備有一個壓力錶，指示貨物上面蒸氣空間的壓力。

15.14.6 貨物如需冷卻，每個貨艙應在艙頂和艙底設有温度計。

15.14.7.1 貨艙在標準温度下所裝液體不得超過 98%。

15.14.7.2 貨艙裝載的最大貨物體積（V_L）應為：

$$V_L = 0.98V\frac{\rho_R}{\rho_L}$$

式中： V = 貨艙容積

P_R = 貨物在標準温度下的密度

P_L= 貨物在裝載温度下的密度

R = 貨物在壓力安全閥開啓壓力下相應於貨物蒸氣壓力的標準温度。

15.14.7.3 對於可能適用的每一裝載温度和最大標準温度下，每一貨艙最大許可的充注極限應在主管機關認可的表上予以指明。該表副本應由船長長期保存在船上。

15.15 點燃温度低、可燃性範圍寬的貨物

對於載運上述貨物的船艙，10.2.3.5 規定的距離要求應至少增至4.5m。

15.16 貨物污染

15.16.1 如第 17 章“m”欄適用於本節，則鹹性或酸性材料（如苛性鈉或硫酸）不得污染貨物。

15.16.2 如第 17 章“m”欄適用於本節，水不得污染貨物。此外，亦應符合下列要求：

.1 裝有貨物的貨艙，其壓力／真空安全閥的進氣口應至少位於風雨甲板以上 2 m 的高度。

.2 第 7 章所需的貨物温度控制系統內不得用水或蒸氣作為熱量傳遞的介質。

.3 除非永久性壓載艙或水艙是空艙和乾艙，否則其鄰近貨艙概不得裝運貨物。

.4 貨物不得載運在這樣的艙內，即這種貨艙相鄰於污液艙或容納壓載水或污液或可能以危險方式起反應的其他含水貨物的貨艙。用於上述貨艙的泵、管子或透氣管路，應同用於裝貨貨艙的類似設備分開。污液艙的管路或壓載管路不得穿過裝貨貨艙，但有管隧者除外。

15.17 增加的通風要求

12.1.3 所述的通風系統對於某些貨品來說，根據處所的總容積，其最小能力至少為每小時換氣 45 次。通風系統的排氣通道應遠離居住處所的開口、通風系統的進口、工作區域或其他類似處所至少 10 m 之外，並至少高出貨艙用板 4 m 以上。

15.18 特種貨物泵艙的要求

對於某些貨品，貨物泵艙應置於甲板平面上，或將貨泵置於貨艙內。主管機關對低於甲板的貨物泵艙應予特別考慮。

15.19 溢流控制

15.19.1 如第 17 章表中的“m”欄具體提及時，本節中的要求將適用，並且是測量儀器要求的補充。

15.19.2 任何安全裝載的關鍵系統萬一出現動力故障時，應向有關操作人員報警。

15.19.3 任何安全裝載的關鍵系統萬一不能工作時，裝載作業應立刻停止。

15.19.4 液位報警器應能在裝載之前予以試驗。

15.19.5 15.19.6所需的高液位報警器系統應同15.19.7所需的溢流控制系統分開，並與 13.1 所需的設備分開。

15.19.6 貨艙應設置符合 15.19.1 到 15.19.5 規定的並能示明貨艙內液位達到正常滿載情況的聲光高液位報警器。

15.19.7 本節所需的貨艙溢流控制系統應為：

.1 當貨艙正常裝載程序制止貨艙液位超過正常滿載情況失靈時能開始工作。

.2 給船舶操作人員發出貨艙溢流的聲光報警。

.3 設有相繼關閉岸泵和／或閥門以及相繼關閉船上閥門的一致信號。信號以及泵和閥的關閉可由操作人員決定。只有在得到主管機關和有關港口主管機關的特別認可後，才能允許使用船上的自動關閉閥。

15.19.8 貨艙裝載率（LR）應不超過：

$$LR=\frac{3600U}{t}\ (m^3/h)$$

式中： u = 操作信號液位時的留空容積（m^3），

t = 從發出信號到完全停止貨物流入貨艙所需的時間（s），此時間為相繼操作的每一步（如操作人員對信號的響應、停泵和關閉閥門等）所需時間的總和。

亦應考慮管路系統的設計壓力。

第 16 章

操作要求*

16.1 每艙允許最大裝貨量

16.1.1 要求裝載在 1 型船內的貨物數量，任一貨艙不得超過 1,250m^3。

16.1.2 要求裝載在 2 型船內的貨物數量，任一貨艙不得超過 3,000m^3。

16.1.3 考慮到貨物可能達到的最高溫度，在環境溫度下載運液體的貨艙，在裝貨時應使得可以避免在航行期間液體漲滿。

16.2 貨物資料

16.2.1 本規則所適用的每艘船上應備有本規則，或已編入本規則要求的國家條例。

16.2.2 需要散裝的任何貨物，應在運輸文件上以正確的技術名稱記明。如果貨物是混合物，應有標明構成貨品整個危害的主要危險因素的分析。倘若可能，應有一份完整的分析。此分析應經製造廠或經主管機關可接受的獨立專家核證。

16.2.3 船上應備有給出貨物安全運載所需數據的資料，並向一切有關人員開放。上述資料應包括存放在易於到達之處的貨物堆裝計劃，並列明船上的包括所載的每一危險化學品的所有貨物：

.1 詳細說明貨物安全裝運所需的物理和化學性能（包括反應性）；

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* 亦應注意包括在國際航運公會油船安全守則（化學品）內的操作指南。

.2 萬一溢出或漏出時應採取的行動；

.3 預防身體意外接觸的措施；

.4 消防措施和滅火手段；

.5 貨物駁運、貨艙清洗、除氣和壓載的程序；

.6 那些按照 15.1、15.5.11 或 15.13.3 需要穩定或阻化的貨物，如果沒有提供在這些條中所要求的證書，則應拒絕裝貨。

16.2.4 如不能得到貨物安全運輸所需的充分資料、該貨物應予拒裝。

16.2.5 凡能放出看不見的劇毒蒸氣的貨物，除非在貨物中放入看得見的添加劑，否則一概不能運輸。

16.3 人員訓練*

16.3.1 所有人員對於使用保護設備應經過充分的訓練，並應經過與他們的職務相適應的、在應急情況下採取必需的操作程序的基本訓練。

16.3.2 參加貨物操作的人員，應在裝卸程序方面經過適當的訓練。

16.3.3 高級船員應進行關於應急程序的訓練，以便處理泄漏、溢出或貨物火災等問題，並對他們中間足夠多的人員教授和訓練所載貨物的主要急救方法。

16.4 貨艙開口及其進入

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* 參考 1978 年海員培訓、發證和值班標準國際公約的規定，特別參考該公約附件第五章規則 V/2 的“化學品船的船長、高級船員和一般船員的訓練與考核的強制性最低要求”，以及 1978 年國際海員培訓和發證會議決議 11 的規定。

16.4.1 會產生易燃和／或有毒蒸氣的貨物在裝卸和載運時，或這種貨物卸載後在進行壓載時，或在裝載或卸下貨物時，貨艙蓋應總是保持關閉。對於任何有危害性的貨物，其貨艙蓋、氣墊和觀察孔、貨艙清洗出入蓋只准在必要時開啓。

16.4.2 人員不得進入貨艙、貨艙周圍的留空處所、貨物裝卸處所或其他封閉處所，除非：

.1 該艙室已排除了有毒蒸氣，並且不缺乏氧氣；或

.2 人員穿戴了呼吸器具和其他必要的保護設備，並且全部工作是在一位負責的高級船員密切監視下進行的。

16.4.3 僅有易燃危險的處所，應在一位負責的高級船員密切監視下，人員才可進入。

16.5 貨物試樣的堆裝

16.5.1 須保存在船上的試樣應堆裝在位於裝貨區域內的指定處所內，或在特殊情況下，裝在主管機關認可的其他處所內。

16.5.2 堆裝處所應為：

.1 容器隔開，以防在海上時瓶子移動，

.2 所用材料完全能抵抗擬載的各種液體的腐蝕，

.3 設有適當的通風裝置。

16.5.3 相互起危險反應的試樣，不能相互緊靠堆裝。

16.5.4 試樣保留在船上的時間不能超過必要的時間。

16.6 不得暴露於過熱狀態下的貨物

16.6.1 如由於貨艙或附屬管路內的貨物受到局部過分加熱後，該貨物可能產生危險的反應，諸如聚合、分解、熱不穩定性或放出氣體等，上述貨物應與温度會高於其初始反應温度的其他貨品適當分隔（見 7.1.5.4）。

16.6.2 裝運上述貨品的貨艙，其加熱盤管應能盲斷或以等效設施關緊。

16.6.3 熱敏感貨品不能載運在未經絕緣的甲板貨艙內。

16.7 附加操作要求

本規則在下列條款內包括附加操作要求：

3.1.1	15.3.1	15.8.22
3.1.2.1	15.3.7	15.8.28
3.1.2.2	15.3.8	15.8.29
3.1.4	15.4.6	15.8.31
3.5.2	15.5	15.8.32
3.7.4	15.6.1	15.8.33
	15.6.3	15.8.34.1
	15.6.4	15.8.34.2
7.1.2	15.7.1	15.8.34.3
7.1.6.3	15.7.6	15.8.35
9.1.4	15.7.11	15.8.36
9.2	15.8.1	15.8.37
11.3.2	15.8.2	15.9
11.4	15.8.3	15.10.1

12.1.2	15.8.4	15.11.4
12.2	15.8.5	15.11.6
13.2.1	15.8.7	15.12.3.1
13.2.2	15.8.15	15.13
13.2.3	15.8.16	15.14.7.1
13.2.4	15.8.17	15.14.7.2
Ch.14	15.8.19	15.14.7.3
15.1	15.8.20	15.16
	15.8.21	15.19.8

第 17 章

最低要求一覽表

註釋

貨品名稱 （a 欄）	貨品名稱並不都跟修改過的散裝化學品規則中所列的相同，（決議 A.212（VII）通過）（說明見化學品索引）。
聯合國編號 （b 欄）	聯合國危險品運輸專家委員會所提的建議案裏有關每一貨品的編號。所列的聯合國編號僅供參考。
船型 （c 欄）	1=船型 1 （2.1.2） 2=船型 2 （2.1.2） 3=船型 3 （2.1.2）
艙型 （d 欄）	1=獨立貨艙（4.1.1） G=重力液貨艙（4.1.3） 2=整體貨艙（4.1.2） P=壓力液貨艙（4.1.4）
貨艙通風 （e 欄）	Open： 開式通風 Cont： 控制通風 SR： 安全釋放閥
貨艙環境控制* （f 欄）	Inert： 惰性控制 （9.1.2.1）

* “No” 表示無要求。

	Pad： 液體或氣體 （9.1.2.2）
	Dry： 乾燥 （9.1.2.3）
	Vent： 自然或強制 （9.1.2.4）
電氣設備	T1 至 T6： 温度等級**
（g 欄）	IIA、IIB 或 IIC： 設備分類**
	NF： 不燃貨品（10.1.6）
	Yes：閃點超過 60°C（閉杯試驗）（10.1.6）
測量	O： 開敞式測量（13.1.1.1）
（h 欄）	R： 限制式測量（13.1.1.2）
	C： 封閉式測量（13.1.1.3）
	I： 間接式測量（13.1.1.3）
蒸氣探測*	F： 可燃蒸氣
（i 欄）	T： 有毒蒸氣
防火*	A： 抗乙醇泡沫
（j 欄）	B： 普通泡沫，包括所有非抗乙醇泡沫，其中包括氟化蛋白質和水膜泡沫（AFFF）

** 温度等級和設備分類見國際電工委員會出版物 79（第 1 篇附錄 D，第 4、8 和 12 篇）。空白即目前無數據。

* “No” 表示無要求。

C： 噴水

D： 乾粉

No： 在本規則中無特殊要求

製造材料（k欄） N： 見 6.2.2

Z： 見 6.2.3

Y： 見 6.2.4

空白表示對製造材料無特殊要求

防毒面具及眼睛防護*（1欄） E： 見 14.2.8

a	b	c	d	e	f	g			h	i	j	k	l	m
貨品名稱	聯合國編號	船型	艙型	貨艙通風	貨艙環境控制	電氣設備			測量	蒸氣探測	防火	製造材料	防毒面具及眼睛防護	特殊要求
						級	類	閃點高於60°C						
乙酸	2789	3	2G	Cont.	No	T1	IIA	No	R	F	A	Y1, Z	E	15.11.2 to 15.11.4, 15.11.6 to 15.11.8
醋酐	1715	2	2G	Cont.	No	T2	IIA	No	R	F-T	A	Y1	E	15.11.2 to 15.11.4, 15.11.6 to 15.11.8
丙酮合氰化氫	1541	2	2G	Cont.	No	T1	IIA	Yes	C	T	A	Y1	E	15.1, 15.12, 15.17, 15.18, 15.19, 16.6
乙腈	1648	2	2G	Cont.	No	T2	IIA	No	R	F-T	A		No	15.12
丙烯酰胺溶液 50%或以下		2	2G	Open	No	NF			C	No	No		No	15.12.3, 15.13, 15.16.1, 15.19.6, 16.6.1
丙烯酸	2218	3	2G	Cont.	No	T2	IIA	No	R	F-T	A	Y1	No	15.13, 16.6.1
丙烯腈	1093	2	2G	Cont.	No	T1	IIB	No	C	F-T	A	N3, Z	E	15.12, 15.13, 15.17, 15.19
己二腈	2205	3	2G	Cont.	No		IIB	Yes	R	T	A		No	
烷基苯磺酸	2584 2586	3	2G	Open	No			Yes	O	No	B		No	
烯丙醇	1098	2	2G	Cont.	No	T2	IIB	No	C	F-T	A		E	15.12, 15.17, 15.19

a 貨品名稱	b 聯合國編號	c 船型	d 艙型	e 貨艙通風	f 貨艙環境控制	g 電氣設備			h 測量	i 蒸氣探測	j 防火	k 製造材料	l 防毒面具及眼睛防護	m 特殊要求
						級	類	閃點高於60°C						
烯丙基氯	1100	2	2G	Cont.	No	T2	IIA	No	C	F-T	A		E	15.12, 15.17, 15.19
2-（2-氨基乙氧基）乙醇		3	2G	Open	No			Yes	O	No	A,C,D	N2	No	15.19.6
乙氨基乙醇胺		3	2G	Open	No	T2	IIA	Yes	O	No	A	N1	No	
N-氨基吗嗪	2815	3	2G	Cont.	No			Yes	R	T	A,C,D	N2	No	15.19.6
氨水 28%或以下	2672	3	2G	Cont.	No	NF			R	T	C	N4	E[a]	
硝銨溶液 93%或以下	2426	2	1G	Open	No	NF			O	No	No	Y4	No	15.2, 15.11.4, 15.11.6, 15.18, 15.19.6
苯胺	1547	2	2G	Cont.	No	T1	IIA	Yes	C	T	A		No	15.12, 15.17, 15.19
苯和含 10%或以上苯的混合物	1114	3	2G	Cont.	No	T1	IIA	No	R	F-T	B		No	15.12.1, 15.17
苯磺酰氯	2225	3	2G	Cont.	No			Yes	R	T	B,D	N1	No	15.19.6
苄基氯	1738	2	2G	Cont.	No	T1	IIA	Yes	C	T	B		E	15.12, 15.13, 15.17, 15.19
正丁酯	2348	2	2G	Cont.	No	T2	IIB	No	R	F-T	A		No	15.13, 16.6.1, 16.6.2
正丁胺	1125	2	2G	Cont.	No			No	R	F-T	A	N1	E	15.12, 15.17, 15.19.6

a	b	c	d	e	f	g			h	i	j	k	l	m
貨品名稱	聯合國編號	船型	艙型	貨艙通風	貨艙環境控制	電氣設備			測量	蒸氣探測	防火	製造材料	防毒面具及眼睛防護	特殊要求
						級	類	閃點高於60°C						
	1214													
正丁基醚	1149	3	2G	Cont.	Inert	T4	IIB	No	R	F-T	A,D		No	15.4.6, 15.12
丁基/癸基/十六烷基一基烷甲基丙烯酸混合物		3	2G	Cont.	No				R	No	A,C,D		No	15.13, 16.6.1, 16.6.2
甲基丙烯酸丁酯	2227	3	2G	Cont.	No		IIA	No	R	F-T	A,D		No	15.13, 16.6.1, 16.6.2
正丁醛	1129	3	2G	Cont.	No	T3	IIA	No	O	F-T	A		No	15.16.1
樟腦油	1130	3	2G	Cont.	No		IIA	No	O	F	B		No	
酚油		2	2G	Cont.	No			Yes	C	F-T	A		No	15.12, 15.19
二硫化碳	1131	2	1G	Cont.	Pad + Inert	T5	IIC	No	C	F-T	C		E	15.3, 15.12, 15.15, 15.19
四氯化碳	1846	3	2G	Cont.	No	NF			C	T	No	Z	E	15.12, 15.17, 15.19.6
橙如堅果油（未處理）		3	2G	Cont.	No			Yes	R	T	B		No	
氫氧化鉀溶液	1814	3	2G	Open	No	NF			O	No	No	N8	No	

a 貨品名稱	b 聯合國編號	c 船型	d 艙型	e 貨艙通風	f 貨艙環境控制	g 電氣設備			h 測量	i 蒸氣探測	j 防火	k 製造材料	l 防毒面具及眼睛防護	m 特殊要求
						級	類	閃點高於60°C						
甲基丙烯酸癸甘酯		3	2G	Open	No			Yes	O	No	A,C,D		No	15.13, 16.6.1, 16.6.2
氯苯	1134	3	2G	Cont.	No	T1	IIA	No	R	F-T	B		No	
氯仿	1888	3	2G	Cont.	No	NF			R	T	No		E	15.12
粗氯乙醇		2	2G	Cont.	No		IIA	No	C	F-T	A		No	15.12, 15.19
2-或 3-氯丙酸	2511	3	2G	Open	No			Yes	O	No	A	Y1	No	15.11.2 to 15.11.4, 15.11.6 to 15.11.8
氯磺酸	1754	1	2G	Cont.	No	NF			C	T	No		E	15.11.2 to 15.11.8, 15.12, 15.16.2, 15.19
（鄰-、間-、對-）氯甲苯	2238	3	2G	Cont.	No			No	R	F-T	B,C		No	
煤焦石腦油	2553	3	2G	Cont.	No	T3	IIA	No	R	F-T	A,D		No	
雜酚油		3	2G	Open	No	T2	IIA	Yes	O	No	B,D		No	15.19.6
甲氧甲酚異體混合物	2076	3	2G	Open	No	T1	IIA	Yes	O	No	B		No	
巴豆醛	1143	2	2G	Cont.	No	T3	IIB	No	R	F-T	A		E	15.12, 15.16.1, 15.17
環己酮	1915	3	2G	Cont.	No	T2	IIA	No	R	F-T	A	N5	No	

a	b	c	d	e	f	g			h	i	j	k	l	m
貨品名稱	聯合國編號	船型	艙型	貨艙通風	貨艙環境控制	電氣設備			測量	蒸氣探測	防火	製造材料	防毒面具及眼睛防護	特殊要求
						級	類	閃點高於60°C						
環己胺	2357	3	2G	Cont.	No	T3	IIA	No	R	F-T	A,D	N1	No	
丙烯酸癸酯		3	2G	Open	No	T3	IIA	Yes	O	No	A,C,D	N2	No	15.13, 16.6.1, 16.6.2
二丁基胺	2248	3	2G	Cont.	No	T2	IIA	No	R	F-T	B,D	N4	No	
鄰二氯苯	1591	3	2G	Cont.	No	T1	IIA	Yes	R	T	B,D	N5	No	
1, 1-二氯乙烷	2362	3	2G	Cont.	No	T2	IIA	No	R	F-T	B		E	
二氯乙醚	1916	2	2G	Cont.	No	T2	IIA	No	R	F-T	A	N5	No	
2, 2-二氯乙醚	2490	2	2G	Cont.	No			Yes	R	T	B,C,D	N5	No	15.12, 15.17, 15.19
2, 4-雙氯酚醇	2021	3	2G	Cont.	Dry			Yes	R	T	B,C,D	N1	No	15.19.6
1, 2-二氯丙烷	1279	2	2G	Cont.	No	T1	IIA	No	R	F-T	B	Z	No	15.12
1, 3-二氯丙烷		2	2G	Cont.	No	T1	IIA	No	R	F-T	B		No	15.12
二氯丙烯/二氯丙烷混合物		2	2G	Cont.	No			No	C	F-T	B,C,D		E	15.12, 15.17, 15.18, 15.19
1, 3-二氯丙烯	2047	2	2G	Cont.	No	T2	IIA	No	C	F-T	B		E	15.12, 15.17, 15.18, 15.19
2, 2-丙酸		3	2G	Cont.	Dry			Yes	R	No	A	Y5	No	15.11.2, 15.11.4, 15.11.6, 15.11.8

a	b	c	d	e	f	g			h	i	j	k	l	m
貨品名稱	聯合國編號	船型	艙型	貨艙通風	貨艙環境控制	電氣設備			測量	蒸氣探測	防火	製造材料	防毒面具及眼睛防護	特殊要求
						級	類	閃點高於60°C						
二乙醇胺		3	2G	Open	No	T1	IIA	Yes	O	No	A	N2	No	
二乙基胺	1154	3	2G	Cont.	No	T2	IIA	No	R	F-T	A	N1	E	15.12
二乙撐三胺	2079	3	2G	Open	No	T2	IIA	Yes	O	No	A	N2	No	
二乙基乙醇胺	2686	3	2G	Cont.	No	T2	IIA	No	R	F-T	A,D	N1	No	
二乙基醚	1155	2	1G	Cont.	Inert	T4	IIB	No	C	F-T	A	N7	E	15.4, 15.14, 15.15, 15.19
焦磷酸	1902	3	2G	Open	No			Yes	O	No	B,C,D	N2	No	
硫酸二乙基	1594	2	2G	Cont.	No			Yes	C	T	A,D	N3	No	15.19.6
二異丁胺	2361	2	2G	Cont.	No			No	R	F-T	B,D	N1	No	15.12.3, 15.19.6
二異丙醇胺		3	2G	Open	No	T2	IIA	Yes	O	No	A	N2	No	
二異丙胺	1158	2	2G	Cont.	No	T2	IIA	No	C	F-T	A	N2	E	15.12, 15.19
水二甲胺 45%或以下	1160	3	2G	Cont.	No	T2	IIA	No	R	F-T	C,D	N1	E	15.12
水二甲胺 45%以上，但 55%以下	1160	2	2G	Cont.	No			No	C	F-T	A,C,D	N1	E	15.12, 15.17, 15.19

a 貨品名稱	b 聯合國編號	c 船型	d 艙型	e 貨艙通風	f 貨艙環境控制	g 電氣設備			h 測量	i 蒸氣探測	j 防火	k 製造材料	l 防毒面具及眼睛防護	m 特殊要求
						級	類	閃點高於 60°C						
水二甲胺 55%以上 65%以下	1160	2	2G	Cont.	No			No	C	F-T	A,C,D	N1	E	15.12, 15.14, 15.17, 15.19
N,N-二甲基環己胺	2264	2	2G	Cont.	No			No	R	F-T	A,C	N1	No	15.12, 15.17, 15.19.6
二甲基乙醇胺	2051	3	2G	Cont.	No	T3	IIA	No	R	F-T	A,D	N2	No	
二甲替甲酰胺	2265	3	2G	Cont.	No	T2	IIA	No	R	F-T	A,D		No	
1,4-二噁烷	1165	2	2G	Cont.	No	T4	IIB	No	C	F-T	A		No	15.12, 15.19
二苯基甲烷二異氰酸脂	2489	2	2G	Cont.	Dry			No[b]	C	T[b]	C[c],D	N5	No	15.12, 15.16.2, 15.17, 15.19.6
二正丙胺	2383	3	2G	Cont.	No			No	R	F-T	A	N2	No	15.12.3, 15.19.6
十二基二苯基氧化二磺酸脂溶液		3	2G	Open	No	NF			O	No	No		No	
甲基丙烯酸十二酯		3	2G	Open	No			Yes	O	No	A,C		No	15.13
甲基丙烯酸十二—十五酯混合物		3	2G	Open	No			Yes	O	No	A,C,D		No	15.13, 16.6.1, 16.6.2
表氯醇	2023	2	2G	Cont.	No		IIB	No	C	F-T	A		E	15.12, 15.17, 15.19

a 貨品名稱	b 聯合國編號	c 船型	d 艙型	e 貨艙通風	f 貨艙環境控制	g 電氣設備			h 測量	i 蒸氣探測	j 防火	k 製造材料	l 防毒面具及眼睛防護	m 特殊要求
						級	類	閃點高於60°C						
丙烯酸乙脂	1917	2	2G	Cont.	No	T2	IIB	No	R	F-T	A		E	15.13, 16.6.1, 16.6.2
N-乙基丁胺		3	2G	Cont.	No			No	R	F-T	A	N1	No	15.12.3, 15.19.6
N-乙基環己胺		3	2G	Cont.	No			No	R	F-T	A,C	N1	No	15.19.6
己撐氯醇	1135	2	2G	Cont.	No	T2	IIA	No	C	F-T	D		E	15.12, 15.17, 15.19
乙撐氰醇		3	2G	Open	No		IIB	Yes	O	No	A		No	
乙二胺	1604	2	2G	Cont.	No	T2	IIA	No	R	F-T	A	N2	No	
二溴化乙烯 15A	1605	2	2G	Cont.	No	NF			C	T	No		E	15.12, 15.19.6
二氯化乙烯	1184	2	2G	Cont.	No	T2	IIA	No	R	F-T	B	N4	No	15.19
2-乙基己基丙烯酸		3	2G	Open	No	T3	IIB	Yes	O	No	A		No	15.13, 16.6.1, 16.6.2
2-乙基己基胺	2276	2	2G	Cont.	No			No	R	F-T	A	N2	No	15.12
乙叉降冰片烯		3	2G	Cont.	No			No	R	F-T	B,C,D	N4	No	15.12.1, 15.16.1, 15.19.6
甲基丙烯酸乙脂	2277	3	2G	Cont.	No		IIA	No	R	F-T	B,D		No	15.13, 16.6.1, 16.6.2
2-乙基-3-丙基丙烯醛		3	2G	Cont.	No		IIA	No	R	F-T	A		No	

a	b	c	d	e	f	g			h	i	j	k	l	m
貨品名稱	聯合國編號	船型	艙型	貨艙通風	貨艙環境控制	電氣設備			測量	蒸氣探測	防火	製造材料	防毒面具及眼睛防護	特殊要求
						級	類	閃點高於60°C						
甲醛溶液 45%或以下	1198[d]	3	2G	Cont.	No	T2	IIB	No	R	F-T	A		E[e]	15.16.1
甲酸	1779	3	2G	Cont.	No	T1	IIA	No	R	T	A	Y2/ Y3	E	15.11.2 to 15.11.4, 15.11.6 to 15.11.8
糠醛	1199	3	2G	Cont.	No	T2	IIB	No	R	F-T	A		No	15.16.1
戊二醛溶液 50%或以下		3	2G	Open	No	NF			O	No	No		No	15.16.1
己撐二胺溶液	1783	3	2G	Cont.	No			Yes	R	T	A	N2	No	15.19.6
六甲撐胺	2493	2	2G	Cont.	No			No	R	F-T	A,C	N1	No	
鹽酸	1789	3	1G	Cont.	No	NF			R	T	No		E[f]	15.11
過氧化氫溶液 60%以上，70%以下		2	2G	Cont.	No	NF			C	No	No		No	15.5, 15.19.6
丙烯酸 2 羥乙脂		2	2G	Cont.	No			Yes	C	T	A		No	15.12, 15.13, 15.19.6, 16.6.1, 16.6.2
丙烯酸異丁脂	2527	2	2G	Cont.	No	T2	IIB	No	R	F-T	A		No	15.13, 16.6.1, 16.6.2
異丁醛	2045	3	2G	Cont.	No	T3	IIA	No	O	F-T	A		No	15.16.1

a 貨品名稱	b 聯合國編號	c 船型	d 艙型	e 貨艙通風	f 貨艙環境控制	g 電氣設備			h 測量	i 蒸氣探測	j 防火	k 製造材料	l 防毒面具及眼睛防護	m 特殊要求
						級	類	閃點高於60°C						
異佛爾酮二胺	2289	3	2G	Cont.	No			Yes	R	T	A	N2	No	
異佛爾酮二異氰酸脂	2290	3	2G	Cont.	Dry			Yes	C	T	C[c],D	N5	No	15.12, 15.16.2, 15.17, 15.19.6
異戊間二烯	1218	3	2G	Cont.	No	T3	IIB	No	R	F	B		No	15.13, 15.14, 16.6.1, 16.6.2
異丙胺	1221	2	2G	Cont.	No	T2	IIA	No	C	F-T	C,D	N2	E	15.12, 15.14, 15.19
異丙醚	1159	3	2G	Cont.	Inert			No	R	F	A		No	15.4.6, 15.13.3, 15.19.6
異戊醛	2058	3	2G	Cont.	Inert	T3	IIB	No	R	F-T	A		No	15.4.6, 15.16.1
馬來酐	2215	3	2G	Cont.	No			Yes	R	No	A[g],C		No	
異丙叉丙酮	1229	3	2G	Cont.	No	T2	IIB	No	R	F-T	A		No	15.19.6
異丁烯酸	2531	3	2G	Cont.	No			Yes	R	T	A	Y1	No	15.13, 16.6.1
丙烯酸甲脂	1919	2	2G	Cont.	No	T1	IIB	No	R	F-T	B		E	15.13, 16.6.1, 16.6.2
甲胺溶液 42%或以下	1235	2	2G	Cont.	No				C	F-T	A,C,D	N1	E	15.12, 15.17, 15.19
2-甲基 6-乙基苯胺		3	2G	Open	No			Yes	O	No	B,C,D		No	
甲叉二氯	1593	3	2G	Cont.	No	T1	IIA	Yes	R	T	No		No	

a 貨品名稱	b 聯合國編號	c 船型	d 艙型	e 貨艙通風	f 貨艙環境控制	g 電氣設備			h 測量	i 蒸氣探測	j 防火	k 製造材料	l 防毒面具及眼睛防護	m 特殊要求
						級	類	閃點高於60°C						
2-甲基 5-乙基吡啶	2300	3	2G	Open	No		IIA	Yes	O	No	D	N4	No	
甲酸甲脂	1243	2	2G	Cont.	No			No	R	F-T	A		E	15.12, 15.14, 15.19
2-甲基-2-羥基-丁炔-[3]		3	2G	Cont.	No			No	R	F-T	A,C,D	N6	No	15.19.6
異丁烯酸甲脂	1247	2	2G	Cont.	No	T2	IIA	No	R	F-T	B		No	15.13, 16.6.1, 16.6.2
2-甲基吡啶	2313	2	2G	Cont.	No			No	C	F	A,C	N4	No	15.12.3, 15.19.6
α-甲基苯乙烯	2303	3	2G	Cont.	No	T1	IIB	No	R	F-T	D		No	15.13, 16.6.1, 16.6.2
一乙醇胺	2491	3	2G	Open	No	T2	IIA	Yes	O	F-T	A	N2	No	
一乙胺		2	1G	Cont.	No	T2	IIA	No	C	F-T	C,D	N2	E	15.12, 15.14
一乙胺溶液 72%或以下	2270	2	2G	Cont.	No			No	C	F-T	A,C	N1	E	15.12, 15.14, 15.17,15.19
一異丙醇胺		3	2G	Open	No	T2	IIA	Yes	O	F-T	A	N2	No	
一硝基苯	1662	2	2G	Cont.	No	T1	IIA	Yes	C	T	D		No	15.12, 15.17, 15.18, 15.19
嗎啉	2054	3	2G	Cont.	No	T2	IIA	No	R	F	A	N2, Z	No	

a 貨品名稱	b 聯合國編號	c 船型	d 艙型	e 貨艙通風	f 貨艙環境控制	g 電氣設備			h 測量	i 蒸氣探測	j 防火	k 製造材料	l 防毒面具及眼睛防護	m 特殊要求
						級	類	閃點高於60°C						
內燃機燃料抗爆化合物	1649	2	1G	Cont.	No	T4	IIA	No	C	F-T	B,C		E	15.6, 15.12, 15.18, 15.19
萘（溶化的）	2304	3	2G	Cont.	No	T1	IIA	Yes	R	No	A,D		No	
硝酸 70%及以上	2031 2032[h]	2	2G	Cont.	No	NF			C	T	No		E	15.11, 15.19
硝酸 70%以下	2031	2	2G	Cont.	No	NF			R	T	No		E	15.11, 15.19
鄰硝基氯苯	1578	2	2G	Cont.	No			Yes	C	T	B,C,D		No	15.12, 15.17, 15.18, 15.19
鄰 - 硝基酚（溶化的）	1663	2	2G	Cont.	No			Yes	C	T	A,C,D		No	15.12, 15.19.6
1-或 2-硝苯丙烷	2608	3	2G	Cont.	No	T2	IIB	No	R	F-T	A		No	
（鄰-及對-）硝基甲苯	1664	2	2G	Cont.	No		IIB	Yes	C	T	B		No	15.12, 15.17, 15.19
發煙硫酸	1831	2	2G	Cont.	No	NF			C	T	No		E	15.11.2 to 15.11.8, 15.12.1, 15.16.2, 15.17, 15.19
仲醛	1264	3	2G	Cont.	No	T3	IIB	No	R	F	A		No	
五氯乙烷	1669	3	2G	Cont.	No	NF			R	T	No		No	15.12, 15.17

a	b	c	d	e	f	g			h	i	j	k	l	m
貨品名稱	聯合國編號	船型	艙型	貨艙通風	貨艙環境控制	電氣設備			測量	蒸氣探測	防火	製造材料	防毒面具及眼睛防護	特殊要求
						級	類	閃點高於60°C						
1,3-戊二烯		3	2G	Cont.	No			No	R	F-T	B		No	15.13, 16.6
酚	2312	2	2G	Cont.	No	T1	IIA	Yes	C	T	A		No	15.12, 15.19
磷酸	1805	3	2G	Open	No	NF			O	No	No		No	15.11.1 to 15.11.4, 15.11.6 to15.11.8
磷（黃的或白的）	2447	1	1G	Cont.	Pad + (vent or Inert)			No[k]	C	No	C		E	15.7, 15.19
酞酐	2214	3	2G	Cont.	No	T1	IIA	Yes	R	No	D		No	
多乙撐多胺	2734[i] 2735	3	2G	Open	No			Yes	O	No	A	N2	No	
多甲撐多苯基異氰酸脂	2206[i] 2207	2	2G	Cont.	Dry			No[b]	C	T[b]	C[c],D	N5	No	15.12, 15.16.2, 15.19.6
正丙醇胺		3	2G	Open	No			Yes	O	No	A,D	N2	No	

a	b	c	d	e	f	g			h	i	j	k	l	m
貨品名稱	聯合國編號	船型	艙型	貨艙通風	貨艙環境控制	電氣設備			測量	蒸氣探測	防火	製造材料	防毒面具及眼睛防護	特殊要求
						級	類	閃點高於60°C						
β-丙基丁內脂		2	2G	Cont.	No		IIA	Yes	R	T	A		No	
丙醛	1275	3	2G	Cont.	No			No	R	F-T	A		E	15.16.1, 15.17
丙酸	1848	3	2G	Cont.	No	T1	IIA	No	R	F	A	Y1	E	15.11.2 to 15.11.4, 15.11.6 to 15.11.8
丙酸酐	2496	3	2G	Cont.	No	T2	IIA	Yes	R	T	A	Y1	No	
丙腈	2404	2	1G	Cont.	No	T1	IIB	No	C	F-T	A,D		E	15.12, 15.17, 15.18, 15.19
正丙胺	1277	2	2G	Cont.	Inert	T2	IIA	No	C	F-T	C,D	N2	E	15.12, 15.19
氧化丙烯	1280	2	2G	Cont.	Inert	T2	IIB	No	C	F-T	A,C	Z	No	15.8, 15.12.1, 15.14, 15.15, 15.19
吡啶	1282	3	2G	Cont.	No	T1	IIA	No	R	F	A	N4	No	
氫硼化鈉 15%或以下/氫氧化鈉溶液		3	2G	Open	No	NF			O	No	No	N1	No	
氯酸鈉溶液 50%或以下		3	2G	Open	No	NF			O	No	No		No	15.9, 15.16.1, 15.19.6
重鉻酸鈉溶液 70%或以下		2	2G	Open	No	NF			C	No	No	N2	No	15.12.3, 15.19
氫硫化鈉溶液 45%或以下		3	2G	Cont.	Vent	NF			R	T	No		No	15.16.1

a	b	c	d	e	f	g			h	i	j	k	l	m
貨品名稱	聯合國編號	船型	艙型	貨艙通風	貨艙環境控制	電氣設備			測量	蒸氣探測	防火	製造材料	防毒面具及眼睛防護	特殊要求
						級	類	閃點高於60°C						
					or pad (gas)									
氫氧化鈉溶液	1824	3	2G	Open	No	NF			O	No	No	N8	No	
次氯酸鈉溶液 15%或以下		3	2G	Cont.	No	NF			R	No	No	N5	No	15.16.1
2-鈉硫基苯並噻唑溶液		3	2G	Open	No	NF			O	No	No	N1	No	
苯乙烯單體	2055	3	2G	Cont.	No	T1	IIA	No	O	F	B	N4, Z	No	15.13, 16.6.1, 16.6.2
液態硫	2448	3	1G	Open	Vent or pad (gas)		T3	Yes[1]	O	F-T	No		No	15.10
硫酸	1830	3	2G	Open	No	NF			O	No	No		No	15.11, 15.16.2
廢硫酸	1832	3	2G	Open	No	NF			O	No	No		No	15.11, 15.16.2
四氯乙烷	1702	3	2G	Cont.	No	NF			R	T	No		No	15.12, 15.17

a 貨品名稱	b 聯合國編號	c 船型	d 艙型	e 貨艙通風	f 貨艙環境控制	g 電氣設備			h 測量	i 蒸氣探測	j 防火	k 製造材料	l 防毒面具及眼睛防護	m 特殊要求
						級	類	閃點高於60°C						
四氯乙撐五胺	2320	3	2G	Open	No			Yes	O	No	A	N1	No	
四氫呋喃	2056	3	2G	Cont.	No	T3	IIB	No	R	F-T	A,D		No	
甲苯二胺	1709	2	2G	Cont.	No			Yes	C	T	B,C,D	N1	E	15.12, 15.17, 15.19
甲苯二異氰酸脂	2078	2	2G	Cont.	Dry	T1	IIA	Yes	C	F-T	C[c],D	N4	E	15.12, 15.16.2, 15.17, 15.19
鄰甲苯胺	1708	2	2G	Cont.	No			Yes	C	T	A,C		No	15.12, 15.17, 15.19
1,2,4-三氯苯	2321	3	2G	Cont.	No			Yes	R	T	C		No	15.19.6
1,1,2-三氯甲烷		3	2G	Cont.	No		NF		R	T	No		No	15.12.1
三氯乙烯	1710	3	2G	Cont.	No	T2	IIA	Yes	R	T	No		No	15.12, 15.16.1, 15.17
1,2,3-三氯丙烷		2	2G	Cont.	No			Yes	C	T	B,C,D		No	15.12, 15.17, 15.19
三乙醇胺		3	2G	Open	No		IIA	Yes	O	No	A	N1	No	
三乙胺	1296	2	2G	Cont.	No	T2	IIA	No	R	F-T	B	N2	E	15.12
三乙基四胺	2259	3	2G	Open	No	T2	IIA	Yes	O	No	A	N1	No	
三甲基乙酸		3	2G	Cont.	No			Yes	R	No	A,C	Y1	No	15.11.2 to 15.11.8

a	b	c	d	e	f	g			h	i	j	k	l	m
貨品名稱	聯合國編號	船型	艙型	貨艙通風	貨艙環境控制	電氣設備			測量	蒸氣探測	防火	製造材料	防毒面具及眼睛防護	特殊要求
						級	類	閃點高於 60°C						
三甲基己烷二胺（2,2,4-和 2,4,4-異體）	2327	3	2G	Open	No			Yes	O	No	A,C	N1	No	15.19.6
三甲基己撐二異氰酸脂（2,2,4-和 2,4,4-異體）	2328	2	2G	Cont.	Dry			Yes	C	T	A,C[c]		No	15.12, 15.16.2, 15.17, 15.19.2
磷酸三甲基脂	2329	3	2G	Cont.	No			No	R	F-T	A,D		No	15.12.1, 15.16.2, 15.19.6
亞磷酸三硝基甲苯，含有 1%或更多的鄰位異構物	2574[i]	2	2G	Cont.	No	T2	IIA	Yes	C	No	B		No	15.12.3, 15.19
尿素銨溶液（含氨水）		3	2G	Cont.	No	NF			R	T	A	N4	No	
正戊醛	2058	3	2G	Cont.	Inert	T3	IIB	No	R	F-T	A		No	15.4.6, 15.16.1
醋酸乙烯脂	1301	3	2G	Cont.	No	T2	IIA	No	O	F	A		No	15.13, 16.6.1, 16.6.2
乙烯基乙基醚	1302	2	1G	Cont.	Inert	T3	IIB	No	C	F-T	A	N6	E	15.4, 15.13, 15.14, 15.19, 16.6.1, 16.6.2
偏二氯乙烯	1303	2	2G	Cont.	Inert	T2	IIA	No	R	F-T	B	N5	E	15.13, 15.14, 16.6.1, 16.6.2

a	b	c	d	e	f	g			h	i	j	k	l	m
貨品名稱	聯合國編號	船型	艙型	貨艙通風	貨艙環境控制	電氣設備			測量	蒸氣探測	防火	製造材料	防毒面具及眼睛防護	特殊要求
						級	類	閃點高於60°C						
新癸乙烯脂		3	2G	Open	No			Yes	O	No	B		No	15.13, 15.16.1,16.6.1, 16.6.2
乙烯基甲苯	2618	3	2G	Cont.	No		IIA	No	R	F	D	N1	No	15.13, 16.6.1, 16.6.2
二甲苯酚	2261	3	2G	Open	No		IIA	Yes	O	No	B		No	

a 適用於 28%或 28%以下但不低於 10%的氨水。

b 如所載貨品含有閃點不超過 60°C 的可燃溶劑，則應設有特殊電氣系統和可燃蒸氣探測器。

c 水雖然適用於熄滅含有本腳註適用的化學品的露天火災，但不許用來污染含有那些化學品的封閉貨艙，否則會引起有害蒸氣產生的危險。

d 聯合國編號 1198 僅適用於閃點低於 60°C。

e 適用於 45%或 45%以下但不低於 5%的甲醛溶液。

f 適用於不低於 10%的氫氯酸。

g 由於具有引起爆炸的可能性，所以不能採用乾粉。

h 聯合國編號 2023 為紅色發煙硝酸的編號。

i 聯合國編號取決於物質的沸點。

j 標有聯合國編號的物質含有 3%以上的鄰位異構物。

k 黃磷或白磷在其自然温度以上的温度下運輸，因此閃點不適用。電氣設備的要求可相似於閃點為 60°C 以上物質的設備要求。

l 液態硫閃點在 60°C 以上，但是電氣設備應經核證，能夠在所產生的氣體中安全使用。

第 18 章

不適用本規則的化學品名單*

1 下面是不列入本規則範圍內的一些貨品的名單。該名單對考慮散裝運輸那些危險性尚未判定的貨品，可作為指導性資料。

2 本章所列貨品即使超出本規則的範圍，主管機關也應注意其安全運輸可能需要的若干安全措施的實際情況。主管機關應適當地規定合理的安全要求。

3 下面所列貨品，待 1973/78 年國際船舶防污染公約生效時，可能需要予以重新考慮。

第 18 章	聯合國編號
丙酮	1090
工業醋酸戊酯	1104
醋酸正戊酯	1104
醋酸仲戊酯	1104
正戊醇	1105
仲戊醇	1105
叔戊醇	1105
初級戊醇	1105
特戊烯	-----
苄醇	-----
醋酸正丁酯	1123
醋酸仲丁酯	1123

* 貨品名稱同各種版本的散裝化學品規則（決議 A.212（VII））所給定的名稱不一定一致。

正丁醇	1120
仲丁醇	1120
叔丁醇	1120
苯二甲酸丁基苄酯	-----
丁二醇	-----
γ-丁內酯	-----
烷基水楊酸鈣	-----
枯烯	1918
環己烷	1145
環己醇	-----
對傘花烴	2046
正癸醇	-----
雙丙酮醇	1148
酞酸二丁酯	-----
雙茂	2048
二乙基苯	2049
二甘醇	-----
二甘醇乙醚	-----
二甘醇一丁醚	-----
二甘醇一醚醋酸酯	-----
二甘醇一乙基醚	-----
二甘醇一乙基醚醋酸鹽	-----
二甘醇一甲基醚	-----
二甘醇一甲基醚醋酸鹽	-----

二異丁烯	2050
二異丁基甲酮	1157
二異丁基酞酸鹽	-----
二異辛基酞酸鹽	-----
二辛基酞酸鹽	-----
酞酸二辛酯	-----
二戊烯	2052
二苯醚	-----
二丙二醇	-----
二丙二醇一甲基醚	-----
十二烷醇	-----
十二烷苯	-----
十二烷酚	-----
2-乙氧基乙醇	1171
2-乙氧基乙酯醋酸	1172
醋酸乙酯	1173
乙酰乙酸乙酯	-----
乙醇	1170
乙苯	1175
乙基環己烷	-----
乙烯碳酸鹽	-----
乙撑二醇	-----
乙二醇甲基丁基醚	-----
乙二醇一丁基醚	2369

乙二醇一丁基醚醋酸鹽	-----
乙二醇一甲基醚	1188
乙二醇一甲基醚醋酸鹽	1189
乙二醇一苯謎	-----
2-乙基己酸	-----
甲酰胺	-----
糠醇	2874
甘油	-----
正庚烷	1206
庚醇，所有異構物	-----
庚烯，混合異構物	2278
正己烷	1208
乙醇-1	2282
1-己烯	2370
己烯乙二醇	-----
醋酸異戊酯	1104
異戊醇	1105
醋酸異丁酯	1213
異丁醇	1212
甲酸異丁酯	2393
異癸醇	-----
異戊烷	1265
異戊烯	2371
異佛爾酮	-----

醋酸異丙酯	1220
異丙醇	1219
乳酸	-----
膠乳	-----
醋酸甲酯	1231
甲醇	1230
甲基·戊基醋酸鹽	1233
甲基·戊基醇	2053
甲基·戊基甲酮	1110
甲基·特丁基醚	2398
甲基·乙基甲酮	1193
甲基·異丁基甲酮	1245
2-甲基-1-戊烯	-----
正甲基-2-吡咯烷酮	-----
糖蜜	-----
石腦油溶劑	1256
壬烷	1920
壬醇	-----
壬酚	-----
辛烷	1262
辛醇，所有異構物	-----
石蠟	-----
正戊烷	1265
正戊烯	1108

凡士林	-----
石腦油	1255
全氯乙烯	1897
蒎烯	2368
聚丙烯醇	-----
正醋酸丙酯	1276
正丙醇	1274
丙二醇	-----
丙二醇一乙基醚	-----
丙二醇一甲基醚	-----
丙烯四聚物	2850
丙烯三聚物	2057
環硒烷	-----
妥爾油	-----
四氫化萘	-----
甲苯	1294
磷酸三丁酯	-----
1,1,1-三氯乙烷	2831
十三醇	-----
三乙苯	-----
三甘醇	-----
三異丙醇胺	-----
1,2,4-三甲基苯	-----
三丙二醇	-----

三丙二醇一甲基醚	-----
三甲苯基磷酸鹽 （<1%鄰位異構物）	-----
三二甲苯基磷酸鹽	-----
松節油	1299
尿素、硝酸銨溶液	-----
尿素、磷酸銨溶液	-----
石油溶劑	1300
酒類	-----
二甲苯類	1307

第 19 章

從事海上焚燒液態化學品廢棄物船舶的要求

19.1 通則

19.1.1 從第 1 章到第 16 章，凡有關之處和經本章的規定補充或修改之處，皆適用於焚燒裝置船舶。

19.1.2 倘若合理，主管機關或港口主管機關或者二者應要求提供關於所需焚燒廢物的成分和危害的資料，並在認為散裝運輸這些廢物太危險時，可以禁運這些廢物。*

19.1.3 下列增加的定義適用：

.1 焚燒裝置處所係指僅設有焚燒裝置及其附屬設施的氣密處所。

.2 焚燒裝置鼓風機處所係指設有向焚燒裝置燃燒器供給燃燒空氣的鼓風機處所。

.3 廢物傾倒公約係指 1972 年海上傾倒廢物和其他物質的防污染公約。

.4 貨品區域係指 1.3.5 規定的船上部分，但不包括焚燒裝置及其化學品廢物管系。

19.1.4 在按照 1.5.2.1.2 和 1.5.2.1.3 規定進行定期和中間檢驗時，應檢查所有貨艙和貨物管系的腐蝕情況，並確定剩餘材料厚度。如已運輸強腐蝕性廢物，則應每年檢查貨艙和貨物管系的腐蝕情況，並在檢查期間確定剩餘材料的厚度。

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* 焚燒和傾倒廢物的環境方面見廢物傾倒公約的規定。一般說來，對於焚燒廢物，需要得到該公約締約方（即裝貨港所在國）的有關主管機構的許可。如裝貨港所在國家不是該公約的締約方，則主管機關應簽發許可證。

19.2 船舶抗沉性及貨艙位置

19.2.1 本章所指的船舶應符合 2 型船舶標準，貨艙位置應符合 2 型船舶的要求。

19.2.2 2 型船舶可以運輸含有可能要求 1 型船舶標準運輸的物質的廢物混合物，但目的僅僅是為了焚燒而已。

19.3 船舶佈置

19.3.1 液態化學品廢物不得裝在與燃油艙相鄰的艙內，除非那些艙內的燃油僅僅用於焚燒之用。

19.3.2 凡可能含有 19.3.3 所述以外液體的艙和泵，並且這些艙和泵須用於焚燒過程或用於清洗貨物管子和貨艙的，均可位於貨艙的相鄰之處，並應位於貨物區域內。3.1 要求所適用的艙和設備，其範圍如同適用於貨艙一樣。

19.3.3 倘若需要在預熱或維持焚燒過程中，直接供油給焚燒裝置燃燒器的燃油艙和燃油泵可以置於貨物區域之外，但所用燃油的閃點要高於 60°C（閉杯試驗）（見 19.5.3）。

19.3.4 凡經用於清洗貨物管子和貨艙以及用於泵艙排放的液體，應裝在貨物區域內的污油水艙內，其處理應符合廢物傾倒公約所附的技術指導。貨艙可以用作污油水艙。用於處理污染的清洗流體的泵應設在貨物區域內。

19.3.5 倘若需要，可無須符合 3.2.1 的規定，起居處所、服務處所、控制站和 A 類以外的機器處所可允許位於貨物區域的前方，但須設有主管機關滿意的等效的安全標準和適當的滅火裝置安排。

19.3.6 起居處所、服務處所、控制站或 A 類以外的機器處所如按 19.3.5 位於貨物區域的前方，依此類推，3.2.3 中的要求也應適用。即：從位於貨物區域前方的艙室的後端起測出規定的距離。

19.3.7 焚燒裝置應位於貨物區域的外周界線之外。主管機關可以考慮替代安排，但應達到同等程度的安全要求。

19.3.8 應考慮到燃燒氣體對駕駛室的良好視野的影響以及對起居處所、服務處所和機器處所的進氣口和開口以及甲板工作區域和通道等處的影響。

19.3.9 應從開敞甲板進入焚燒裝置的處所。然而焚燒裝置控制室和鼓風機處所可從焚燒裝置處所進入，但這些處所應另有從開敞甲板進入的出入口。焚燒裝置處所的出入口應設有自閉式氣密門。

19.4 貨物容器及焚燒裝置標準

19.4.1 整體式重力貨櫃可以用於裝載危險的廢物。

19.4.2 焚燒裝置（包括燃燒器）的設計和制造應能達到主管機關可以接受的安全標準。*對於製造材料，應符合 6.1 的要求。

19.4.3 焚燒裝置（包括支撐件和其他固定件）應設計成能承受在 0°C 至 30°C 範圍內最不利的靜止傾角，並考慮到由於船舶運動而引起的動負荷。

19.4.4 應有適當的磚層和絕熱材料，以保證任何温升不致損害焚燒裝置結構的強度，或損害所屬輔機和儀錶的作用，並且不致有害於工作人員的安全。

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* 亦應符合傾倒公約中所規定的海上操縱焚燒廢棄物及其他物質的標準。

19.4.5 應設有能測量爐子外表面温度的裝置。應設有報警裝置，以便當温度超過主管機關認可的温度而應停止焚燒時能發出警報。

19.5 貨物移注

19.5.1 5.1 中的要求適用，但貨物管系應儘實際可能設在貨物區域內，並且通往焚燒裝置的貨物管系應：

.1 至少設在貨物區域之內 760mm；

.2 如設在貨物區域之外，則應位於開敞甲板之上；

.3 清楚地標明；和

.4 設計成易於排放和清洗。

19.5.2 貨物管系和操縱的佈置，應為在正常裝卸貨物時能防止把擬將焚燒的廢棄物排至舷外。

19.5.3 燃油和貨物管系可以連接在燃燒器的前面，但應要裝三向旋塞，並應在焚燒裝置處所的內側給燃油管子設置兩個截止止回閥。

19.5.4 應在控制站和駕駛室內設置遙空關閉裝置，以便切斷焚燒的廢棄物和燃油的供給。停止閥應位於貨物區域內。若停止閥為遙控式的，則應設有就地人工操作的裝置，或者設置獨立的人工操作閥。

19.5.5 裝貨支管連接的法蘭應設有可移式護罩，以防止發生貨物噴出的危險。亦應設置滴盤。

19.6 製造材料

19.6.1 6.2 節—對於材料的特殊要求，由下列條文代替：

.1 鋁、銅、銅合金、鋅、鍍鋅鋼或水銀不得用於貨艙、

管路、閥件、附件和其他可能接觸液態廢棄物或其蒸氣的設備。

.2 融點低於 925°C 的製造材料（如鋁和鋁合金等），不得用於涉及擬載閃點不超過 60°C（閉杯試驗）廢棄物船舶的貨物操作的外界管系。連接貨艙的短的外界管子，如它們設有耐火絕緣，則主管機關可以允許使用。

.3 在確定貨物系統尺寸時，應考慮到廢棄物的腐蝕性。

19.7 貨艙透氣系統

19.7.1 對於控制透氣系統的要求，第 8 章和第 15 章的 15.12 節中除 8.2.1 和 15.12.3 以外均適用。

19.8 貨艙環境控制

19.8.1 當再循環滴水管路不能終止在貨艙底部附近時，當具有閃點不超過 60°C（閉杯試驗）的廢棄物被循環至此時，該貨艙應進行惰性處理。

19.8.2 當使用採用閃點不超過 60°C（閉杯試驗）液體的洗艙機時，貨艙應進行惰性保護。

19.8.3 惰性艙內大氣中的含氧量，在艙的任何部分均不得超過容量的 8%。

19.8.4 應設聲光報警器，以便在惰性貨艙的蒸氣空間中的壓力低於 0.07 巴時發出警報。

19.9 電氣設備

19.9.1 對於焚燒裝置處所、焚燒裝置鼓風機處所以及能直接進入這些處所的相鄰處所，其照明系統、電話和播音系統以及一般報警系統應為獲准的安全型。

19.9.2 須裝在 19.9.1 所述處所的所有其他的電氣設備，均應為獲准的安全型，但符合下列條件者例外：

.1 保證處所在起動非獲准的安全型設備之前應有適當的通風。在上述設備的風機和開關裝置之間應設有聯鎖裝置，以保證符合此要求。

.2 非獲准安全型的設備，在 19.11.2.1 和 19.11.3.1 所規定的壓力一旦失壓時應能自動斷開。主管機關可允許這些設備在斷開之前有一合理的遲延時間。

.3 非獲准安全型的設備應至少符合 IP55*或等效的防護要求。

19.10 防火與滅火

19.10.1 焚燒裝置處所應設有符合國際海上人命安全公約 1983 年修正條款第 II-2/8 條或第 II-2/9 條的固定式的泡沫滅火系統，該系統可以接至甲板泡沫滅火系統。

19.11 貨物區域及焚燒裝置位置的機械通風

19.11.1 對於貨物泵艙，15.17 段—增加通風的要求—應適用。

19.11.2 焚燒爐處所的通風系統應為固定的、通常為正壓型的，並與所有其他供氣系統分開。

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* 參見國際電工委員會出版的建議，尤其是出版物 44。

.1 空氣壓力對於爐內壓力來說始終是正壓的（見 19.9.2.2）。

.2 根據焚燒爐處所的總容積，其最小的通風量應為每小時換氣 45 次。

燃燒室在維修期間應考慮其通風要求。

19.11.3 焚燒爐鼓風機處所的通風系統應為固定的、通常為正壓型的，並與其他供氣系統分開。

.1 空氣壓力對於爐內壓力來說始終是正壓的（見 19.9.2.2）。

.2 根據焚燒爐鼓風機處所的總容積，其最小通風量應為每小時換氣 20 次。

19.12 儀錶和溢流控制

19.12.1 應設置 13.1.1.3 所述的封閉式測量裝置和 15.19 所需的溢流控制系統。

19.12.2 應設置 13.2 所述的有毒和可燃貨品的蒸氣探測器。

19.13 工作人員的保護

19.13.1 應備有 14.2 所述的安全設備，其中包括 14.2.8 所述的船上每人的防毒面具和眼睛的保護。

附錄

國際散裝運輸危險化學品適航證書的標準格式

國際散裝運輸危險化學品適航證書

（公章）

按國際散裝運輸危險化學品船舶構造和設備規則

頒發

（決議 MSC.4（48））

根據.....政府授權，

（國家全名）

由 .....

（經主管機關承認的能勝任的個人或組織的正式全名）

船名	識別號碼或字母	登記港	總噸位	船型 （規則的第 2.1.2 段）[1]

安方龍骨或船舶處於相應建造階段的日期或（對於改裝船舶）化學品船開始改裝之日：.....

* 證書應以簽發國家的官方語文印製。若所用語文既不是英文又不是法文，則文本應包括一份前述語文之一的翻譯文本。

本船也應完全符合該規則的下列修正條款：

.....

.....

本船免除符合該規則的下列要求：

.....

.....

茲證明：

1 .1 本船已按該規則 1.5 節的要求檢驗；

.2 檢驗表明該船的構造和設備符合該規則的有關要求；

*.3 本船是也符合第 19 章補充要求和修改要求的焚燒爐船舶。

2 本船適於散裝運輸下列貨品，但應符合該規則所有有關的操作要求[2]。

貨 品	運輸情況(艙號等)

* 下接經簽署和註明日期的附件 1。

本表所指航號應與經簽署和註明日期的貨艙計劃附件 2 一致。

對於焚燒船來說，各產品名稱應以“液態化學品廢棄物”代替。

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* 不適合者刪去。

3 按照*1.4 和*2.8.2 規定，該規則的要求應對本船在下列方面作出修改：

4 本船裝載時必須：

*.1 符合經蓋章並說明日期為.....的獲准裝載手冊中規定的裝載條件，而且此手冊應經主管機關所承認的組織的負責官員簽署；

*.2 遵守本證書所附的裝載限定。

在需要不按上述要求裝船時，則將證明所擬裝載條件的必要計算提供給發證主管機關，該機關可以書面批准所建議的裝載條件。**

本證書有效期限至.....止。

19.....發於.....

（發證地點）

簽名人聲明，本人由所述政府正式授權頒發本證書。

.....

（發證官員簽名和／或發證主管機構印記）

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* 不適合者刪去。

** 本文如經適當簽署和蓋印後可以附於證書後，而不必合併到證書裏。

證書末尾的註解：

1/ “船型”：任何填入本欄的內容，均必須與所有有關的建議有關，例如：填入“2 型”，即為該規則所述的所有方面的 2 型。

2/ 第 2 節：僅列該規則第 17 章所列貨品或由主管機關按該規則 1.1.3 業經鑑定過的貨品。關於後面的“新”的貨品，應注意所述的任何臨時的特殊要求。應注意，對於焚燒船來說，各種貨品的名稱應以“液態化學品廢棄物”代替。

法定年度檢驗的簽署

茲證明，經按照國際散裝運輸危險化學品船舶構造和設備規則第1.5.2.1.4 段的要求進行法定年度檢驗，本船符合國際散裝化學品規則的有關要求。

簽字：.....

（經正式授權的官員簽字）

地點：.....

日期：.....

（如適用，主管機構的公章或鋼印）

簽字：.....

（經正式授權的官員簽字）

地點：.....

日期：.....

（如適用，主管機構的公章或鋼印）

簽字：.....

（經正式授權的官員簽字）

地點：.....

日期：.....

（如適用，主管機構的公章或鋼印）

註： 在符合 1.5.2.1.3 段和 1.5.2.1.4 段規定的情況下，可用中期檢驗代替法定年度檢驗。

簽字：.....

（經正式授權的官員簽字）

地點：.....

日期：.....

（如適用，主管機構的公章或鋼印）

中期檢驗

茲證明經按國際散裝運輸危險化學品船舶構造和設備規則的1.5.2.1.3段的要求進行中間檢驗，本船符合規則中的有關要求。

簽字：.....

（經正式授權的官員簽字）

地點：.....

日期：.....

（主管機構公章或鋼印）

簽字：.....

（經正式授權的官員簽字）

地點：.....

日期：.....

（主管機構公章或鋼印）

國際散裝運輸危險化學品適航證書附件 1

第 3 節所列貨品清單及其運載條件之續。

貨品名稱	運載條件(艙號等)

日期：……

（發證日期）

……

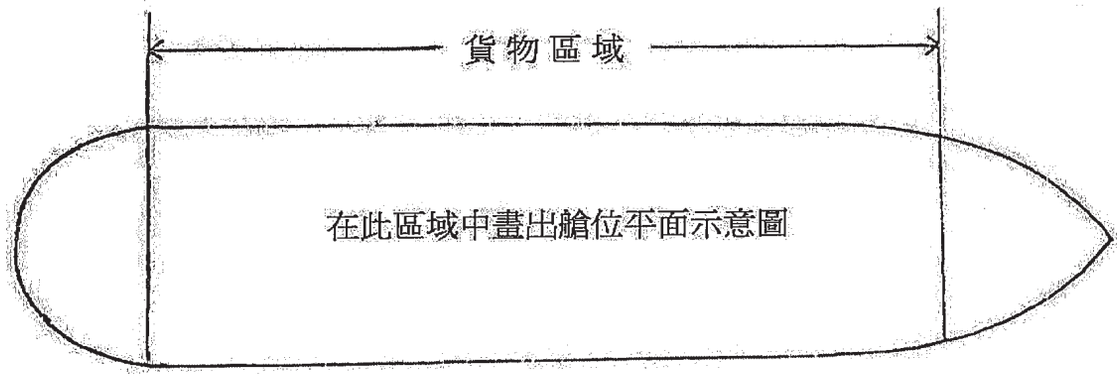
頒發證書官員簽字和／或頒發主管機關印章

國際散裝運輸危險化學品適航證書附件 2

艙位平面圖（樣本）

船名：.....

識別數碼或字母：.....



日期：.....

（發證日期）

.....

頒發證書官員簽字和／或發證主管機關印章

RESOLUTION MSC.4(48)

ADOPTION OF THE INTERNATIONAL CODE FOR THE CONSTRUCTION AND EQUIPMENT OF SHIPS CARRYING DANGEROUS CHEMICALS IN BULK (IBC CODE)

THE MARITIME SAFETY COMMITTEE,

RECALLING resolution A.490(XII) by which the Assembly authorized it to adopt the revised Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk when harmonized with the Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk as adopted by resolution A.328(IX),

NOTING resolution MSC.6(48) by which it adopts, *inter alia,* amendments to chapter VII of the International Convention for the Safety of Life at Sea, 1974 (1974 SOLAS Convention), to make the provisions of the International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk (IBC Code) mandatory under that Convention,

HAVING CONSIDERED the text of the proposed IBC Code:

1 ADOPTS the IBC Code, the text of which is given in the Annex to the present resolution;

2 NOTES that under part B of chapter VII of the 1974 SOLAS Convention as amended by resolution MSC.6(48), amendments to the IBC Code shall be adopted, brought into force and take effect in accordance with the provisions of article VIII of that Convention;

3 FURTHER NOTES that the IBC Code will require amendments to cover pollution prevention aspects prior to the entry into force of Annex II of the International Convention for the Prevention of Pollution from Ships, 1973, as modified by the Protocol of 1978 relating thereto;

4 REQUESTS the Secretary-General to circulate to all Governments concerned amendments to the IBC Code adopted as above which comprise the inclusion in chapter 17 of new products, recommending that, pending the entry into force of those amendments, these new products should be carried by chemical tankers in compliance with the provisions of the amendments;

5 FURTHER REQUESTS the Secretary-General to transmit a copy of the present resolution together with the text of the IBC Code to all Members of the Organization and to all Contracting Governments to the 1974 SOLAS Convention which are not Members of the Organization.

Note by the Secretariat

1. At its forty-eighth session held in June 1983, the Maritime Safety Committee adopted amendments to the International Convention for the Safety of Life at Sea, 1974 (SOLAS). Thirty-three Contracting Governments to the Convention were present at the session and all the texts of the amendments were adopted in accordance with the procedure specified in Article VIII(b)(iv).

2. The amendments adopted at the session consist of complete replacement texts of Chapters III and VII and amendments to Chapters II-1, II-2 and IV.

3. The decimal numbering system has been used in Chapters II-1, II-2, III and VII. Metric and Imperial units have been replaced with those of the Système International (SI Units), except where conventionally accepted nautical units were considered more appropriate.

4. Cross references are given in a concise form, e.g. Regulation II-2/10.4 meaning paragraph 4 of Regulation 10 of Chapter II-2.

5. Footnotes given throughout the Convention, as well as amendments thereto, refer to the relevant recommendations annexed to the Convention and other internationally accepted standards. The Maritime Safety Committee has emphasized that these footnotes do not form part of the Convention and are only inserted for ease of reference. The footnotes are to be altered to reflect any changes which may be made to the resolutions, recommendations or documents on which they are based. References to draft resolutions to be considered by the Assembly at its thirteenth regular session are to be replaced by the definitive numbers of the resolutions as adopted by the Assembly.

Preamble

1 The purpose of this Code is to provide an international standard for the safe carriage by sea in bulk of dangerous liquid chemicals listed in chapter 17 of the Code by prescribing the design and construction standards of ships regardless of tonnage involved in such carriage and the equipment they should carry so as to minimize the risk to the ship, to its crew and to the environment, having regard to the nature of the products involved.

2 The basic philosophy is one of ship types related to the hazards of the products covered by the Code. Each of the products may have one or more hazard properties which include flammability, toxicity, corrosivity and reactivity.

3 Throughout the development of the Code it was recognized that it must be based upon sound naval architectural and engineering principles and the best understanding available as to the hazards of the various products covered; furthermore that chemical tanker design technology is not only a complex technology but is rapidly evolving and that the Code should not remain static. Therefore the Organization will periodically review the Code taking into account both experience and technical development.

4 Requirements for new products and their conditions of carriage will be circulated as recommendations, on an interim basis, when adopted by the Maritime Safety Committee of the Organization, prior to the entry into force of the appropriate amendments, under the terms of article VIII of the International Convention for the Safety of Life at Sea, 1974.

5 The Code primarily deals with ship design and equipment. In order to ensure the safe transport of the products, the total system must, however, be appraised. Other important facets of the safe transport of the products, such as training, operation, traffic control and handling in port, are being or will be examined further by the Organization.

6 The development of the Code has been greatly assisted by relevant work of the International Association of Classification Societies (IACS) and of the International Electrotechnical Commission (IEC).

7 Chapter 16 of the Code, dealing with operational requirements of chemical tankers, highlights the regulations in other chapters that are operational in nature and mentions those other important safety features that are peculiar to chemical tanker operation.

8 The layout of the Code is in line with the International Code for the Construction and Equipment of Ships Carrying Liquefied Gases in Bulk (IGC Code) adopted by the Maritime Safety Committee at its forty-eighth session. Gas carriers may also carry in bulk liquid chemicals covered by this Code as dealt with in the IGC Code.

CHAPTER 1 – GENERAL

1.1 Application

1.1.1 The Code applies to ships regardless of size, including those of less than 500 tons gross tonnage, engaged in the carriage of bulk cargoes of dangerous liquid chemical substances, other than petroleum or similar flammable products as follows:

.1 products having significant fire hazards in excess of those of petroleum products and similar flammable products;

.2 products having significant hazards in addition to or other than flammability.

The Code is at present limited to the liquids shown in the summary of minimum requirements in chapter 17. Products that have been reviewed and determined not to come within the scope of the Code are found in chapter 18.

1.1.2 Liquids covered by the Code are those having a vapour pressure not exceeding 2.8 bar at a temperature of 37.8°C.

1.1.3 For a product proposed for carriage in bulk, but not listed in chapter 17 or 18, the Administration and port Administrations involved in such carriage should prescribe the preliminary suitable conditions for the carriage, having regard to the criteria for hazard evaluation of bulk chemicals. The Organization should be notified of the conditions for consideration for inclusion of the product in the Code.

1.1.4 Unless expressly provided otherwise the Code applies to ships the keels of which are laid or which are at a stage at which:

.1 construction identifiable with the ship begins; and

.2 assembly has commenced comprising at least 50 tonnes or 1% of the estimated mass of all structural material, whichever is less;

on or after 1 July 1986.

1.1.5 A ship, irrespective of the date of construction, which is converted to a chemical tanker on or after 1 July 1986, should be treated as a chemical tanker constructed on the date on which such conversion commences.

1.1.6 Where reference is made in the Code to a paragraph, all the provisions of the subparagraphs of that designation should apply.

1.2 Hazards

Hazards of products covered by the Code include:

1.2.1 Fire hazard defined by flashpoint, boiling point, flammability limits and autoignition temperature of the chemical.

1.2.2 Health hazard defined by:

.1 irritant or toxic effect on the skin or on the mucous membranes of the eyes, nose, throat and lungs in the gas or vapour state combined with vapour pressure; or

.2 irritational effects on the skin in the liquid state; or

.3 toxic effect, taking into account values of

LD 50 oral: a dose which is lethal to 50% of the test subjects when administered orally;

LD 50 skin: a dose which is lethal to 50% of the test subjects when administered to the skin;

LC 50: the concentration which is lethal by inhalation to 50% of the test subjects.

1.2.3 Water pollution hazard defined by human toxicity, water solubility, volatility, odour or taste, and relative density.

1.2.4 Air pollution hazard defined by:

.1 emergency exposure limit (E.E.L.) or LC 50;

.2 vapour pressure;

.3 solubility in water;

.4 relative density of liquid;

.5 vapour density.

1.2.5 Reactivity hazard defined by reactivity with:

.1 other products; or

.2 water; or

.3 the product itself (including polymerization).

1.3 Definitions

The following definitions apply unless expressly provided otherwise. (Additional definitions are given in individual chapters).

1.3.1 *Accommodation spaces* are those spaces used for public spaces, corridors, lavatories, cabins, offices, hospitals, cinemas, games and hobbies rooms, barber shops, pantries containing no cooking appliances and similar spaces. ***Public spaces*** are those portions of the accommodation spaces which are used for halls, dining rooms, lounges and similar permanently enclosed spaces.

1.3.2.1 *Administration* means the Government of the State whose flag the ship is entitled to fly.

1.3.2.2 *Port Administration* means the appropriate authority of the country in the port of which the ship is loading or unloading.

1.3.3 *Boiling point* is the temperature at which a product exhibits a vapour pressure equal to the atmospheric pressure.

1.3.4 *Breadth (B)* means the maximum breadth of the ship, measured amidships to the moulded line of the frame in a ship with a metal shell and to the outer surface of the hull in a ship with a shell of any other material. The breadth (B) should be measured in metres.

1.3.5 *Cargo area* is that part of the ship that contains cargo tanks, slop tanks, cargo pump rooms including pump rooms, cofferdams, ballast or void spaces adjacent to cargo tanks and also deck areas throughout the entire length and breadth of the part of the ship over the above-mentioned spaces. Where independent tanks are installed in hold spaces, cofferdams, ballast or void spaces at the after end of the aftermost hold space or at the forward end of the forwardmost hold space are excluded from the cargo area.

1.3.6 *Cargo pump room* is a space containing pumps and their accessories for the handling of products covered by the Code.

1.3.7 *Cargo service spaces* are spaces within the cargo area used for workshops, lockers and store-rooms of more than $2\,m^2$ in area, used for cargo handling equipment.

1.3.8 *Cargo tank* is the envelope designed to contain the cargo.

1.3.9 *Chemical tanker* is a cargo ship constructed or adapted and used for the carriage in bulk of any liquid product listed in chapter 17.

1.3.10 *Cofferdam* is the isolating space between two adjacent steel bulkheads or decks. This space may be a void space or a ballast space.

1.3.11 *Control stations* are those spaces in which 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. This does not include special fire-control equipment which can be most practically located in the cargo area.

1.3.12 *Flammability limits* are the conditions defining the state of fuel-oxidant mixture at which application of an adequately strong external ignition source is only just capable of producing flammability in a given test apparatus.

1.3.13 *Flashpoint* is the temperature in degrees Celsius at which a product will give off enough flammable vapour to be ignited. Values given in the Code are "closed cup test" determined by an approved flashpoint apparatus.

1.3.14 *Hold space* is the space enclosed by the ship's structure in which an independent cargo tank is situated.

1.3.15 *Independent* means that a piping or venting system, for example, is in no way connected to another system and that there are no provisions available for the potential connection to other systems.

1.3.16 *Length (L)* means 96% of the total length on a waterline at 85% of the least moulded depth measured from the top of the keel, or the length from the foreside of the stem to the axis of the rudder stock on that waterline, if that be greater. In ships designed with a rake of keel, the waterline on which this length is measured should be parallel to the designed waterline. The length (L) should be measured in metres.

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

.1 internal combustion machinery used for main propulsion; or

.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.

1.3.18 *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.

1.3.19 *Oil fuel unit* is the equipment used for the preparation of oil fuel for delivery to an oil-fired boiler, or equipment used for the preparation for delivery of heated oil to an internal combustion engine, and includes any oil pressure pumps, filters and heaters dealing with oil at a pressure of more than 1.8 bar gauge.

1.3.20 *Organization* is the International Maritime Organization (IMO).

1.3.21 *Permeability* of a space means the ratio of the volume within that space which is assumed to be occupied by water to the total volume of that space.

1.3.22 *Pump room* is a space, located in the cargo area, containing pumps and their accessories for the handling of ballast and oil fuel.

1.3.23 *Relative density* of liquid is the ratio of the mass of a volume of a product to the mass of an equal volume of fresh water. For a product of limited solubility, the relative density indicates whether it floats on water or sinks.

1.3.24 *Separate* means that a cargo piping system or cargo vent system, for example, is not connected to another cargo piping or cargo vent system. This separation may be achieved by the use of design or operational methods. Operational methods should not be used within a cargo tank and should consist of one of the following types:

.1 removing spool pieces or valves and blanking the pipe ends;

.2 arrangement of two spectacle flanges in series with provisions for detecting leakage into the pipe between the two spectacle flanges.

1.3.25 *Service spaces* are those spaces used for galleys, pantries containing cooking appliances, lockers, mail and specie rooms, store-rooms, workshops other than those forming part of the machinery spaces and similar spaces and trunks to such spaces.

1.3.26 *1974 SOLAS Convention* means the International Convention for the Safety of Life at Sea, 1974.

1.3.27 *1983 SOLAS amendments* means the amendments to the 1974 SOLAS Convention adopted by the Maritime Safety Committee of the Organization at its forty-eighth session on 17 June 1983 by resolution MSC.6(48).

1.3.28 *Vapour density* or the relative density of vapour is the ratio of the mass of a volume of vapour or gas (with no air present) to the mass of an equal volume of air at the same pressure and temperature. Vapour density below or above 1 indicates whether the vapour or gas is lighter or heavier than air.

1.3.29 *Vapour pressure* is the equilibrium pressure of the saturated vapour above the liquid expressed in bars absolute at a specified temperature.

1.3.30 *Void space* is an enclosed space in the cargo area external to a cargo tank, other than a hold space, ballast space, oil fuel tank, cargo pump room, pump room, or any space in normal use by personnel.

1.4 Equivalents

1.4.1 Where the Code requires that a particular fitting, material, appliance, apparatus, item of equipment or type thereof should be fitted or carried in a ship, or that any particular provision should be made, or any procedure or arrangement should be complied with, the Administration may allow any other fitting, material, appliance, apparatus, item of equipment or type thereof to be fitted or carried, or any other provision, procedure or arrangement to be made in that ship, if it is satisfied by trial thereof or otherwise that such fitting, material, appliance, apparatus, item of equipment or type thereof or that any particular provision, procedure or arrangement is at least as effective as that required by the Code. However, the Administration may not allow operational methods or procedures to be made an alternative to a particular fitting, material, appliance, apparatus, item of equipment, or type thereof, which are prescribed by the Code, unless such substitution is specifically allowed by the Code.

1.4.2 When the Administration so allows any fitting, material, appliance, apparatus, item of equipment, or type thereof, or provision, procedure, or arrangement, or novel design or application to be substituted thereafter, it should communicate to the Organization the particulars thereof together with a report on the evidence submitted so that the Organization may circulate the same to other Contracting Governments to the 1974 SOLAS Convention for the information of their officers.

1.5 Surveys and certification

1.5.1 *Survey procedure*

1.5.1.1 The survey of ships, so far as regards the enforcement of the provisions of the regulations and granting of exemptions therefrom, should be carried out by officers of the Administration. The Administration may, however, entrust the surveys either to surveyors nominated for the purpose or to organizations recognized by it.

1.5.1.2 The Administration nominating surveyors or recognizing organizations to conduct surveys should, as a minimum, empower any nominated surveyor or recognized organization to:

.1 require repairs to a ship; and

.2 carry out surveys if requested by the port State authority* concerned.

The Administration should notify the Organization of the specific responsibilities and conditions of the authority delegated to nominated surveyors or recognized organizations for circulation to the Contracting Governments.

1.5.1.3 When a nominated surveyor or recognized organization determines that the condition of the ship or its equipment does not correspond substantially with the particulars of the certificate or is such that the ship is not fit to proceed to sea without danger to the ship, or persons on board, such surveyor or organization should immediately ensure that corrective action is taken and should in due course notify the Administration. If such corrective action is not taken the relevant certificate should be withdrawn and the Administration should be notified immediately; and, if the ship is in a port of another Contracting Government, the port State authority concerned should also be notified immediately.

1.5.1.4 In every case, the Administration should guarantee the completeness and efficiency of the survey, and should undertake to ensure the necessary arrangements to satisfy this obligation.

1.5.2 *Survey requirements*

1.5.2.1 The structure, equipment, fittings, arrangements and material (other than items in respect of which a Cargo Ship Safety Construction Certificate, Cargo Ship Safety Equipment Certificate and Cargo Ship Safety Radiotelegraphy Certificate or Cargo Ship Safety Radiotelephony Certificate are issued) of a chemical tanker should be subjected to the following surveys:

.1 An initial survey before the ship is put in service or before the International Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk is issued for the first time, which should include a complete examination of its structure, equipment, fittings, arrangements and material in so far as the ship is covered by the Code. This survey should be such as to ensure that the structure, equipment, fittings, arrangements and material fully comply with the applicable provisions of the Code.

.2 A periodical survey at intervals specified by the Administration, but not exceeding 5 years which should be such as to ensure that the structure, equipment, fittings, arrangements and material comply with the applicable provisions of the Code.

.3 A minimum of one intermediate survey during the period of validity of the International Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk. In cases where only one such intermediate survey is

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* Port State authority has the meaning as presented in chapter I, regulation 19 of the 1978 Protocol to the 1974 SOLAS Convention.

carried out in any one certificate validity period, it should be held not before 6 months prior to, nor later than 6 months after, the half-way date of the certificate's period of validity. Intermediate surveys should be such as to ensure that the safety equipment, and other equipment, and associated pump and piping systems comply with the applicable provisions of the Code and are in good working order. Such surveys should be endorsed on the International Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk.

.4 A mandatory annual survey within 3 months before or after the anniversary date of the International Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk which should include a general examination to ensure that the structure, equipment, fittings, arrangements and materials remain in all respects satisfactory for the service for which the ship is intended. Such a survey should be endorsed in the International Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk.

.5 An additional survey, either general or partial according to the circumstances, should be made when required after an investigation prescribed in 1.5.3.3, or whenever any important repairs or renewals are made. Such a survey should ensure that the necessary repairs or renewals have been effectively made, that the material and workmanship of such repairs or renewals are satisfactory; and that the ship is fit to proceed to sea without danger to the ship or persons on board.

1.5.3 *Maintenance of conditions after survey*

1.5.3.1 The condition of the ship and its equipment should be maintained to conform with the provisions of the Code to ensure that the ship will remain fit to proceed to sea without danger to the ship or persons on board.

1.5.3.2 After any survey of the ship under 1.5.2 has been completed, no change should be made in the structure, equipment, fittings, arrangements and material covered by the survey, without the sanction of the Administration, except by direct replacement.

1.5.3.3 Whenever an accident occurs to a ship or a defect is discovered, either of which affects the safety of the ship or the efficiency or completeness of its life-saving appliances or other equipment, the master or owner of the ship should report at the earliest opportunity to the Administration, the nominated surveyor or recognized organization responsible for issuing the relevant certificate, who should cause investigations to be initiated to determine whether a survey, as required by 1.5.2.5 is necessary. If the ship is in a port of another Contracting Government, the master or owner should also report immediately to the port State authority concerned and the nominated surveyor or recognized organization should ascertain that such a report has been made.

1.5.4 *Issue of International Certificate of Fitness*

1.5.4.1 A certificate called an International Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk, the model form of which is set out in the appendix, should be issued after an initial or periodical survey to a chemical tanker which complies with the relevant requirements of the Code.

1.5.4.2 The certificate issued under provisions of this section should be available on board for inspection at all times.

1.5.5 *Issue or endorsement of International Certificate of Fitness by another Government*

1.5.5.1 A Contracting Government may, at the request of the Government of another State, cause a ship entitled to fly the flag of the other State to be surveyed and, if satisfied that the requirements of the Code are complied with, issue or authorize the issue of the certificate to the ship, and, where appropriate, endorse or authorize the endorsement of the certificate on board the ship in accordance with the Code. Any certificate so issued should contain a statement to the effect that it has been issued at the request of the Government of the State whose flag the ship is entitled to fly.

1.5.6 *Duration and validity of the International Certificate of Fitness*

1.5.6.1 An International Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk should be issued for a period specified by the Administration which should not exceed 5 years from the date of the initial survey or the periodical survey.

1.5.6.2 No extension of the 5 year period of the certificate should be permitted.

1.5.6.3 The certificate should cease to be valid:

.1 if the surveys are not carried out within the period specified by 1.5.2;

.2 upon transfer of the ship to the flag of another State. A new certificate should only be issued when the Government issuing the new certificate is fully satisfied that the ship is in compliance with the requirements of 1.5.3.1 and 1.5.3.2. Where a transfer occurs between Contracting Governments, the Government of the State whose flag the ship was formerly entitled to fly should, if requested within 12 months after the transfer has taken place, as soon as possible transmit to the Administration copies of the certificates carried by the ship before the transfer and, if available, copies of the relevant survey reports.

CHAPTER 2 — SHIP SURVIVAL CAPABILITY* AND LOCATION OF CARGO TANKS

2.1 General

2.1.1 Ships subject to the Code should survive the normal effects of flooding following assumed hull damage caused by some external force. In addition, to safeguard the ship and the environment, the cargo tanks of certain types of ships should be protected from penetration in the case of minor damage to the ship resulting, for example, from contact with a jetty or tug, and given a measure of protection from damage in the case of collision or stranding, by locating them at specified minimum distances inboard from the ship's shell plating. Both the damage to be assumed and the proximity of the cargo tanks to the ship's shell should be dependent upon the degree of hazard presented by the products to be carried.

2.1.2 Ships subject to the Code should be designed to one of the following standards:

.1 A type 1 ship is a chemical tanker intended to transport chapter 17 products with very severe environmental and safety hazards which require maximum preventive measures to preclude an escape of such cargo.

.2 A type 2 ship is a chemical tanker intended to transport chapter 17 products with appreciably severe environmental and safety hazards which require significant preventive measures to preclude an escape of such cargo.

.3 A type 3 ship is a chemical tanker intended to transport chapter 17 products with sufficiently severe environmental and safety hazards which require a moderate degree of containment to increase survival capability in a damaged condition.

Thus a type 1 ship is a chemical tanker intended for the transportation of products considered to present the greatest overall hazard and type 2 and type 3 for products of progressively lesser hazards. Accordingly, a type 1 ship should survive the most severe standard of damage and its cargo tanks should be located at the maximum prescribed distance inboard from the shell plating.

2.1.3 The ship type required for individual products is indicated in column "c" in the table of chapter 17.

2.1.4 If a ship is intended to carry more than one product listed in chapter 17, the standard of damage should correspond to that product having the most stringent ship type requirement. The requirements for the location of individual cargo tanks, however, are those for ship types related to the respective products intended to be carried.

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* Reference is made to the Guidelines for the Uniform Application of the Survival Requirements of the Bulk Chemical Code and the Gas Carrier Code.

2.2 **Freeboard and intact stability**

2.2.1 Ships subject to the Code may be assigned the minimum freeboard permitted by the International Convention on Load Lines in force. However, the draught associated with the assignment should not be greater than the maximum draught otherwise permitted by this Code.

2.2.2 The stability of the ship in all seagoing conditions should be to a standard which is acceptable to the Administration.

2.2.3 When calculating the effect of free surfaces of consumable liquids for loading conditions it should be assumed that, for each type of liquid, at least one transverse pair or a single centre tank has a free surface and the tank or combination of tanks to be taken into account should be those where the effect of free surfaces is the greatest. The free surface effect in undamaged compartments should be calculated by a method acceptable to the Administration.

2.2.4 Solid ballast should not normally be used in double bottom spaces in the cargo area. Where, however, because of stability considerations, the fitting of solid ballast in such spaces becomes unavoidable, then its disposition should be governed by the need to ensure that the impact loads resulting from bottom damage are not directly transmitted to the cargo tank structure.

2.2.5 The master of the ship should be supplied with a Loading and Stability Information booklet. This booklet should contain details of typical service and ballast conditions, provisions for evaluating other conditions of loading and a summary of the ship's survival capabilities. In addition, the booklet should contain sufficient information to enable the master to load and operate the ship in a safe and seaworthy manner.

2.3 **Shipside discharges below the freeboard deck**

2.3.1 The provision and control of valves fitted to discharges led through the shell from spaces below the freeboard deck or from within the superstructures and deckhouses on the freeboard deck fitted with weathertight doors should comply with the requirements of the relevant regulation of the International Convention on Load Lines in force, except that the choice of valves should be limited to:

.1 one automatic non-return valve with a positive means of closing from above the freeboard deck; or

.2 where the vertical distance from the summer load waterline to the inboard end of the discharge pipe exceeds 0.01L, two automatic non-return valves without positive means of closing, provided that the inboard valve is always accessible for examination under service conditions.

2.3.2 For the purpose of this chapter "summer load waterline" and "freeboard deck", have the meanings as defined in the International Convention on Load Lines in force.

2.3.3 The automatic non-return valves referred to in 2.3.1.1 and 2.3.1.2 should be of a type acceptable to the Administration and should be fully effective in preventing admission of water into the ship, taking into account the sinkage, trim and heel in survival requirements in 2.9.

2.4 **Conditions of loading**

Damage survival capability should be investigated on the basis of loading information submitted to the Administration for all anticipated conditions of loading and variations in draught and trim. Ballast conditions where the chemical tanker is not carrying products covered by the Code, or is carrying only residues of such products, need not be considered.

2.5 **Damage assumptions**

2.5.1 The assumed maximum extent of damage should be:

.1 Side damage:

.1.1	Longitudinal extent:	$1/3L^{2/3}$ or 14.5 m, whichever is less
.1.2	Transverse extent: measured inboard from the ship's side at right angles to the centreline at the level of the summer load line	B/5 or 11.5 m, whichever is less
.1.3	Vertical extent: from the moulded line of the bottom shell plating at centreline	upwards without limit

.2 Bottom damage:

		For 0.3L from the forward perpendicular of the ship	Any other part of the ship
.2.1	Longitudinal extent:	$1/3L^{2/3}$ or 14.5 m, whichever is less	$1/3L^{2/3}$ or 5 m, whichever is less
.2.2	Transverse extent:	B/6 or 10 m, whichever is less	B/6 or 5 m, whichever is less
.2.3	Vertical extent:	B/15 or 6 m, whichever is less measured from the moulded line of the bottom shell plating at centreline (see 2.6.2).	B/15 or 6 m, whichever is less measured from the moulded line of the bottom shell plating at centreline (see 2.6.2).

2.5.2 Other damage:

.1 If any damage of a lesser extent than the maximum damage specified in 2.5.1 would result in a more severe condition, such damage should be considered.

.2 For type 1 and type 2 ships, local side damage anywhere in the cargo area extending inboard 760 mm measured normal to the hull shell should be considered and transverse bulkheads should be additionally assumed damaged when also required by the applicable subparagraphs of 2.8.1.

2.6 Location of cargo tanks

2.6.1 Cargo tanks should be located at the following distances inboard:

.1 Type 1 ships: from the side shell plating not less than the transverse extent of damage specified in 2.5.1.1.2 and from the moulded line of the bottom shell plating at centreline not less than the vertical extent of damage specified in 2.5.1.2.3 and nowhere less than 760 mm from the shell plating.

.2 Type 2 ships: from the moulded line of the bottom shell plating at centreline not less than the vertical extent of damage specified in 2.5.1.2.3 and nowhere less than 760 mm from the shell plating.

.3 Type 3 ships: no requirement.

2.6.2 Except for type 1 ships, suction wells installed in cargo tanks may protrude into the vertical extent of bottom damage specified in 2.5.1.2.3 provided that such wells are as small as practicable and the protrusion below the inner bottom plating does not exceed 25% of the depth of the double bottom or 350 mm, whichever is less. Where there is no double bottom, the protrusion of the suction well of independent tanks below the upper limit of bottom damage should not exceed 350 mm. Suction wells installed in accordance with this paragraph may be ignored in determining the compartments affected by damage.

2.7 Flooding assumptions

2.7.1 The requirements of 2.9 should be confirmed by calculations which take into consideration the design characteristics of the ship; the arrangements, configuration and contents of the damaged compartments; the distribution, relative densities and the free surface effects of liquids; and the draught and trim for all conditions of loading.

2.7.2 The permeabilities of spaces assumed to be damaged should be as follows:

Spaces	*Permeabilities*
Appropriated to stores	0.60
Occupied by accommodation	0.95
Occupied by machinery	0.85
Voids	0.95
Intended for consumable liquids	0 to 0.95*
Intended for other liquids	0 to 0.95*

* The permeability of partially filled compartments should be consistent with the amount of liquid carried in the compartment.

2.7.3 Wherever damage penetrates a tank containing liquids it should be assumed that the contents are completely lost from that compartment and replaced by salt water up to the level of the final plane of equilibrium.

2.7.4 Every watertight division within the maximum extent of damage defined in 2.5.1 and considered to have sustained damage in positions given in 2.8.1 should be assumed to be penetrated. Where damage less than the maximum is being considered in accordance with 2.5.2, only watertight divisions or combinations of watertight divisions within the envelope of such lesser damage should be assumed to be penetrated.

2.7.5 The ship should be so designed as to keep unsymmetrical flooding to the minimum consistent with efficient arrangements.

2.7.6 Equalization arrangements requiring mechanical aids such as valves or cross-levelling pipes, if fitted, should not be considered for the purpose of reducing an angle of heel or attaining the minimum range of residual stability to meet the requirements of 2.9 and sufficient residual stability should be maintained during all stages where equalization is used. Spaces which are linked by ducts of large cross-sectional area may be considered to be common.

2.7.7 If pipes, ducts, trunks or tunnels are situated within the assumed extent of damage penetration, as defined in 2.5, arrangements should be such that progressive flooding cannot thereby extend to compartments other than those assumed to be flooded for each case of damage.

2.7.8 The buoyancy of any superstructure directly above the side damage should be disregarded. The unflooded parts of superstructures beyond the extent of damage, however, may be taken into consideration provided that:

.1 they are separated from the damaged space by watertight divisions and the requirements of 2.9.3 in respect of these intact spaces are complied with; and

.2 openings in such divisions are capable of being closed by remotely operated sliding watertight doors and unprotected openings are not immersed within the minimum range of residual stability required in 2.9; however the immersion of any other openings capable of being closed weathertight may be permitted.

2.8 **Standard of damage**

2.8.1 Ships should be capable of surviving the damage indicated in 2.5 with the flooding assumptions in 2.7 to the extent determined by the ship's type according to the following standards:

.1 A type 1 ship should be assumed to sustain damage anywhere in its length;

.2 A type 2 ship of more than 150 m in length should be assumed to sustain damage anywhere in its length;

.3 A type 2 ship of 150 m in length or less should be assumed to sustain damage anywhere in its length except involving either of the bulkheads bounding a machinery space located aft;

.4 A type 3 ship of more than 225 m in length should be assumed to sustain damage anywhere in its length;

.5 A type 3 ship of 125 m in length or more but not exceeding 225 m in length should be assumed to sustain damage anywhere in its length except involving either of the bulkheads bounding a machinery space located aft;

.6 A type 3 ship below 125 m in length should be assumed to sustain damage anywhere in its length except involving damage to the machinery space when located aft. However, the ability to survive the flooding of the machinery space should be considered by the Administration.

2.8.2 In the case of small type 2 and type 3 ships which do not comply in all respects with the appropriate requirements of 2.8.1.3 and 2.8.1.6, special dispensations may only be considered by the Administration provided that alternative measures can be taken which maintain the same degree of safety. The nature of the alternative measures should be approved and clearly stated and be available to the port Administration. Any such dispensation should be duly noted on the International Certificate of Fitness referred to in 1.5.4.

2.9 **Survival requirements**

2.9.1 Ships subject to the Code should be capable of surviving the assumed damage specified in 2.5 to the standard provided in 2.8 in a condition of stable equilibrium and should satisfy the following criteria.

2.9.2 In any stage of flooding:

.1 the waterline, taking into account sinkage, heel and trim, should be below the lower edge of any opening through which progressive flooding or downflooding may take place. Such openings should include air pipes and openings which are closed by means of weathertight doors or hatch covers and may exclude those openings closed by means of watertight manhole covers and watertight flush scuttles, small watertight cargo tank hatch covers which maintain the high integrity of the deck, remotely operated watertight sliding doors, and sidescuttles of the non-opening type;

.2 the maximum angle of heel due to unsymmetrical flooding should not exceed 25°, except that this angle may be increased up to 30° if no deck immersion occurs;

.3 the residual stability during intermediate stages of flooding should be to the satisfaction of the Administration. However, it should never be significantly less than that required by 2.9.3.

2.9.3 At final equilibrium after flooding:

.1 the righting lever curve should have a minimum range of 20° beyond the position of equilibrium in association with a maximum residual righting lever of at least 0.1 m within the 20° range; the area under the curve within this range should not be less than 0.0175 m/rad. Unprotected openings should not be immersed within this range unless the space concerned is assumed to be flooded. Within this range, the immersion of any of the openings listed in 2.9.2.1 and other openings capable of being closed weathertight may be permitted; and

.2 the emergency source of power should be capable of operating.

CHAPTER 3 -- SHIP ARRANGEMENTS

3.1 Cargo segregation

3.1.1 Unless expressly provided otherwise, tanks containing cargo or residues of cargo subject to the Code should be segregated from accommodation, service and machinery spaces and from drinking water and stores for human consumption by means of a cofferdam, void space, cargo pump room, pump room, empty tank, oil fuel tank or other similar space.

3.1.2 Cargoes which react in a hazardous manner with other cargoes should:

.1 be segregated from such other cargoes by means of a cofferdam, void space, cargo pump room, pump room, empty tank, or tank containing a mutually compatible cargo;

.2 have separate pumping and piping systems which should not pass through other cargo tanks containing such cargoes, unless encased in a tunnel; and

.3 have separate tank venting systems.

3.1.3 Cargo piping should not pass through any accommodation, service or machinery space other than cargo pump rooms or pump rooms.

3.1.4 Cargoes subject to the Code should not be carried in either the fore or aft peak tank.

3.2 Accommodation, service and machinery spaces and control stations

3.2.1 No accommodation or service spaces or control stations should be located within the cargo area except over a cargo pump room recess or pump room recess that complies with regulation II-2/56 of the 1983 SOLAS amendments and no cargo or slop tank should be aft of the forward end of any accommodation.

3.2.2 In order to guard against the danger of hazardous vapours, due consideration should be given to the location of air intakes and openings into accommodation, service and machinery spaces and control stations in relation to cargo piping and cargo vent systems.

3.2.3 Entrances, air inlets and openings to accommodation, service and machinery spaces and control stations should not face the cargo area. They should be located on the end bulkhead not facing the cargo area and/or on the outboard side of the superstructure or deckhouse at a distance of at least 4% of the length (L) of the ship but not less than 3 m from the end of the superstructure or deckhouse facing the cargo area. This distance, however, need not exceed 5 m. No doors should be permitted within the limits mentioned above, except that doors to those spaces not having access to accommodation and service spaces and control stations, such as cargo control stations and store-rooms may be permitted by the Administration. Where such doors are fitted, the boundaries of the space should be insulated to "A-60" standard. Bolted plates for removal of machinery may be fitted within the limits specified above. Wheelhouse doors and wheelhouse windows may be located within the limits specified above so long as they are so designed that a rapid

and efficient gas and vapour tightening of the wheelhouse can be ensured. Windows and sidescuttles facing the cargo area and on the sides of the superstructures and deckhouses within the limits specified above should be of the fixed (non-opening) type. Such sidescuttles in the first tier on the main deck should be fitted with inside covers of steel or equivalent material.

3.3 Cargo pump rooms

3.3.1 Cargo pump rooms should be so arranged as to ensure:

.1 unrestricted passage at all times from any ladder platform and from the floor; and

.2 unrestricted access to all valves necessary for cargo handling for a person wearing the required personnel protective equipment.

3.3.2 Permanent arrangements should be made for hoisting an injured person with a rescue line while avoiding any projecting obstacles.

3.3.3 Guard railings should be installed on all ladders and platforms.

3.3.4 Normal access ladders should not be fitted vertical and should incorporate platforms at suitable intervals.*

3.3.5 Means should be provided to deal with drainage and any possible leakage from cargo pumps and valves in cargo pump rooms. The bilge system serving the cargo pump room should be operable from outside the cargo pump room. One or more slop tanks for storage of contaminated bilge water or tank washings should be provided. A shore connection with a standard coupling or other facilities should be provided for transferring contaminated liquids to on-shore reception facilities.

3.3.6 Pump discharge pressure gauges should be provided outside the cargo pump room.

3.3.7 Where machinery is driven by shafting passing through a bulkhead or deck, gastight seals with efficient lubrication or other means of ensuring the permanence of the gas seal should be fitted in way of the bulkhead or deck.

3.4 Access to spaces in the cargo area

3.4.1 Access to cofferdams, ballast tanks, cargo tanks and other spaces in the cargo area should be direct from the open deck and such as to ensure their complete inspection. Access to double bottom spaces may be through a cargo pump room, pump room, deep cofferdam, pipe tunnel or similar compartments, subject to consideration of ventilation aspects.

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* Reference is made to the Recommendation on Safe Access to and Working in Large Tanks (resolution A.272(VIII)) as amended by resolution A.330(IX).

3.4.2 For access through horizontal openings, hatches or manholes, the dimensions should 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 to provide a clear opening to facilitate the hoisting of an injured person from the bottom of the space. The minimum clear opening should be not less than 600 mm by 600 mm.

3.4.3 For access through vertical openings, or manholes providing passage through the length and breadth of the space, the minimum clear opening should be not less than 600 mm by 800 mm at a height of not more than 600 mm from the bottom shell plating unless gratings or other footholds are provided.

3.4.4 Smaller dimensions may be approved by the Administration in special circumstances, if the ability to traverse such openings or to remove an injured person can be proved to the satisfaction of the Administration.

3.5 **Bilge and ballast arrangements**

3.5.1 Pumps, ballast lines, vent lines and other similar equipment serving permanent ballast tanks should be independent of similar equipment serving cargo tanks and of cargo tanks themselves. Discharge arrangements for permanent ballast tanks sited immediately adjacent to cargo tanks should be outside machinery spaces and accommodation spaces. Filling arrangements may be in the machinery spaces provided that such arrangements ensure filling from tank deck level and non-return valves are fitted.

3.5.2 Filling of ballast in cargo tanks may be arranged from deck level by pumps serving permanent ballast tanks, provided that the filling line has no permanent connection to cargo tanks or piping and that non-return valves are fitted.

3.5.3 Bilge pumping arrangements for cargo pump rooms, pump rooms, void spaces, slop tanks, double bottom tanks and similar spaces should be situated entirely within the cargo area except for void spaces, double bottom tanks and ballast tanks where such spaces are separated from tanks containing cargo or residues of cargo by a double bulkhead.

3.6 **Pump and pipeline identification**

Provisions should be made for the distinctive marking of pumps, valves and pipelines to identify the service and tanks which they serve.

3.7 **Bow or stern loading and unloading arrangements**

3.7.1 Subject to the approval of the Administration, cargo piping may be fitted to permit bow or stern loading and unloading. Portable arrangements should not be permitted.

3.7.2 Bow or stern loading and unloading lines should not be used for the transfer of products required to be carried in type 1 ships. Bow and stern loading and unloading lines should not be used for the transfer of cargoes emitting toxic vapours required to comply with 15.12.1, unless specifically approved by the Administration.

3.7.3 In addition to 5.1, the following provisions apply:

.1 The piping outside the cargo area should be fitted at least 760 mm inboard on the open deck. Such piping should be clearly identified and fitted with a shutoff valve at its connection to the cargo piping system within the cargo area. At this location, it should also be capable of being separated by means of a removable spool piece and blank flanges when not in use.

.2 The shore connection should be fitted with a shutoff valve and a blank flange.

.3 The piping should be full penetration butt welded, and fully radiographed. Flange connections in the piping should only be permitted within the cargo area and at the shore connection.

.4 Spray shields should be provided at the connections specified in .1 as well as collecting trays of sufficient capacity with means for the disposal of drainage.

.5 The piping should be self-draining to the cargo area and preferably into a cargo tank. Alternative arrangements for draining the piping may be accepted by the Administration.

.6 Arrangements should be made to allow such piping to be purged after use and maintained gas-safe when not in use. The vent pipes connected with the purge should be located in the cargo area. The relevant connections to the piping should be provided with a shutoff valve and blank flange.

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

3.7.5 Air pipes and other openings to enclosed spaces not listed in 3.7.4 should be shielded from any spray which may come from a burst hose or connection.

3.7.6 Escape routes should not terminate within the coamings required by 3.7.7 or within a distance of 3 m beyond the coamings.

3.7.7 Continuous coamings of suitable height should be fitted to keep any spills on deck and away from the accommodation and service areas.

3.7.8 Electrical equipment within the coamings required by 3.7.7 or within a distance of 3 m beyond the coamings should be in accordance with the requirements of chapter 10.

3.7.9 Fire-fighting arrangements for the bow or stern loading and unloading areas should be in accordance with 11.3.16.

3.7.10 Means of communication between the cargo control station and the cargo shore connection location should be provided and certified safe, if necessary. Provision should be made for the remote shutdown of cargo pumps from the cargo shore connection location.

CHAPTER 4 – CARGO CONTAINMENT

4.1 Definitions

4.1.1 *Independent tank* means a cargo containment envelope which is not contiguous with, or part of, the hull structure. An independent tank is built and installed so as to eliminate whenever possible (or in any event to minimjze) its stressing as a result of stressing or motion of the adjacent hull structure. An independent tank is not essential to the structural completeness of the ship's hull.

4.1.2 *Integral tank* means a cargo containment envelope which forms part of the ship's hull and which may be stressed in the same manner and by the same loads which stress the contiguous hull structure and which is normally essential to the structural completeness of the ship's hull.

4.1.3 *Gravity tank* means a tank having a design pressure not greater than 0.7 bar gauge at the top of the tank. A gravity tank may be independent or integral. A gravity tank should be constructed and tested according to the standards of the Administration taking account of the temperature of carriage and relative density of the cargo.

4.1.4 *Pressure tank* means a tank having a design pressure greater than 0.7 bar gauge. A pressure tank should be an independent tank and should be of a configuration permitting the application of pressure vessel design criteria according to the standards of the Administration.

4.2 Tank type requirements for individual products

Requirements for both installation and design of tank types for individual products are shown in column "d" in the table of chapter 17.

CHAPTER 5 — CARGO TRANSFER

5.1 Piping scantlings*

5.1.1 Subject to the conditions stated in 5.1.4 the wall thickness (t) of pipes should not be less than:

$$t = \frac{t_o + b + c}{1 - \frac{a}{100}} \text{ (mm)}$$

where:

t_o = theoretical thickness

$t_o = PD/(20\,Ke + P)$ (mm)

with

P = design pressure (bar) referred to in 5.1.2

D = outside diameter (mm)

K = allowable stress (N/mm^2) referred to in 5.1.5

e = efficiency factor; equal to 1.0 for seamless pipes and for longitudinally or spirally welded pipes, delivered by manufacturers approved for making welded pipes which are considered by the Administration as equivalent to seamless pipes. In other cases the e value is to be determined by the Administration depending on the manufacturing process and testing procedure.

b = allowance for bending (mm). The value of b should be chosen so that the calculated stress in the bend, due to internal pressure only, does not exceed the allowable stress. Where such justification is not given, b should be not less than:

$$b = \frac{Dt_o}{2.5r} \text{ (mm)}$$

with

r = mean radius of the bend (mm).

c = corrosion allowance (mm). If corrosion or erosion is expected, the wall thickness of piping should be increased over that required by the other design requirements.

a = negative manufacturing tolerance for thickness (%).

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* Reference is also made to the published Rules of the Members and Associate Members of the International Association of Classification Societies (IACS).

5.1.2 The design pressure P in the formula for t_o in 5.1.1 is the maximum gauge pressure to which the system may be subjected in service, taking into account the highest set pressure on any relief valve on the system.

5.1.3 Piping and piping system components which are not protected by a relief valve, or which may be isolated from their relief valve, should be designed for at least the greatest of:

.1 for piping systems or components which may contain some liquid, the saturated vapour pressure at 45°C;

.2 the pressure setting of the associated pump discharge relief valve;

.3 the maximum possible total pressure head at the outlet of the associated pumps when a pump discharge relief valve is not installed.

5.1.4 The design pressure should not be less than 10 bar gauge except for open-ended lines where it should be not less than 5 bar gauge.

5.1.5 For pipes, the allowable stress to be considered in the formula for t_o in 5.1.1 is the lower of the following values:

$$\frac{R_m}{A} \text{ or } \frac{R_e}{B}$$

where:

R_m = specified minimum tensile strength at ambient temperature (N/mm^2)

R_e = specified minimum yield stress at ambient temperature (N/mm^2). If the stress-strain curve does not show a defined yield stress, the 0.2% proof stress applies.

A and B should have values of at least

A = 2.7 and B = 1.8

5.1.6.1 The minimum wall thickness should be in accordance with Recognized Standards*.

5.1.6.2 Where necessary for mechanical strength to prevent damage, collapse, excessive sag or buckling of pipes due to weight of pipes and content and to super-imposed loads from supports, ship deflection or other causes, the wall thickness should be increased over that required by 5.1.1 or, if this is impracticable or would cause excessive local stresses, these loads should be reduced, protected against or eliminated by other design methods.

5.1.6.3 Flanges, valves and other fittings should be to a standard acceptable to the Administration, taking into account the design pressure defined under 5.1.2.

5.1.6.4 For flanges not complying with a standard the dimensions of flanges and associated bolts should be to the satisfaction of the Administration.

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* Recognized Standards for the purpose of this chapter are standards laid down and maintained by a classification society recognized by the Administration.

5.2 **Piping fabrication and joining details**

5.2.1 The requirements of this section apply to piping inside and outside the cargo tanks. However, the Administration may accept relaxations from these requirements for open-ended piping and for piping inside cargo tanks except for cargo piping serving other cargo tanks.

5.2.2 Cargo piping should be joined by welding except:

.1 for approved connections to shutoff valves and expansion joints; and

.2 for other exceptional cases specifically approved by the Administration.

5.2.3 The following direct connections of pipe lengths, without flanges may be considered:

.1 Butt welded joints with complete penetration at the root may be used in all applications.

.2 Slip-on welded joints with sleeves and related welding having dimensions satisfactory to the Administration should only be used for pipes with an external diameter of 50 mm or less. This type of joint should not be used when crevice corrosion is expected to occur.

.3 Screwed connections acceptable to the Administration should only be used for accessory lines and instrumentation lines with external diameters of 25 mm or less.

5.2.4 Expansion of piping should normally be allowed for by the provision of expansion loops or bends in the piping system.

.1 Bellows may be specially considered by the Administration in each case.

.2 Slip joints should not be used.

5.2.5 Welding, post weld heat treatment and non-destructive testing should be performed in accordance with Recognized Standards.

5.3 **Flange connections**

5.3.1 Flanges should be of the welded neck, slip-on or socket welded type. However, socket welded type flanges should not be used in nominal size above 50 mm.

5.3.2 Flanges should comply with standards acceptable to the Administration as to their type, manufacture and test.

5.4 **Test requirements for piping**

5.4.1 The test requirements of this section apply to piping inside and outside cargo tanks. However, the Administration may accept relaxations from these requirements for piping inside cargo tanks and open-ended piping.

5.4.2 After assembly, each cargo piping system should be subject to a hydrostatic test to at least 1.5 times the design pressure. When piping systems or parts of systems are completely manufactured and equipped with all fittings, the hydrostatic test may be conducted prior to installation aboard the ship. Joints welded on board should be hydrostatically tested to at least 1.5 times the design pressure.

5.4.3 After assembly on board, each cargo piping system should be tested for leaks to a pressure depending on the method applied.

5.5 Piping arrangements

5.5.1 Cargo piping should not be installed under deck between the outboard side of the cargo containment spaces and the skin of the ship unless clearances required for damage protection (see 2.6) are maintained; but such distances may be reduced where damage to the pipe would not cause release of cargo provided that the clearance required for inspection purposes is maintained.

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

.1 designed to preclude the risk of leakage;

.2 fitted on the bulkhead of the cargo tank which it serves;

.3 suitably protected against mechanical damage;

.4 fitted at a distance from the shell, as required for damage protection; and

.5 operable from the weather deck.

5.5.3 In any cargo pump room where a pump serves more than one tank, a stop valve should be fitted in the line to each tank.

5.5.4 Cargo piping installed in pipe tunnels should also comply with the requirements of 5.5.1 and 5.5.2. Pipe tunnels should satisfy all tank requirements for construction, location and ventilation and electrical hazard requirements. Cargo compatibility should be assured in the event of a piping failure. The tunnel should not have any other openings except to the weather deck and cargo pump room or pump room.

5.5.5 Cargo piping passing through bulkheads should be so arranged as to preclude excessive stresses at the bulkhead and should not utilize flanges bolted through the bulkhead.

5.6 **Cargo transfer control systems**

5.6.1 For the purpose of adequately controlling the cargo, cargo transfer systems should be provided with:

.1 one stop valve capable of being manually operated on each tank filling and discharge line, located near the tank penetration; if an individual deepwell pump is used to discharge the contents of a cargo tank, a stop valve is not required on the discharge line of that tank;

.2 one stop valve at each cargo hose connection;

.3 remote shutdown devices for all cargo pumps and similar equipment.

5.6.2 The controls necessary during transfer or transport of cargoes covered by the Code other than in cargo pump rooms which have been dealt with elsewhere in the Code should not be located below the weather deck.

5.6.3 For certain products additional cargo transfer control requirements are shown in column "m" in the table of chapter 17.

5.7 **Ship's cargo hoses**

5.7.1 Liquid and vapour hoses used for cargo transfer should be compatible with the cargo and suitable for the cargo temperature.

5.7.2 Hoses subject to tank pressure or the discharge pressure of pumps should be designed for a bursting pressure not less than 5 times the maximum pressure the hose will be subjected to during cargo transfer.

5.7.3 Each new type of cargo hose, complete with end fittings, should be prototype tested to a pressure not less than 5 times its specified maximum working pressure. The hose temperature during this prototype test should be the intended extreme service temperature. Hoses used for prototype testing should not be used for cargo service. Thereafter, before being placed in service, each new length of cargo hose produced should be hydrostatically tested at ambient temperature to a pressure not less than 1.5 times its specified maximum working pressure but not more than two-fifths of its bursting pressure. The hose should be stencilled or otherwise marked with its specified maximum working pressure and, if used in other than ambient temperature services, its maximum and minimum service temperature as applicable. The specified maximum working pressure should not be less than 10 bar gauge.

CHAPTER 6 – MATERIALS OF CONSTRUCTION

6.1 General

6.1.1 Structural materials used for tank construction, together with associated piping, pumps, valves, vents and their jointing materials, should be suitable at the temperature and pressure for the cargo to be carried to the satisfaction of the Administration. Steel is assumed to be the normal material of construction.

6.1.2 Where applicable the following should be taken into account in selecting the material of construction:

.1 notch ductility at the operating temperature;

.2 corrosive effect of the cargo;

.3 possibility of hazardous reactions between the cargo and the material of construction; and

.4 suitability of linings.

6.2 Special requirements for materials

6.2.1 For certain products special requirements apply in respect of materials indicated by symbols in column "k" in the table of chapter 17, as stipulated in 6.2.2, 6.2.3 and 6.2.4.

6.2.2 The following materials of construction should not be used for tanks, pipelines, valves, fittings and other equipment, which may come into contact with the products or their vapour where referred to in column "k" in the table of chapter 17:

N1 Aluminium, copper, copper alloys, zinc, galvanized steel and mercury.

N2 Copper, copper alloys, zinc and galvanized steel.

N3 Aluminium, magnesium, zinc, galvanized steel and lithium.

N4 Copper and copper-bearing alloys.

N5 Aluminium, copper and alloys of either.

N6 Copper, silver, mercury, magnesium and other acetylide-forming metals and their alloys.

N7 Copper and copper-bearing alloys with greater than 1% copper.

N8 Aluminium, zinc, galvanized steel and mercury.

6.2.3 Materials normally used in electrical apparatus, such as copper, aluminium and insulation, should as far as practicable be protected, e.g. by encapsulation, to prevent contact with vapours of products where referred to by Z in column "k" in the table of chapter 17.

6.2.4 The following materials of construction which may come into contact with certain products or their vapour should be used for tanks, pipelines, valves, fittings and other equipment, where referred to in column "k" in the table of chapter 17 as follows:

Y1 Steel covered with a suitable protective lining or coating, aluminium or stainless steel.

Y2 Aluminium or stainless steel for product concentrations of 98% or more.

Y3 Special acid-resistant stainless steel for product concentrations of less than 98%.

Y4 Solid austenitic stainless steel.

Y5 Steel covered with suitable protective lining or coating or stainless steel.

6.2.5 Materials of construction having a melting point below 925°C, e.g. aluminium and its alloys, should not be used for external piping involved in cargo handling operations on ships intended for the carriage of products with flashpoints not exceeding 60°C (closed cup test) unless so specified in column "k" in the table of chapter 17. Short lengths of external pipes connected to cargo tanks may be permitted by the Administration if they are provided with fire-resistant insulation.

CHAPTER 7 – CARGO TEMPERATURE CONTROL

7.1 General

7.1.1 When provided, any cargo heating or cooling systems should be constructed, fitted and tested to the satisfaction of the Administration. Materials used in the construction of temperature control systems should be suitable for use with the product intended to be carried.

7.1.2 Heating or cooling media should be of a type approved for use with the specific cargo. Consideration should be given to the surface temperature of heating coils or ducts to avoid dangerous reactions from localized overheating or over-cooling of cargo. (See also 15.13.6.)

7.1.3 Heating or cooling systems should be provided with valves to isolate the system for each tank and to allow manual regulation of flow.

7.1.4 In any heating or cooling system, means should be provided to ensure that, when in any condition other than empty, a higher pressure can be maintained within the system than the maximum pressure head that could be exerted by the cargo tank contents on the system.

7.1.5 Means should be provided for measuring the cargo temperature.

.1 The means for measuring the cargo temperature should be of restricted or closed type, respectively, when a restricted or closed gauging device is required for individual substances as shown in column "h" in the table of chapter 17.

.2 A restricted temperature measuring device is subject to the definition for a restricted gauging device in 13.1.1.2, e.g. a portable thermometer lowered inside a gauge tube of the restricted type.

.3 A closed temperature measuring device is subject to the definition for closed gauging device in 13.1.1.3, e.g. a remote-reading thermometer of which the sensor is installed in the tank.

.4 When overheating or overcooling could result in a dangerous condition, an alarm system which monitors the cargo temperature should be provided. (See also operational requirements in 16.6.)

7.1.6 When products for which 15.12, 15.12.1 or 15.12.3 are listed in column "m" in the table of chapter 17 are being heated or cooled, the heating or cooling medium should operate in a circuit:

.1 which is independent of other ship's services, except for another cargo heating or cooling system, and which does not enter the machinery space; or

.2 which is external to the tank carrying toxic products; or

.3 where the medium is sampled to check for the presence of cargo before it is recirculated to other services of the ship or into the machinery space. The sampling equipment should be located within the cargo area and be capable of detecting the presence of any toxic cargo being heated or cooled. Where this method is used, the coil return should be tested not only at the commencement of heating or cooling of a toxic product, but also on the first occasion the coil is used subsequent to having carried an unheated or uncooled toxic cargo.

7.2 Additional requirements

For certain products, additional requirements contained in chapter 15 are shown in column "m" in the table of chapter 17.

CHAPTER 8 – CARGO TANK VENT SYSTEMS

8.1 General

8.1.1 All cargo tanks should be provided with a venting system appropriate to the cargo being carried. Tank vent systems should be designed so as to minimize the possibility of cargo vapour accumulating about the decks, entering accommodation, service and machinery spaces and control stations and, in the case of flammable vapours, any spaces containing sources of ignition. They should also be designed to minimize possible spraying on to the decks. Vent outlets should be arranged to prevent entrance of water into the cargo tanks and, at the same time, should direct the vapour discharge upwards in the form of unimpeded jets.

8.1.2 Provision should be made to ensure that the liquid head in any tank does not exceed the test head of that tank. Suitable high-level alarms, overflow control systems or spill valves, together with gauging and tank filling procedures may be accepted for this purpose. Where the means of limiting cargo tank overpressure includes an automatic closing valve, the valve should comply with the appropriate provisions of 15.19.

8.1.3 For a tank equipped with closed or restricted gauging, the vent system should be sized, allowing for flame screens if fitted, to permit loading at the design rate without overpressurizing the tank. Specifically, under conditions in which a saturated cargo vapour is discharged through the venting system at the maximum anticipated loading rate, the pressure differential between the cargo tank vapour space and the atmosphere should not exceed 0.2 bar or, for independent tanks, the maximum working pressure of the tank.

8.1.4 Any flame screens fitted to the discharge openings of vent systems should be easily accessible and removable for cleaning.

8.1.5 Suitable provision should be made for drainage of vent lines.

8.1.6 Tank vent piping connected to cargo tanks of corrosion resistant material, or to tanks which are lined or coated to handle special cargoes, as required by the Code, should be similarly lined or coated, or constructed of corrosion-resistant material.

8.2 Types of tank vent systems*

8.2.1 Open tank venting system means a system which offers no restriction except for friction losses and flame screens if fitted, to the free flow of cargo vapours to and from the cargo tanks during normal operations and should only be used for those cargoes having a flashpoint above 60°C (closed cup test) and not offering a significant inhalation health hazard. An open venting system may consist of individual vents from each tank, or such individual vents may be combined into a common header or headers, with due regard to cargo segregation. However, in no case should shutoff valves be fitted either to the individual vents or to the header.

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* Attention is drawn to regulation II-2/59 of the 1983 amendments to the 1974 SOLAS Convention.

8.2.2 Controlled tank venting system means a system in which pressure/vacuum relief valves are fitted to each tank to limit the pressure or vacuum in the tank to be used for cargoes other than those for which open venting is permitted. A controlled venting system may consist of individual vents from each tank, or such individual vents, on the pressure side only, as may be combined into a common header or headers with due regard to cargo segregation. In no case should shutoff valves be fitted either above or below pressure/vacuum relief valves but provision may be made for bypassing the pressure/vacuum relief valves under certain operating conditions.

.1 The heights of vent outlets should not be less than 4 m above the weather deck or above the fore and aft gangway if fitted within 4 m of the gangway.

.2 The vent height may be reduced to 3 m above the deck or fore and aft gangway, as applicable, provided high-velocity vent valves of a type approved by the Administration directing the vapour-air mixture upwards in an unimpeded jet with an exit velocity of at least 30 m/s are fitted.

.3 The vent outlets should also be arranged at a distance of at least 10 m from the nearest air intake or openings to accommodation, service and machinery spaces and ignition sources. Flammable vapour outlets should be provided with readily renewable and effective flame screens or safety heads of an approved type. Due attention should be paid in the design of pressure/vacuum valves, flame screens and vent heads to the possibility of the blockage of these devices by the freezing of cargo vapour or by icing up in adverse weather conditions.

8.2.3 Reference in 8.2.1 and 8.2.2 to the use of shutoff valves in the vent lines should be interpreted to extend to all other means of stoppage, including spectacle blanks and blank flanges.

8.3 **Venting requirements for individual products**

Venting requirements for individual products are shown in column "e" and additional requirements in column "m" in the table of chapter 17.

CHAPTER 9 -- ENVIRONMENTAL CONTROL

9.1 General

9.1.1 Vapour spaces within cargo tanks and, in some cases, spaces surrounding cargo tanks may require to have specially controlled atmospheres.

9.1.2 There are four different types of control for cargo tanks, as follows:

.1 Inerting — by filling the cargo tank and associated piping systems and, where specified in chapter 15, the spaces surrounding the cargo tanks, with a gas or vapour which will not support combustion and which will not react with the cargo, and maintaining that condition.

.2 Padding — by filling the cargo tank and associated piping systems with a liquid, gas or vapour which separates the cargo from the air, and maintaining that condition.

.3 Drying — by filling the cargo tank and associated piping systems with moisture-free gas or vapour with a dewpoint of —40°C or below at atmospheric pressure, and maintaining that condition.

.4 Ventilation — forced or natural.

9.1.3 Where inerting or padding of cargo tanks is required:

.1 An adequate supply of inert gas for use in filling and discharging the cargo tanks should be carried or should be manufactured on board unless a shore supply is available. In addition, sufficient inert gas should be available on the ship to compensate for normal losses during transportation.

.2 The inert gas system on board the ship should be able to maintain a pressure of at least 0.07 bar gauge within the containment system at all times. In addition, the inert gas system should not raise the cargo tank pressure to more than the tank's relief valve setting.

.3 Where padding is used, similar arrangements for supply of the padding medium should be made as required for inert gas in .1 and .2.

.4 Means should be provided for monitoring ullage spaces containing a gas blanket to ensure that the correct atmosphere is being maintained.

.5 Inerting or padding arrangements or both, where used with flammable cargoes, should be such as to minimize the creation of static electricity during the admission of the inerting medium.

9.1.4 Where drying is used and dry nitrogen is used as the medium, similar arrangements for supply of the drying agent should be made to those required in 9.1.3. Where drying agents are used as the drying medium on all air inlets to the tank, sufficient medium should be carried for the duration of the voyage, taking into consideration the diurnal temperature range and the expected humidity.

9.2 Environmental control requirements for individual products

The required types of environmental control for certain products are shown in column "f" in the table of chapter 17.

CHAPTER 10 – ELECTRICAL INSTALLATIONS

10.1 General

10.1.1 The provisions of this chapter are applicable to ships carrying cargoes which are inherently, or due to their reaction with other substances, flammable or corrosive to the electrical equipment, and should be applied in conjunction with applicable electrical requirements of part D, chapter II-1 of the 1983 SOLAS amendments.

10.1.2.1 Electrical installations should be such as to minimize the risk of fire and explosion from flammable products. Electrical installations complying with this chapter should not be considered a source of ignition for the purposes of 8.2.2.3, having regard to 10.1.4.

10.1.2.2 Where the specific cargo is liable to damage the materials normally used in electrical apparatus, due consideration should be given to the particular characteristics of the materials chosen for conductors, insulation, metal parts, etc. as far as necessary, these components should be protected to prevent contact with gases or vapours liable to be encountered.

10.1.3 The Administration should take appropriate steps to ensure uniformity in the implementation and the application of the provisions of this chapter in respect of electrical installations*.

10.1.4 Electrical equipment and wiring should not be installed in the hazardous locations referred to in 10.2, unless essential for operational purposes, when the exceptions listed in 10.2.3 are permitted.

10.1.5 Where electrical equipment is installed in hazardous locations, as permitted in this chapter, it should be to the satisfaction of the Administration and certified by the relevent authorities recognized by the Administration for operation in the flammable atmosphere concerned, as indicated in column "g" in the table of chapter 17.

10.1.6 Absence of information on temperature class and apparatus group in column "g" in the table of chapter 17 means that data are not currently available, and this should not be confused with the non-flammable (NF) notation describing some substances. For guidance, indication is given if the flashpoint of a substance is in excess of 60°C (closed cup test). In the case of heated cargo, carriage conditions might need to be established and the requirements of 10.2.2 applied.

10.2 Hazardous locations and types of equipment and wiring

10.2.1 The restrictions in this section do not preclude the use of intrinsically safe systems and circuits in all hazardous locations including cargo piping. It is particularly recommended that intrinsically safe systems and circuits are used for measurement, monitoring, control and communication purposes .

10.2.2 Cargoes with a flashpoint exceeding 60°C (closed cup test):

.1 Cargo tanks and cargo piping are the only hazardous locations for such cargoes which have no qualification in column "m" in the table of chapter 17. Submerged cargo pump motors and their associated cables

* Reference is made to the Recommendations published by the International Electrotechnical Commission and in particular to Publication 92-502.

may, in exceptional circumstances for a specific cargo or for a clearly defined range of cargoes, be permitted by the Administration, due consideration having been given to the chemical and physical characteristics of the products. Arrangements should be made to prevent the energizing of motors and cables in flammable gas air mixtures and to de-energize the motors and cables in the event of low liquid level. Such a shutdown should be indicated by an alarm at the cargo control station.

.2 Where electrical equipment is located in a cargo pump room, due consideration should be given to the use of types of apparatus which ensure the absence of arcs or sparks and hot spots during normal operation, or which are of a certified safe type.

.3 Where the cargo is heated to within 15°C of its flashpoint value, the cargo pump room should be considered as a hazardous area as well as areas within 3 m of openings from tanks where the cargo is so heated, and within 3 m of the entrance or ventilation openings to cargo pump rooms. Electrical equipment installed within these locations should be of a certified safe type.

.4 Where the cargo is heated above its flashpoint value, the requirements of 10.2.3 are applicable.

10.2.3 For cargoes with a flashpoint not exceeding 60°C (closed cup test) without qualification in column "m" in the table of chapter 17, the hazardous locations are given below. In addition to intrinsically safe systems and circuits, the only electrical installations permitted in hazardous locations are the following:

.1 Cargo tanks and cargo piping:

No additional electrical equipment is permitted.

.2 Void spaces adjacent to, above or below integral tanks:

.2.1 Through runs of cables. Such cables should be installed in heavy gauge steel pipes with gastight joints. Expansion bends should not be fitted in such spaces.

.2.2 Electrical depth sounding or log devices and impressed current cathodic protection system anodes or electrodes. These devices should be housed in gastight enclosures; associated cables should be protected as referred to in 10.2.3.2.1.

.3 Hold spaces containing independent cargo tanks:

.3.1 Through runs of cables without any additional protection.

.3.2 Lighting fittings with pressurized enclosure or of the flameproof type. The lighting system should be divided between at least two branch circuits. All switches and protective devices should interrupt all poles or phases and should be located in a non-hazardous location.

.3.3 Electrical depth sounding or log devices and impressed current cathodic protection system anodes or electrodes. These devices should be housed in gastight enclosures.

.4 Cargo pump rooms and pump rooms in the cargo area:

.4.1 Lighting fittings with pressurized enclosures or of the flameproof type. The lighting system should be divided between at least two branch

circuits. All switches and all protective devices should interrupt all poles or phases and should be located in a non-hazardous location.

.4.2 Electrical motors for driving cargo pumps and any associated auxiliary pumps should be separated from these spaces by a gastight bulkhead or deck. Flexible couplings, or other means of maintaining alignment, should be fitted to the shafts between the driven equipment and its motors, and in addition, glands should be provided to the satisfaction of the Administration where the shafts pass through the bulkhead or deck. Such electrical motors should be located in a compartment having positive pressure ventilation.

.4.3 Flameproof general alarm audible indicator.

.5 Zones on open deck, or semi-enclosed spaces on open deck, within 3 m of any cargo tank outlet, gas or vapour outlet, cargo pipe flange, cargo valve or entrance and ventilation opening to cargo pump rooms; cargo area on open deck over all cargo tanks and cargo tank holds, including all ballast tanks and cofferdams within the cargo area, to the full width of the ship, plus 3 m fore and aft and up to a height of 2.4 m above the deck:

.5.1 equipment of a certified safe type, adequate for open deck use;

.5.2 through runs of cables.

.6 Enclosed or semi-enclosed spaces in which pipes containing cargoes are located; enclosed or semi-enclosed spaces immediately above cargo tanks (e.g. between decks) or having bulkheads above and in line with cargo tank bulkheads; enclosed or semi-enclosed spaces immediately above cargo pump rooms or above vertical cofferdams adjoining cargo tanks, unless separated by a gastight deck and suitably ventilated; and compartments for cargo hoses:

.6.1 Lighting fittings of a certified safe type. The lighting system should be divided between at least two branch circuits. All switches and protective devices should interrupt all poles or phases and should be located in a non-hazardous location.

.6.2 Through runs of cables.

.7 Enclosed or semi-enclosed spaces having a direct opening into any hazardous location referred to above should have electrical installations complying with the requirements for the space or zone into which the opening leads.

10.3. **Bonding**

Independent cargo tanks should be electrically bonded to the hull. All gasketed cargo pipe joints and hose connections should be electrically bonded.

10.4 **Electrical requirements for individual products**

Electrical requirements for individual products are shown in column "g" in the table of chapter 17.

CHAPTER 11 — FIRE PROTECTION AND FIRE EXTINCTION

11.1 Application

11.1.1 The requirements for tankers in chapter II-2 of the 1983 SOLAS amendments should apply to ships covered by the Code, irrespective of tonnage, including ships of less than 500 tons gross tonnage, except that:

.1 regulations 60, 61, 62 and 63 should not apply;

.2 regulation 56.2, i.e. the requirements for location of the main cargo control station, need not apply;

.3 regulation 4, as applicable to cargo ships, and regulation 7 should apply as they would apply to tankers of 2,000 tons gross tonnage and over;

.4 the provisions of 11.3 should apply in lieu of regulation 61; and

.5 the provisions of 11.2 should apply in lieu of regulation 63.

11.1.2 Notwithstanding the provisions of 11.1.1, ships engaged solely in the carriage of caustic potash solution, phosphoric acid or sodium hydroxide solution need not comply with part D of chapter II-2 of the 1983 SOLAS amendments, provided that they comply with part C of that chapter, except that regulation 53 need not apply to such ships and 11.2 and 11.3 hereunder need not apply.

11.2 Cargo pump rooms

11.2.1 The cargo pump room of any ship should be provided with a fixed fire-extinguishing system as follows:

.1 a carbon dioxide system as specified in regulation II-2/5.1 and .2 of the 1983 SOLAS amendments. A notice should be exhibited at the controls stating that the system is only to be used for fire-extinguishing and not for inerting purposes, due to the electrostatic ignition hazard. The alarms referred to in regulation II-2/5.1.6 of the 1983 SOLAS amendments should be safe for use in a flammable cargo vapour-air mixture. For the purpose of this requirement, an extinguishing system should be provided which would be suitable for machinery spaces. However, the amount of gas carried should be sufficient to provide a quantity of free gas equal to 45% of the gross volume of the cargo pump room in all cases; or

.2 a halogenated hydrocarbon system as specified in regulation II-2/5.1 and .3 of the 1983 SOLAS amendments. A notice should be exhibited at the controls stating that the system is only to be used for fire-extinguishing and not for inerting purposes, due to the electrostatic ignition hazard The alarms referred to in regulation II-2/5.1.6 of the 1983 SOLAS amendments should be safe for use in a flammable cargo vapour-air mixture. For the purpose of this requirement, an extinguishing system should be provided which would be suitable for machinery spaces but utilizing the following minimum design quantities based on the gross volume of the cargo pump room:

halon 1301	7%
halon 1211	5.5%
halon 2402	0.3 kg/m^3

11.2.2 Cargo pump rooms of ships which are dedicated to the carriage of a restricted number of cargoes should be protected by an appropriate fire-extinguishing system approved by the Administration.

11.2.3 A fire-extinguishing system consisting of either a fixed pressure water-spray system or a high-expansion foam system could be provided for a cargo pump room if it can be demonstrated to the Administration that cargoes will be carried which are not suited to extinguishment by carbon dioxide or halogenated hydrocarbons. The International Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk should reflect this conditional requirement.

11.3 Cargo area*

11.3.1 Every ship should be provided with a fixed deck foam system in accordance with the requirements of 11.3.2 to 11.3.12.

11.3.2 Only one type of foam concentrate should be supplied, and it should be effective for the maximum possible number of cargoes intended to be carried. For other cargoes for which foam is not effective or is incompatible, additional arrangements to the satisfaction of the Administration should be provided. Basic protein foams should not be used.

11.3.3 The arrangements for providing foam should be capable of delivering foam to the entire cargo tanks deck area as well as into any cargo tank, the deck of which is assumed to be ruptured.

11.3.4 The deck foam system should be capable of simple and rapid operation. The main control station for the system should be suitably located outside of the cargo area, adjacent to the accommodation spaces and readily accessible and operable in the event of fires in the areas protected.

11.3.5 The rate of supply of foam solution should be not less than the greatest of the following:

.1 2 ℓ/min per square metre of the cargo tanks deck area, where cargo tanks deck area means the maximum breadth of the ship times the total longitudinal extent of the cargo tank spaces;

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* Reference is made to MSC/Circ. 314 which provides guidance for calculating the capacity of foam systems for chemical tankers and may be used in applying the requirements for extinguishing media of the Code.

.2 20 ℓ/min per square metre of the horizontal sectional area of the single tank having the largest such area;

.3 10 ℓ/min per square metre of the area protected by the largest monitor, such area being entirely forward of the monitor, but not less than 1,250 ℓ/min. For ships of less than 4,000 tonnes deadweight, the minimum capacity of the monitor should be to the satisfaction of the Administration.

11.3.6 Sufficient foam concentrate should be supplied to ensure at least 30 min of foam generation when using the highest of the solution rates stipulated in 11.3.5.1, 11.3.5.2 and 11.3.5.3.

11.3.7 Foam from the fixed foam system should be supplied by means of monitors and foam applicators. At least 50% of the foam rate required in 11.3.5.1 or 11.3.5.2 should be delivered from each monitor. The capacity of any monitor should be at least 10 ℓ/min of foam solution per square metre of deck area protected by that monitor, such area being entirely forward of the monitor. Such capacity should be not less than 1,250 ℓ/min. For ships of less than 4,000 tonnes deadweight, the minimum capacity of the monitor should be to the satisfaction of the Administration.

11.3.8 The distance from the monitor to the farthest extremity of the protected area forward of that monitor should be not more than 75% of the monitor throw in still air conditions.

11.3.9 A monitor and hose connection for a foam applicator should be situated both port and starboard at the poop front or accommodation spaces facing the cargo area.

11.3.10 Applicators should be provided for flexibility of action during fire-fighting operations and to cover areas screened from the monitors. The capacity of any applicator should be not less than 400 ℓ/min and the applicator throw in still air conditions should be not less than 15 m. The number of foam applicators provided should be not less than four. The number and disposition of foam main outlets should be such that foam from at least two applicators can be directed to any part of the cargo tanks deck area.

11.3.11 Valves should be provided in the foam main, and in the fire main where this is an integral part of the deck foam system, immediately forward of any monitor position to isolate damaged sections of those mains.

11.3.12 Operation of a deck foam system at its required output should permit the simultaneous use of the minimum required number of jets of water at the required pressure from the fire main.

11.3.13 Ships which are dedicated to the carriage of a restricted number of cargoes should be protected by alternative provisions to the satisfaction of the Administration when they are just as effective for the products concerned as the deck foam system required for the generality of flammable cargoes.

11.3.14 Suitable portable fire-extinguishing equipment for the products to be carried should be provided and kept in good operating order.

11.3.15 Where flammable cargoes are to be carried all sources of ignition should be excluded from hazardous locations referred to in 10.2.

11.3.16 Ships fitted with bow or stern loading and unloading arrangements should be provided with one additional foam monitor meeting the requirements of 11.3.7 and one additional applicator meeting the requirements of 11.3.10. The additional monitor should be located to protect the bow or stern loading and unloading arrangements. The area of the cargo line forward or aft of the cargo area should be protected by the above-mentioned applicator.

11.4 **Special requirements**

Fire-extinguishing media considered to be suitable for certain products are listed for information in column "j" in the table of chapter 17.

CHAPTER 12 – MECHANICAL VENTILATION IN THE CARGO AREA

For ships to which the Code applies, the requirements of this chapter replace the requirements of regulation II-2/59.3 of the 1983 SOLAS amendments.

12.1 Spaces normally entered during cargo handling operations

12.1.1 Cargo pump rooms and other enclosed spaces which contain cargo handling equipment and similar spaces in which work is performed on the cargo should be fitted with mechanical ventilation systems, capable of being controlled from outside such spaces.

12.1.2 Provision should be made to ventilate such spaces prior to entering the compartment and operating the equipment and a warning notice requiring the use of such ventilation should be placed outside the compartment.

12.1.3 Mechanical ventilation inlets and outlets should be arranged to ensure sufficient air movement through the space to avoid the accumulation of toxic or flammable vapours or both (taking into account their vapour densities) and to ensure sufficient oxygen to provide a safe working environment, but in no case should the ventilation system have a capacity of less than 30 changes of air per hour based upon the total volume of the space. For certain products, increased ventilation rates for cargo pump rooms are prescribed in 15.17.

12.1.4 Ventilation systems should be permanent and should normally be of the extraction type. Extraction from above and below the floor plates should be possible. In rooms housing motors driving cargo pumps, the ventilation should be of the positive pressure type.

12.1.5 Ventilation exhaust ducts from spaces within the cargo area should discharge upwards in locations at least 10 m in the horizontal direction from ventilation intakes and openings to accommodation, service and machinery spaces and control stations and other spaces outside the cargo area.

12.1.6 Ventilation intakes should be so arranged as to minimize the possibility of recycling hazardous vapours from any ventilation discharge opening.

12.1.7 Ventilation ducts should not be led through accommodation, service and machinery spaces or other similar spaces.

12.1.8 Electric motors driving fans should be placed outside the ventilation ducts if the carriage of flammable products is intended. Ventilation fans and fan ducts, in way of fans only, for hazardous locations referred to in chapter 10 should be of nonsparking construction defined as:

.1 impellers and housing of nonmetallic construction, due regard being paid to the elimination of static electricity;

.2 impellers and housing of nonferrous materials;

.3 impellers and housing of austenitic stainless steel; and

.4 ferrous impellers and housing with not less than 13 mm design tip clearance.

Any combination of an aluminium or magnesium alloy fixed or rotating component and a ferrous fixed or rotating component, regardless of tip clearance, is considered a sparking hazard and should not be used in these places.

12.1.9 Sufficient spare parts should be carried for each type of fan on board, required by this chapter.

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

12.2 Pump rooms and other enclosed spaces normally entered

Pump rooms and other enclosed spaces normally entered, which are not covered by 12.1.1, should be fitted with mechanical ventilation systems, capable of being controlled from outside such spaces and complying with the requirements of 12.1.3, except that the capacity should not be less than 20 changes of air per hour, based upon the total volume of the space. Provision should be made to ventilate such spaces prior to entering.

12.3 Spaces not normally entered

Double bottoms, cofferdams, duct keels, pipe tunnels, hold spaces and other spaces where cargo may accumulate, should be capable of being ventilated to ensure a safe environment when entry into the spaces is necessary. Where a permanent ventilation system is not provided for such spaces, approved means of portable mechanical ventilation should be provided. Where necessary owing to the arrangement of spaces, for instance hold spaces, essential ducting for such ventilation should be permanently installed. For permanent installations, the capacity of eight air changes per hour should be provided and for portable systems the capacity of 16 air changes per hour. Fans or blowers should be clear of personnel access openings, and should comply with 12.1.8.

CHAPTER 13 – INSTRUMENTATION

13.1 Gauging

13.1.1 Cargo tanks should be fitted with one of the following types of gauging devices:

.1 *Open device* – which makes use of an opening in the tanks and may expose the gauger to the cargo or its vapour. An example of this is the ullage opening.

.2 *Restricted device* – which penetrates the tank and which, when in use, permits a small quantity of cargo vapour or liquid to be exposed to the atmosphere. When not in use, the device is completely closed. The design should ensure that no dangerous escape of tank contents (liquid or spray) can take place in opening the device.

.3 *Closed device* – which penetrates the tank, but which is part of a closed system and keeps tank contents from being released. Examples are the float-type systems, electronic probe, magnetic probe and protected sight glass. Alternatively an indirect device which does not penetrate the tank shell and which is independent of the tank may be used. Examples are weighing of cargo, pipe flow meter.

13.1.2 Gauging devices should be independent of the equipment required under 15.19.

13.1.3 Open gauging and restricted gauging should be allowed only where:

.1 open venting is allowed by the Code; or

.2 means are provided for relieving tank pressure before the gauge is operated.

13.1.4 Types of gauging for individual products are shown in column "h" in the table of chapter 17.

13.2 Vapour detection

13.2.1 Ships carrying toxic or flammable products or both should be equipped with at least two instruments designed and calibrated for testing for the specific vapours in question. If such instruments are not capable of testing for both toxic concentrations and flammable concentrations, then two separate sets of instruments should be provided.

13.2.2 Vapour detection instruments may be portable or fixed. If a fixed system is installed, at least one portable instrument should be provided.

13.2.3 When toxic vapour detection equipment is not available for some products which require such detection, as indicated in column "i" in the table of chapter 17, the Administration may exempt the ship from the requirement, provided an appropriate entry is made on the International Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk. When granting such an exemption, the Administration should recognize the necessity for additional breathing air supply and an entry should be made on the International Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk drawing attention to the provisions of 14.2.4 and 16.4.2.2.

13.2.4 Vapour detection requirements for individual products are shown in column "i" in the table of chapter 17.

CHAPTER 14 – PERSONNEL PROTECTION

14.1 Protective equipment

14.1.1 For the protection of crew members who are engaged in loading and discharging operations, the ship should have on board suitable protective equipment consisting of large aprons, special gloves with long sleeves, suitable footwear, coveralls of chemical-resistant material, and tight-fitting goggles or face shields or both. The protective clothing and equipment should cover all skin so that no part of the body is unprotected.

14.1.2 Work clothes and protective equipment should be kept in easily accessible places and in special lockers. Such equipment should not be kept within accommodation spaces, with the exception of new, unused equipment and equipment which has not been used since undergoing a thorough cleaning process. The Administration may, however, approve storage rooms for such equipment within accommodation spaces if adequately segregated from living spaces such as cabins, passageways, dining rooms, bathrooms, etc.

14.1.3 Protective equipment should be used in any operation which may entail danger to personnel.

14.2 Safety equipment

14.2.1 Ships carrying cargoes for which 15.12, 15.12.1 or 15.12.3 is listed in column "m" in the table of chapter 17 should have on board sufficient but not less than three complete sets of safety equipment each permitting personnel to enter a gas-filled compartment and perform work there for at least 20 min. Such equipment should be in addition to that required by regulation II-2/17 of the 1983 SOLAS amendments.

14.2.2 One complete set of safety equipment should consist of:

.1 one self-contained air-breathing apparatus (not using stored oxygen);

.2 protective clothing, boots, gloves and tight-fitting goggles;

.3 fireproof lifeline with belt resistant to the cargoes carried; and

.4 explosion-proof lamp.

14.2.3 For the safety equipment required in 14.2.1, all ships should carry the following, either:

.1 one set of fully charged spare air bottles for each breathing apparatus;

.2 a special air compressor suitable for the supply of high-pressure air of the required purity;

.3 a charging manifold capable of dealing with sufficient spare breathing apparatus air bottles for the breathing apparatus; or

.4 fully charged spare air bottles with a total free air capacity of at least 6,000 ℓ for each breathing apparatus on board in excess of the requirements of regulation II-2/17 of the 1983 SOLAS amendments.

14.2.4 A cargo pump room of ships carrying cargoes which are subject to the requirements of 15.18 or cargoes for which in column "i" in the table of chapter 17 toxic vapour detection equipment is required but is not available should have either:

.1 a low-pressure line system with hose connections suitable for use with the breathing apparatus required by 14.2.1. This system should provide sufficient high-pressure air capacity to supply, through pressure reduction devices, enough low-pressure air to enable two men to work in a gas-dangerous space for at least 1 h without using the air bottles of the breathing apparatus. Means should be provided for recharging the fixed air bottles and breathing apparatus air bottles from a special air compressor suitable for the supply of high-pressure air of the required purity; or

.2 an equivalent quantity of spare bottled air in lieu of the low-pressure air line.

14.2.5 At least one set of safety equipment as required by 14.2.2 should be kept in a suitable clearly marked locker in a readily accessible place near the cargo pump room. The other sets of safety equipment should also be kept in suitable, clearly marked, easily accessible, places.

14.2.6 The breathing apparatus should be inspected at least once a month by a responsible officer, and the inspection recorded in the ship's log-book. The equipment should be inspected and tested by an expert at least once a year.

14.2.7 A stretcher which is suitable for hoisting an injured person up from spaces such as the cargo pump room should be placed in a readily accessible location.

14.2.8 Ships intended for the carriage of certain cargoes should be provided with suitable respiratory and eye protection sufficient for every person on board for emergency escape purposes, subject to the following:

.1 filter-type respiratory protection should be accepted only when one filter is suitable for all designated cargoes that the ship is certified to carry;

.2 self-contained breathing apparatus should have normally at least a duration of service of 15 min;

.3 emergency escape respiratory protection should not be used for fire-fighting or cargo handling purposes and should be marked to that effect.

Individual cargoes to which the provisions of this paragraph apply are indicated in column "l" in the table of chapter 17.

14.2.9 The ship should have on board medical first-aid equipment including oxygen resuscitation equipment and antidotes for cargoes carried.

14.2.10 Suitably marked decontamination showers and an eyewash should be available on deck in convenient locations. The showers and eyewash should be operable in all ambient conditions.

CHAPTER 15 – SPECIAL REQUIREMENTS

The provisions of this chapter are applicable where specific reference is made in column "m" in the table of chapter 17. These requirements are additional to the general requirements of the Code.

15.1 Acetone cyanohydrin

Acetone cyanohydrin should be stabilized with an inorganic acid to prevent decomposition. A certificate of stabilization should be provided by the manufacturer, and kept on board, specifying:

.1 name and amount of stabilizer added;

.2 date stabilizer was added and duration of effectiveness;

.3 any temperature limitations qualifying the stabilizer's effective lifetime;

.4 the action to be taken should the length of voyage exceed the effective lifetime of the stabilizer.

15.2 Ammonium nitrate solution, 93% or less

15.2.1 The ammonium nitrate solution should contain at least 7% by weight of water. The acidity (pH) of the cargo when diluted with ten parts of water to one part of cargo by weight should be between 5.0 and 7.0. The solution should not contain more than 10 ppm chloride ions, 10 ppm ferric ions, and should be free of other contaminants.

15.2.2 Tanks and equipment for ammonium nitrate solution should be independent of tanks and equipment containing other cargoes or combustible products. Equipment which may in service, or when defective, release combustible products into the cargo, e.g. lubricants, should not be used. Tanks should not be used for seawater ballast.

15.2.3 Except where expressly approved by the Administration, ammonium nitrate solutions should not be transported in tanks which have previously contained other cargoes unless tanks and associated equipment have been cleaned to the satisfaction of the Administration.

15.2.4 The temperature of the heat exchanging medium in the tank heating system should not exceed 160°C. The heating system should be provided with a control system to keep the cargo at a bulk mean temperature of 140°C. High-temperature alarms at 145°C and 150°C and a low-temperature alarm at 125°C should be provided. Where the temperature of the heat exchanging medium exceeds 160°C an alarm should also be given. Temperature alarms and controls should be located on the navigating bridge.

15.2.5 If the bulk mean cargo temperature reaches 145°C, a cargo sample should be diluted with ten parts of distilled or demineralized water to one part of cargo by weight and the acidity (pH) should be determined by means of a narrow range

indicator paper or stick. Acidity (pH) measurements should then be taken every 24 h. If the acidity (pH) is found to be below 4.2, ammonia gas should be injected into the cargo until the acidity (pH) of 5.0 is reached.

15.2.6 A fixed installation should be provided to inject ammonia gas into the cargo. Controls for this system should be located on the navigating bridge. For this purpose, 300 kg of ammonia per 1,000 tonnes of ammonium nitrate solution should be available on board.

15.2.7 Cargo pumps should be of the centrifugal deepwell type or of the centrifugal type with water flushed seals.

15.2.8 Vent piping should be fitted with approved weatherhoods to prevent clogging. Such weatherhoods should be accessible for inspection and cleaning.

15.2.9 Hot work on tanks, piping and equipment which have been in contact with ammonium nitrate solution should only be done after all traces of ammonium nitrate have been removed, inside as well as outside.

15.3 Carbon disulphide

15.3.1 Provision should be made to maintain a water pad in the cargo tank during loading, unloading and transit. In addition, an inert gas pad should be maintained in the ullage space during transit.

15.3.2 All openings should be in the top of the tank, above the deck.

15.3.3 Loading lines should terminate near the bottom of the tank.

15.3.4 A standard ullage opening should be provided for emergency sounding.

15.3.5 Cargo piping and vent lines should be independent of piping and vent lines used for other cargo.

15.3.6 Pumps may be used for discharging cargo, provided they are of the deepwell or hydraulically driven submersible types. The means of driving a deepwell pump should not present a source of ignition for carbon disulphide and should not employ equipment that may exceed a temperature of 80°C.

15.3.7 If a cargo discharge pump is used, it should be inserted through a cylindrical well extending from the tank top to a point near the tank bottom. A water pad should be formed in this well before attempting pump removal unless the tank has been certified as gas-free.

15.3.8 Water or inert gas displacement may be used for discharging cargo, provided the cargo system is designed for the expected pressure and temperature.

15.3.9 Safety relief valves should be of stainless steel construction.

15.3.10 Because of its low ignition temperature and close clearances required to arrest its flame propagation, only intrinsically safe systems and circuits are permitted in the hazardous locations described in 10.2.3.

15.4 Diethyl ether

15.4.1 Unless inerted, natural ventilation should be provided for the voids around the cargo tanks while the vessel is under way. If a mechanical ventilation system is installed, all blowers should be of nonsparking construction. Mechanical ventilation equipment should not be located in the void spaces surrounding the cargo tanks.

15.4.2 Pressure relief valve settings should not be less than 0.2 bar gauge for gravity tanks.

15.4.3 Inert gas displacement may be used for discharging cargo from pressure tanks provided the cargo system is designed for the expected pressure.

15.4.4 In view of the fire hazard, provision should be made to avoid any ignition source or heat generation or both in the cargo area.

15.4.5 Pumps may be used for discharging cargo, provided that they are of a type designed to avoid liquid pressure against the shaft gland or are of a hydraulically operated submerged type and are suitable for use with the cargo.

15.4.6 Provision should be made to maintain the inert gas pad in the cargo tank during loading, unloading and transit.

15.5 Hydrogen peroxide solutions over 60% but not over 70%

15.5.1 Hydrogen peroxide solutions should be carried in dedicated ships only and no other cargoes should be carried.

15.5.2 Cargo tanks and associated equipment should be either pure aluminium (99.5%) or solid stainless steel (304L, 316, 316L or 316Ti), and passivated in accordance with approved procedures. Aluminium should not be used for piping on deck. All nonmetallic materials of construction for the containment system should neither be attacked by hydrogen peroxide nor contribute to its decomposition.

15.5.3 Pump rooms should not be used for cargo transfer operations.

15.5.4 Cargo tanks should be separated by cofferdams from oil fuel tanks or any other space containing flammable or combustible materials.

15.5.5 Tanks intended for the carriage of hydrogen peroxide should not be used for seawater ballast.

15.5.6 Temperature sensors should be installed at the top and bottom of the tank. Remote temperature readouts and continuous monitoring should be located on the navigating bridge. If the temperature in the tanks rises above 35°C, visible and audible alarms should be activated on the navigating bridge.

15.5.7 Fixed oxygen monitors (or gas sampling lines) should be provided in void spaces adjacent to tanks to detect leakage of the cargo into these spaces. Remote readouts, continuous monitoring (if gas sampling lines are used, intermittent sampling is satisfactory) and visible and audible alarms similar to those for the temperature sensors should also be located on the navigating bridge. The visible and

audible alarms should be activated if the oxygen concentration in these void spaces exceeds 30% by volume. Two portable oxygen monitors should also be available as back-up systems.

15.5.8 As a safeguard against uncontrolled decomposition, a cargo jettisoning system should be installed to discharge the cargo overboard. The cargo should be jettisoned if the temperature rise of the cargo exceeds a rate of 2°C per hour over a 5 h period or when the temperature in the tank exceeds 40°C.

15.5.9 Cargo tank venting systems should have pressure/vacuum relief valves for normal controlled venting, and rupture discs or a similar device for emergency venting, should tank pressure rise rapidly as a result of uncontrolled decomposition. Rupture discs should be sized on the basis of tank design pressure, tank size and anticipated decomposition rate.

15.5.10 A fixed water-spray system should be provided for diluting and washing away any concentrated hydrogen peroxide solution spilled on deck. The areas covered by the water-spray should include the manifold/hose connections and the tank tops of those tanks designated for carrying hydrogen peroxide solutions. The minimum application rate should satisfy the following criteria:

.1 The product should be diluted from the original concentration to 35% by weight within 5 min of the spill.

.2 The rate and estimated size of the spill should be based upon maximum anticipated loading and discharge rates, the time required to stop flow of cargo in the event of tank overfill or a piping/hose failure, and the time necessary to begin application of dilution water with actuation at the cargo control location or on the navigating bridge.

15.5.11 Hydrogen peroxide solutions should be stabilized to prevent decomposition. A certificate of stabilization should be provided by the manufacturer, and kept on board, specifying:

.1 name and amount of stabilizer added;

.2 date stabilizer was added and duration of effectiveness;

.3 any temperature limitations qualifying the stabilizer's effective lifetime;

.4 the action to be taken should the length of voyage exceed the effective lifetime of the stabilizer.

15.5.12 Only those hydrogen peroxide solutions which have a maximum decomposition rate of 1% per year at 25°C should be carried. Certification from the shipper that the product meets this standard should be presented to the master and kept on board. A technical representative of the manufacturer should be on board to monitor the transfer operations and have the capability to test the stability of the peroxide. He should certify to the master that the cargo has been loaded in a stable condition.

15.5.13 Protective clothing that is resistant to hydrogen peroxide solutions should be provided for each crew member involved in cargo transfer operations. Protective clothing should include non-flammable coveralls, suitable gloves, boots and eye protection.

15.6 Motor fuel anti-knock compounds (containing lead alkyls)

15.6.1 Tanks used for these cargoes should not be used for the transportation of any other cargo except those commodities to be used in the manufacture of motor fuel anti-knock compounds containing lead alkyls.

15.6.2 If a cargo pump room is located on deck level according to 15.18, the ventilation arrangements should be in compliance with 15.17.

15.6.3 Entry into cargo tanks used for the transportation of these cargoes is not permitted unless approved by the Administration.

15.6.4 Air analysis should be made for lead content to determine if the atmosphere is satisfactory prior to allowing personnel to enter the cargo pump room or void spaces surrounding the cargo tank.

15.7 Phosphorus, yellow or white

15.7.1 Phosphorus should, at all times, be loaded, carried and discharged under a water pad of 760 mm minimum depth. During discharge operations, arrangements should be made to ensure that water occupies the volume of phosphorus discharged. Any water discharged from a phosphorus tank should be returned only to a shore installation.

15.7.2 Tanks should be designed and tested to a minimum equivalent water head of 2.4 m above the top of the tank, under designed loading conditions, taking into account the depth, relative density and method of loading and discharge of the phosphorus.

15.7.3 Tanks should be so designed as to minimize the interfacial area between the liquid phosphorus and its water pad.

15.7.4 A minimum ullage space of 1% should be maintained above the water pad. The ullage space should be filled with inert gas or naturally ventilated by two cowled standpipes terminating at different heights but at least 6 m above the deck and at least 2 m above the pump house top.

15.7.5 All openings should be at the top of cargo tanks, and fittings and joints attached thereto should be of materials resistant to phosphorus pentoxide.

15.7.6 Phosphorus should be loaded at a temperature not exceeding 60°C.

15.7.7 Tank heating arrangements should be external to tanks and have a suitable method of temperature control to ensure that the temperature of the phosphorus does not exceed 60°C. A high-temperature alarm should be fitted.

15.7.8 A water drench system acceptable to the Administration should be installed in all void spaces surrounding the tanks. The system should operate automatically in the event of an escape of phosphorus.

15.7.9 Void spaces referred to in 15.7.8 should be provided with effective means of mechanical ventilation which should be capable of being sealed off quickly in an emergency.

15.7.10 Loading and discharge of phosphorus should be governed by a central system on the ship which, in addition to incorporating high-level alarms, should ensure that no overflow of tanks is possible and that such operations can be stopped quickly in an emergency from either ship or shore.

15.7.11 During cargo transfer, a water hose on deck should be connected to a water supply and kept flowing throughout the operation so that any spillage of phosphorus may be washed down with water immediately.

15.7.12 Ship-to-shore loading and discharge connections should be of a type approved by the Administration.

15.8 Propylene oxide

15.8.1 Propylene oxide transported under the provisions of this section should be acetylene-free.

15.8.2 Unless cargo tanks are properly cleaned, propylene oxide should not be carried in tanks which have contained as one of the three previous cargoes any product known to catalyse polymerization, such as:

.1 mineral acids (e.g. suphuric, hydrochloric, nitric);

.2 carboxylic acids and anhydrides (e.g. formic. acetic);

.3 halogenated carboxylic acids (e.g. chloroacetic);

.4 sulphonic acids (e.g. benzene sulphonic);

.5 caustic alkalis (e.g. sodium hydroxide, potassium hydroxide);

.6 ammonia and ammonia solutions;

.7 amines and amine solutions;

.8 oxidizing substances.

15.8.3 Before carrying propylene oxide, tanks should be thoroughly and effectively cleaned to remove all traces of previous cargoes from tanks and associated pipework, except where the immediate prior cargo has been propylene oxide. Particular care should be taken in the case of ammonia in tanks made of steel other than stainless steel.

15.8.4 In all cases, the effectiveness of cleaning procedures for tanks and associated pipework should be checked by suitable testing or inspection to ascertain that no traces of acidic or alkaline materials remain that might create a hazardous situation in the presence of propylene oxide.

15.8.5 Tanks should be entered and inspected prior to each initial loading of propylene oxide to ensure freedom from contamination, heavy rust deposits and visible structural defects. When cargo tanks are in continuous propylene oxide service, such inspections should be performed at intervals of not more than 2 years.

15.8.6 Tanks for the carriage of propylene oxide should be of steel or stainless steel construction. Suitable tank coatings may be accepted as such by the Administration and noted on the International Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk.

15.8.7 Tanks which have contained propylene oxide may be used for other cargoes after thorough cleaning of tanks and associated pipework systems by washing or purging.

15.8.8 All valves, flanges, fittings and accessory equipment should be of a type suitable for use with propylene oxide and should be constructed of steel or stainless steel or other material acceptable to the Administration. The chemical composition of all material used should be submitted to the Administration for approval prior to fabrication. Discs or disc faces, seats and other wearing parts of valves should be made of stainless steel containing not less than 11% chromium.

15.8.9 Gaskets should be constructed of materials which do not react with, dissolve in, or lower the autoignition temperature of propylene oxide and which are fire-resistant and possess adequate mechanical behaviour. The surface presented to the cargo should be polytetrafluoroethylene (PTFE) or materials giving a similar degree of safety by their inertness. Spirally-wound stainless steel with a filler of PTFE or similar fluorinated polymer may be accepted by the Administration.

15.8.10 Insulation and packing, if used, should be of a material which does not react with, dissolve in, or lower the autoignition temperature of propylene oxide.

15.8.11 The following materials are generally found unsatisfactory for gaskets, packing and similar uses in propylene oxide containment systems and would require testing before being approved by the Administration:

.1 neoprene or natural rubber, if it comes into contact with propylene oxide;

.2 asbestos, or binders used with asbestos;

.3 materials containing oxides of magnesium, such as mineral wools.

15.8.12 Threaded joints should not be permitted in the cargo liquid and vapour lines.

15.8.13 Filling and discharge piping should extend to within 100 mm of the bottom of the tank or any sump pit.

15.8.14 The containment system for a tank containing propylene oxide should have a valved vapour return connection.

15.8.15 Propylene oxide should be loaded and discharged in such a manner that venting of the tanks to atmosphere does not occur. If vapour return to shore is used during tank loading, the vapour return system connected to a propylene oxide containment system should be independent of all other containment systems.

15.8.16 During discharging operations, the pressure in the cargo tank should be maintained above 0.07 bar gauge.

15.8.17 Tanks carrying propylene oxide should be vented independently of tanks carrying other products. Facilities should be provided for sampling the tank contents without opening the tank to atmosphere.

15.8.18 The cargo should be discharged only by deepwell pumps, hydraulically operated submerged pumps, or inert gas displacement. Each cargo pump should be arranged to ensure that the propylene oxide does not heat significantly if the discharge line from the pump is shut off or otherwise blocked.

15.8.19 Cargo hoses used for transfer of propylene oxide should be marked "FOR PROPYLENE OXIDE TRANSFER ONLY"

15.8.20 Cargo tanks, void spaces and other enclosed spaces, adjacent to an integral gravity cargo tank, should either contain a compatible cargo (those cargoes specified in 15.8.2 are examples of substances considered incompatible) or be inerted by injection of a suitable inert gas. Any hold space in which an independent cargo tank is located should be inerted. Such inerted spaces and tanks should be monitored for propylene oxide and oxygen. Portable sampling equipment is satisfactory. The oxygen content of these spaces should be maintained below 2%.

15.8.21 In no case should air be allowed to enter the cargo pump or piping system while propylene oxide is contained within the system.

15.8.22 Prior to disconnecting shore-lines, the pressure in liquid and vapour lines should be relieved through suitable valves installed at the loading header. Liquid and vapour from these lines should not be discharged to atmosphere.

15.8.23 Propylene oxide may be carried in pressure tanks or in independent or integral gravity tanks. Tanks should be designed for the maximum pressure expected to be encountered during loading, conveying and discharging cargo.

15.8.24 Cargo tanks with a design pressure less than 0.6 bar gauge should have a cooling system to maintain the propylene oxide below the reference temperature. Reference temperature (R) means, in the case of propylene oxide, the temperature corresponding to the vapour pressure of the propylene oxide at the set pressure of the pressure relief valve.

15.8.25 The refrigeration requirement for tanks with a design pressure less than 0.6 bar gauge may be waived by the Administration if the ship is operating in restricted areas or in voyages of restricted duration, and account may be taken in such cases of any insulation of the tanks. The area and times of year for which such carriage would be permitted should be included in the conditions of carriage on the International Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk.

15.8.26 Any cooling system should maintain the liquid temperature below the boiling temperature at the containment pressure. At least two complete cooling plants automatically regulated by variations within the tanks should be provided. Each cooling plant should be complete with the necessary auxiliaries for proper operation. The control system should also be capable of being manually operated. An alarm should be provided to indicate malfunctioning of the temperature controls. The capacity of each cooling system should be sufficient to maintain the temperature of the liquid cargo below the reference temperature (R).

15.8.27 An alternative arrangement may consist of three cooling plants, any two of which should be sufficient to maintain the liquid temperature below the reference temperature (R).

15.8.28 Cooling media which are separated from propylene oxide by a single wall only should be nonreactive with the propylene oxide.

15.8.29 Cooling systems requiring compression of propylene oxide should not be used.

15.8.30 Pressure relief valve settings should not be less than 0.2 bar gauge, or greater than 7.0 bar gauge, for pressure tanks.

15.8.31 The piping system for tanks to be loaded with propylene oxide should be separate (as defined in 1.3.24) from piping systems for all other tanks, including empty tanks. If the piping system for the tanks to be loaded is not independent (as defined in 1.3.15), the required piping separation should be accomplished by the removal of spool pieces, valves, or other pipe sections, and the installation of blank flanges at these locations. The required separation applies to all liquid and vapour piping, liquid and vapour vent lines and any other possible connections such as common inert gas supply lines.

15.8.32 Propylene oxide may be transported only in accordance with cargo handling plans that have been approved by the Administration. Each intended loading arrangement should be shown on a separate cargo handling plan. Cargo handling plans should show the entire cargo piping system and the locations for installation of blank flanges needed to meet the above piping separation requirements. A copy of each approved cargo handling plan should be maintained on board the ship. The International Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk should be endorsed to include reference to the approved cargo handling plans.

15.8.33 Before each loading of propylene oxide, certification verifying that the required piping separation has been achieved should be obtained from a responsible person acceptable to the port Administration and should be carried on board the ship. Each connection between a blank flange and a pipeline flange should be fitted with a wire and seal by the responsible person to ensure that inadvertent removal of the blank flange is impossible.

15.8.34.1 No cargo tanks should be more than 98% liquid full at the reference temperature (R).

15.8.34.2 The maximum volume (V_L) of cargo to be loaded in a tank should be:

$$V_L = 0.98\,V\,\frac{\rho_R}{\rho_L}$$

where V = volume of the tank

ρ_R = relative density of cargo at the reference temperature (R)

ρ_L = relative density of cargo at the loading temperature

R = reference temperature corresponding to the vapour pressure of the cargo at the set pressure of the pressure relief valve.

15.8.34.3 The maximum allowable tank filling limits for each cargo tank should be indicated, for each loading temperature which may be applied and for the applicable maximum reference temperature, on a list to be approved by the Administration. A copy of the list should be permanently kept on board by the master.

15.8.35 The cargo should be carried under a suitable protective padding of nitrogen gas. An automatic nitrogen make-up system should be installed to prevent the tank pressure falling below 0.07 bar gauge in the event of product temperature fall due to ambient conditions or maloperation of refrigeration systems. Sufficient nitrogen should be available on board to satisfy the demand of the automatic pressure control. Nitrogen of commercially pure quality (99.9% by volume) should be used for padding. A battery of nitrogen bottles connected to the cargo tanks through a pressure reduction valve satisfies the intention of the expression "automatic" in this context.

15.8.36 The cargo tank vapour space should be tested prior to and after loading to ensure that the oxygen content is 2% by volume or less.

15.8.37 A water spray system of sufficient capacity should be provided to blanket effectively the area surrounding the loading manifold, the exposed deck piping associated with product handling and the tank domes. The arrangement of piping and nozzles should be such as to give a uniform distribution rate of 10 ℓ/min per square metre. The water-spray system should be capable of both local and remote manual operation and the arrangement should ensure that any spilled cargo is washed away. Additionally, a water hose with pressure to the nozzle, when atmospheric temperatures permit, should be connected ready for immediate use during loading and unloading operations.

15.8.38 A remotely operated, controlled closing-rate shutoff valve should be provided at each cargo hose connection used during cargo transfer.

15.9 Sodium chlorate solution, 50% or less

15.9.1 Tanks and associated equipment which have contained this product may be used for other cargoes after thorough cleaning by washing or purging.

15.9.2 In the event of spillage of this product, all spilled liquid should be thoroughly washed away without delay. To minimize fire risk, spillage should not be allowed to dry out.

15.10 Sulphur liquid

15.10.1 Cargo tank ventilation should be provided to maintain the concentration of hydrogen sulphide below one half of its lower explosive limit throughout the cargo tank vapour space for all conditions of carriage, i.e. below 1.85% by volume.

15.10.2 Where mechanical ventilation systems are used for maintaining low gas concentrations in cargo tanks, an alarm system should be provided to give warning if the system fails.

15.10.3 Ventilation systems should be so designed and arranged as to preclude depositing of sulphur within the system.

15.10.4 Openings to void spaces adjacent to cargo tanks should be so designed and fitted as to prevent the entry of water, sulphur or cargo vapour.

15.10.5 Connections should be provided to permit sampling and analysing of vapour in void spaces.

15.10.6 Cargo temperature controls should be provided to ensure that the temperature of the sulphur does not exceed 155°C.

15.11 Acids

15.11.1 The ship's shell plating should not form any boundaries of tanks containing mineral acids.

15.11.2 Proposals for lining steel tanks and related piping systems with corrosion-resistant materials may be considered by the Administration. The elasticity of the lining should not be less than that of the supporting boundary plating.

15.11.3 Unless constructed wholly of corrosion-resistant materials or fitted with an approved lining, the plating thickness should take into account the corrosivity of the cargo.

15.11.4 Flanges of the loading and discharge manifold connections should be provided with shields, which may be portable, to guard against the danger of the cargo being sprayed; and, in addition, drip trays should also be provided to guard against leakage on to the deck.

15.11.5 Because of the danger of evolution of hydrogen when these substances are being carried, the electrical arrangements should comply with 10.2.3.1, 10.2.3.2, 10.2.3.3, 10.2.3.4, 10.2.3.6 and 10.2.3.7. The certified safe type equipment should be suitable for use in hydrogen-air mixtures. Other sources of ignition should not be permitted in such spaces.

15.11.6 Substances subjected to the requirements of this section should be segregated from oil fuel tanks, in addition to the segregation requirements in 3.1.1.

15.11.7 Provision should be made for suitable apparatus to detect leakage of cargo into adjacent spaces.

15.11.8 The cargo pump room bilge pumping and drainage arrangements should be of corrosion-resistant materials.

15.12 Toxic products

15.12.1 Exhaust openings of tank vent systems should be located:

.1 at a height of B/3 or 6 m, whichever is greater, above the weather deck or, in the case of a deck tank, the access gangway;

.2 not less than 6 m above the fore and aft gangway, if fitted within 6 m of the gangway; and

.3 15 m from any opening or air intake to any accommodation and service spaces;

.4 the vent height may be reduced to 3 m above the deck or fore and aft gangway, as applicable, provided high-velocity vent valves of a type approved by the Administration, directing the vapour-air mixture upwards in an unimpeded jet with an exit velocity of at least 30 m/s, are fitted.

15.12.2 Tank venting systems should be provided with a connection for a vapour return line to the shore installation.

15.12.3 Products should:

.1 not be stowed adjacent to oil fuel tanks;

.2 have separate piping systems; and

.3 have tank vent systems separate from tanks containing nontoxic products.

(See also 3.7.2)

15.12.4 Cargo tank relief valve settings should be a minimum of 0.2 bar gauge.

15.13 **Cargoes inhibited against self-reaction**

15.13.1 Certain cargoes, with a reference in column "m" in the table of chapter 17, by the nature of their chemical make-up tend to polymerize under certain conditions of temperature, exposure to air or contact with a catalyst. Mitigation of this tendency is carried out by introducing small amounts of chemical inhibitors into the liquid cargo or controlling the cargo tank environment.

15.13.2 Ships carrying these cargoes should be so designed as to eliminate from the cargo tanks and cargo handling system any material of construction or contaminants which could act as a catalyst or destroy the inhibitor.

15.13.3 Care should be taken to ensure that these cargoes are sufficiently inhibited to prevent polymerization at all times during the voyage. Ships carrying such cargoes should be provided with a certificate of inhibition from the manufacturer, and kept during the voyage, specifying:

.1 name and amount of inhibitor added;

.2 date inhibitor was added and duration of effectiveness;

.3 any temperature limitations qualifying the inhibitor's effective lifetime;

.4 the action to be taken should the length of voyage exceed the effective lifetime of the inhibitor.

15.13.4 Ships using the exclusion of air as the method of preventing self-reaction of the cargo should comply with 9.1.3.

15.13.5 Venting systems should be of a design that eliminates blockage from polymer build-up. Venting equipment should be of a type that can be checked periodically for adequacy of operation.

15.13.6 Crystallization or solidification of cargoes normally carried in the molten state can lead to depletion of inhibitor in parts of the tank contents. Subsequent remelting can thus yield pockets of uninhibited liquid, with the accompanying risk of dangerous polymerization. To prevent this, care should be taken to ensure that at no time are such cargoes allowed to crystallize or solidify, either wholly or partially, in any part of the tank. Any required heating arrangements should be such as to ensure that in no part of the tank does cargo become overheated to such an extent that any dangerous polymerization can be initiated. If the temperature from steam coils would induce overheating, an indirect low-temperature heating system should be used.

15.14 Cargoes with a vapour pressure greater than 1.013 bar absolute at 37.8°C

15.14.1 For a cargo referenced in column "m" in the table of chapter 17 to this section, a mechanical refrigeration system should be provided unless the cargo system is designed to withstand the vapour pressure of the cargo at 45°C. Where the cargo system is designed to withstand the vapour pressure of the cargo at 45°C, and no refrigeration system is provided, a notation should be made in the conditions of carriage on the International Certificate of Fitness for the Carriage of Dangerous Chemicals in Bulk to indicate the required relief valve setting for the tanks.

15.14.2 A mechanical refrigeration system should maintain the liquid temperature below the boiling temperature at the cargo tank design pressure.

15.14.3 When ships operate in restricted areas and at restricted times of the year, or on voyages of limited duration, the Administration involved may agree to waive requirements for a refrigeration system. A notation of any such agreement, listing geographic area restrictions and times of the year, or voyage duration limitations, should be included in the conditions of carriage on the International Certificate for the Carriage of Dangerous Chemicals in Bulk.

15.14.4 Connections should be provided for returning expelled gases to shore during loading.

15.14.5 Each tank should be provided with a pressure gauge which indicates the pressure in the vapour space above the cargo.

15.14.6 Where the cargo needs to be cooled, thermometers should be provided at the top and bottom of each tank.

15.14.7.1 No cargo tanks should be more than 98% liquid full at the reference temperature (R).

15.14.7.2 The maximum volume (V_L) of cargo to be loaded in a tank should be:

$$V_L = 0.98\, V \frac{\rho_R}{\rho_L}$$

where V = volume of the tank

ρ_R = relative density of cargo at the reference temperature (R)

ρ_L = relative density of cargo at the loading temperature

R = reference temperature corresponding to the vapour pressure of the cargo at the set pressure of the pressure relief valve.

15.14.7.3 The maximum allowable tank filling limits for each cargo tank should be indicated for each loading temperature which may be applied, and for the applicable maximum reference temperature, on a list approved by the Administration. A copy of the list should be permanently kept on board by the master.

15.15 **Cargoes with low ignition temperature and wide flammability range**

For ships carrying such cargoes, the distance requirements of 10.2.3.5 should be increased to at least 4.5 m.

15.16 **Cargo contamination**

15.16.1 Where column "m" in the table of chapter 17 refers to this section, alkaline or acidic materials, such as caustic soda or sulphuric acid, should not be allowed to contaminate the cargo.

15.16.2 Where column "m" in the table of chapter 17 refers to this section, water should not be allowed to contaminate this cargo. In addition, the following provisions apply:

.1 Air inlets to pressure/vacuum relief valves of tanks containing the cargo should be situated at least 2 m above the weather deck.

.2 Water or steam should not be used as the heat transfer media in a cargo temperature control system required by chapter 7.

.3 The cargo should not be carried in cargo tanks adjacent to permanent ballast or water tanks unless the tanks are empty and dry.

.4 The cargo should not be carried in tanks adjacent to slop tanks or cargo tanks containing ballast or slops or other cargoes containing water which may react in a dangerous manner. Pumps, pipes or vent lines serving such tanks should be separate from similar equipment serving tanks containing the cargo. Pipelines from slop tanks or ballast lines should not pass through tanks containing the cargo unless encased in a tunnel.

15.17 **Increased ventilation requirements**

For certain products, the ventilation system as described in 12.1.3 should have a minimum capacity of at least 45 changes of air per hour based upon the total volume of space. The ventilation system exhaust ducts should discharge at least 10 m away from openings into accommodation spaces, work areas or other similar spaces, and intakes to ventilation systems, and at least 4 m above the tank deck.

15.18 Special cargo pump room requirements

For certain products, the cargo pump room should be located on the deck level or cargo pumps should be located in the cargo tank. The Administration may give special consideration to cargo pump rooms below deck.

15.19 Overflow control

15.19.1 The provisions of this section are applicable where specific reference is made in column "m" in the table of chapter 17, and are in addition to the requirements for gauging devices.

15.19.2 In the event of a power failure on any system essential for safe loading, an alarm should be given to the operators concerned.

15.19.3 Loading operations should be terminated at once in the event of any system essential for safe loading becoming inoperative.

15.19.4 Level alarms should be capable of being tested prior to loading.

15.19.5 The high-level alarm system required under 15.19.6 should be independent of the overflow control system required by 15.19.7 and should be independent of the equipment required by 13.1.

15.19.6 Cargo tanks should be fitted with a visual and audible high-level alarm which complies with 15.19.1 to 15.19.5 and which indicates when the liquid level in the cargo tank approaches the normal full condition.

15.19.7 A tank overflow control system required by this section should:

.1 come into operation when the normal tank loading procedures fail to stop the tank liquid level exceeding the normal full condition;

.2 give a visual and audible tank overflow alarm to the ship's operator; and

.3 provide an agreed signal for sequential shutdown of onshore pumps or valves or both and of the ship's valves. The signal, as well as the pump and valve shutdown, may be dependent on operator's intervention. The use of shipboard automatic closing valves should be permitted only when specific approval has been obtained from the Administration and the port Administrations concerned.

15.19.8 The loading rate (LR) of the tank should not exceed:

$$LR = \frac{3600\ U}{t}\ (m^3/h)$$

where U = ullage volume (m^3) at operating signal level;

t = time (s) needed from the initiating signal to fully stopping the cargo flow into the tank, being the sum of times needed for each step in sequential operations such as operator's responses to signals, stopping pumps and closing valves;

and should also take into account the pipeline system design pressure.

CHAPTER 16 – OPERATIONAL REQUIREMENTS*

16.1 Maximum allowable quantity of cargo per tank

16.1.1 The quantity of a cargo required to be carried in a type 1 ship should not exceed 1,250 m^3 in any one tank.

16.1.2 The quantity of a cargo required to be carried in a type 2 ship should not exceed 3,000 m^3 in any one tank.

16.1.3 Tanks carrying liquids at ambient temperatures should be so loaded as to avoid the tank becoming liquid-full during the voyage, having due regard to the highest temperature which the cargo may reach.

16.2 Cargo information

16.2.1 A copy of this Code, or national regulations incorporating the provisions of this Code, should be on board every ship covered by this Code.

16.2.2 Any cargo offered for bulk shipment should be indicated in the shipping documents by the correct technical name. Where the cargo is a mixture, an analysis indicating the dangerous components contributing significantly to the total hazard of the product should be provided, or a complete analysis if this is available. Such an analysis should be certified by the manufacturer or by an independent expert acceptable to the Administration.

16.2.3 Information should be on board, and available to all concerned, giving the necessary data for the safe carriage of the cargo. Such information should include a cargo stowage plan to be kept in an accessible place, indicating all cargo on board, including each dangerous chemical carried:

.1 a full description of the physical and chemical properties, including reactivity necessary for the safe containment of the cargo;

.2 action to be taken in the event of spills or leaks;

.3 counter-measures against accidental personal contact;

.4 fire-fighting procedures and fire-fighting media;

.5 procedures for cargo transfer, tank cleaning, gas-freeing and ballasting;

.6 for those cargoes required to be stabilized or inhibited in accordance with 15.1, 15.5.11 or 15.13.3, the cargo should be refused if the certificate required by these paragraphs is not supplied.

16.2.4 If sufficient information necessary for the safe transportation of the cargo is not available, the cargo should be refused.

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* Attention is also drawn to the operation guidelines contained in the ICS Tanker Safety Guide (Chemicals).

16.2.5 Cargoes which evolve highly toxic imperceptible vapours should not be transported unless perceptible additives are introduced into the cargo.

16.3 Personnel training*

16.3.1 All personnel should be adequately trained in the use of protective equipment and have basic training in the procedures appropriate to their duties, necessary under emergency conditions.

16.3.2 Personnel involved in cargo operations should be adequately trained in handling procedures.

16.3.3 Officers should be trained in emergency procedures to deal with conditions of leakage, spillage or fire involving the cargo, and a sufficient number of them should be instructed and trained in essential first aid for cargoes carried.

16.4 Opening of and entry into cargo tanks

16.4.1 During handling and carriage of cargoes producing flammable or toxic vapours, or both, or when ballasting after the discharge of such cargo, or when loading or unloading cargo, cargo tank lids should always be kept closed. With any hazardous cargo, cargo tank lids, ullage and sighting ports and tank washing access covers should be open only when necessary.

16.4.2 Personnel should not enter cargo tanks, void spaces around such tanks, cargo handling spaces or other enclosed spaces unless:

.1 the compartment is free of toxic vapours and not deficient in oxygen; or

.2 personnel wear breathing apparatus and other necessary protective equipment, and the entire operation is under the close supervision of a responsible officer.

16.4.3 Personnel should not enter such spaces when the only hazard is of a purely flammable nature, except under the close supervision of a responsible officer.

16.5 Stowage of cargo samples

16.5.1 Samples which have to be kept on board should be stowed in a designated space situated in the cargo area or, exceptionally, elsewhere, subject to the approval of the Administration.

16.5.2 The stowage space should be:

.1 cell-divided in order to avoid shifting of the bottles at sea;

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* Reference is made to the provisions of the International Convention on Standards of Training, Certification and Watchkeeping for Seafarers, 1978, and in particular to the "Mandatory minimum requirements for the training and qualifications of masters, officers and ratings of chemical tankers" – regulation V/2, chapter V of the Annex to that Convention and to resolution 11 of the International Conference on Training and Certification of Seafarers, 1978.

.2 made of material fully resistant to the different liquids intended to be stowed; and

.3 equipped with adequate ventilation arrangements.

16.5.3 Samples which react with each other dangerously should not be stowed close to each other.

16.5.4 Samples should not be retained on board longer than necessary.

16.6 Cargoes not to be exposed to excessive heat

16.6.1 Where the possibility exists of a dangerous reaction of a cargo such as polymerization, decomposition, thermal instability or evolution of gas, resulting from local overheating of the cargo in either the tank or associated pipelines, such cargo should be loaded and carried adequately segregated from other products whose temperature is sufficiently high to initiate a reaction of such cargo (see 7.1.5.4).

16.6.2 Heating coils in tanks carrying this product should be blanked off or secured by equivalent means.

16.6.3 Heat-sensitive products should not be carried in deck tanks which are not insulated.

16.7 Additional operational requirements

The code contains additional operational requirements in:

3.1.1	15.3.8	15.8.28
3.1.2.1	15.4.6	15.8.29
3.1.2.2	15.5	15.8.31
3.1.4	15.6.1	15.8.32
3.5.2	15.6.3	15.8.33
3.7.4	15.6.4	15.8.34.1
7.1.2	15.7.1	15.8.34.2
7.1.6.3	15.7.6	15.8.34.3
9.1.4	15.7.11	15.8.35
9.2	15.8.1	15.8.36
11.3.2	15.8.2	15.8.37
11.4	15.8.3	15.9
12.1.2	15.8.4	15.10.1
12.2	15.8.5	15.11.4
13.2.1	15.8.7	15.11.6
13.2.2	15.8.15	15.12.3.1
13.2.3	15.8.16	15.13
13.2.4	15.8.17	15.14.7.1
Ch.14	15.8.19	15.14.7.2
15.1	15.8.20	15.14.7.3
15.3.1	15.8.21	15.16
15.3.7	15.8.22	15.19.8

CHAPTER 17 – SUMMARY OF MINIMUM REQUIREMENTS

EXPLANATORY NOTES

Product name (column a)	The product names are not always identical with those given in the Bulk Chemical Code, as amended, (adopted by resolution A.212(VII)). (For explanation see index of chemicals).
UN number (column b)	The number relating to each product shown in the recommendations proposed by the United Nations Committee of Experts on the Transport of Dangerous Goods. UN numbers, where available, are given for information only.
Ship type (column c)	1 = ship type 1 (2.1.2) 2 = ship type 2 (2.1.2) 3 = ship type 3 (2.1.2)
Tank type (column d)	1 = independent tank (4.1.1) 2 = integral tank (4.1.2) G = gravity tank (4.1.3) P = pressure tank (4.1.4)
Tank vents (column e)	Open: open venting Cont: controlled venting SR: safety relief valve
Tank environmental control* (column f)	Inert: inerting (9.1.2.1) Pad: liquid or gas (9.1.2.2) Dry: drying (9.1.2.3) Vent: natural or forced (9.1.2.4)
Electrical equipment (column g)	T1 to T6: temperature classes** IIA, IIB or IIC: apparatus groups** NF: nonflammable product (10.1.6) Yes: flashpoint exceeding 60°C (closed cup test) (10.1.6)
Gauging (column h)	O : open gauging (13.1.1.1) R : restricted gauging (13.1.1.2) C : closed gauging (13.1.1.3) I : indirect gauging (13.1.1.3)

* "No" indicates nil requirements.

** Temperature classes and apparatus groups as defined in International Electrotechnical Commission Publication 79 (Part 1, Appendix D, Parts 4, 8 and 12). A blank indicates that data are currently not available.

Vapour detection* (column i)	F	:	flammable vapours
	T	:	toxic vapours
Fire protection (column j)	A	:	alcohol-resistant foam
	B	:	regular foam, encompasses all foams that are not of an alcohol-resistant type, including fluoroprotein and aqueous-film-forming foam (AFFF)
	C	:	water-spray
	D	:	dry chemical
	No	:	no special requirements under this Code
Materials of construction (column k)	N	:	see 6.2.2
	Z	:	see 6.2.3
	Y	:	see 6.2.4
	A blank indicates no special guidance given for materials of construction		
Respiratory and eye protection* (column l)	E	:	see 14.2.8

* "No" indicates nil requirements.

a	b	c	d	e	f	g			h	i	j	k	l	m
						Electrical equipment								
Product name	UN number	Ship type	Tank type	Tank vents	Tank environmental control	Class	Group	Flashpoint $\geq 60^{\circ}C$	Gauging	Vapour detection	Fire protection	Materials of construction	Respiratory and eye protection	Special requirements
Acetic acid	2789	3	2G	Cont.	No	T1	IIA	No	R	F	A	Y1,Z	E	15.11.2 to 15.11.4, 15.11.6 to 15.11.8
Acetic anhydride	1715	2	2G	Cont.	No	T2	IIA	No	R	F-T	A	Y1	E	15.11.2 to 15.11.4, 15.11.6 to 15.11.8
Acetone cyanohydrin	1541	2	2G	Cont.	No	T1	IIA	Yes	C	T	A	Y1	E	15.1, 15.12, 15.17, 15.18, 15.19, 16.6
Acetonitrile	1648	2	2G	Cont.	No	T2	IIA	No	R	F-T	A		No	15.12
Acrylamide solution, 50% or less		2	2G	Open	No	NF			C	No	No		No	15.12.3, 15.13, 15.16.1, 15.19.6, 16.6.1
Acrylic acid	2218	3	2G	Cont.	No	T2	IIA	No	R	F-T	A	Y1	No	15.13, 16.6.1
Acrylonitrile	1093	2	2G	Cont.	No	T1	IIB	No	C	F-T	A	N3,Z	E	15.12, 15.13, 15.17, 15.19
Adiponitrile	2205	3	2G	Cont.	No		IIB	Yes	R	T	A		No	
Alkyl benzene sulphonic acid	2584 2586	3	2G	Open	No			Yes	O	No	B		No	
Allyl alcohol	1098	2	2G	Cont.	No	T2	IIB	No	C	F-T	A		E	15.12, 15.17, 15.19
Allyl chloride	1100	2	2G	Cont.	No	T2	IIA	No	C	F-T	A		E	15.12, 15.17, 15.19

a	b	c	d	e	f	g			h	i	j	k	l	m
Product name	*UN number*	*Ship type*	*Tank type*	*Tank vents*	*Tank environmental control*	*Electrical equipment*			*Gauging*	*Vapour detection*	*Fire protection*	*Materials of construction*	*Respiratory and eye protection*	*Special requirements*
						Class	*Group*	*Flashpoint > 60°C*						
2-(2-Aminoethoxy)ethanol		3	2G	Open	No			Yes	O	No	A, C,D	N2	No	15.19.6
Aminoethylethanolamine		3	2G	Open	No	T2	IIA	Yes	O	No	A	N1	No	
N-Aminoethylpiperazine	2815	3	2G	Cont	No			Yes	R	T	A, C,D	N2	No	15.19.6
Ammonia aqueous, 28% or less	2672	3	2G	Cont.	No	NF			R	T	C	N4	E[a]	
Ammonium nitrate solution, 93% or less	2426	2	1G	Open	No	NF			O	No	No	Y4	No	15.2, 15.11.4, 15.11.6, 15.18, 15.19.6
Aniline	1547	2	2G	Cont.	No	T1	IIA	Yes	C	T	A		No	15.12, 15.17, 15.19
Benzene and mixtures having 10% benzene content or more	1114	3	2G	Cont.	No	T1	IIA	No	R	F-T	B		No	15.12.1, 15.17
Benzenesulphonyl chloride	2225	3	2G	Cont.	No			Yes	R	T	B,D	N1	No	15.19.6
Benzyl chloride	1738	2	2G	Cont.	No	T1	IIA	Yes	C	T	B		E	15.12, 15.13, 15.17, 15.19
n-Butyl acrylate	2348	2	2G	Cont.	No	T2	IIB	No	R	F-T	A		No	15.13, 16.6.1, 16.6.2
Butylamine (all isomers)	1125 1214	2	2G	Cont.	No			No	R	F-T	A	N1	E	15.12, 15.17, 15.19.6

a *Product name*	b *UN number*	c *Ship type*	d *Tank type*	e *Tank vents*	f *Tank environmental control*	g *Electrical equipment*			h *Gauging*	i *Vapour detection*	j *Fire protection*	k *Materials of construction*	l *Respiratory and eye protection*	m *Special requirements*
						Class	*Group*	*Flashpoint ≤ 60°C*						
n-Butyl ether	1149	3	2G	Cont.	Inert	T4	IIB	No	R	F-T	A,D		No	15.4.6, 15.12
Butyl/Decyl/Cetyl-Eicosyl methacrylate mixture		3	2G	Cont.	No				R	No	A, C,D		No	15.13, 16,6.1, 16.6.2
Butyl methacrylate	2227	3	2G	Cont.	No		IIA	No	R	F-T	A,D		No	15.13, 16.6.1, 16.6.2
n-Butyraldehyde	1129	3	2G	Cont.	No	T3	IIA	No	O	F-T	A		No	15.16.1
Camphor oil	1130	3	2G	Cont.	No		IIA	No	O	F	B		No	
Carbolic oil		2	2G	Cont.	No			Yes	C	F-T	A		No	15.12, 15.19
Carbon disulphide	1131	2	1G	Cont.	Pad + Inert	T5	IIC	No	C	F-T	C		E	15.3, 15.12, 15.15, 15.19
Carbon tetrachloride	1846	3	2G	Cont.	No	NF			C	T	No	Z	E	15.12, 15.17, 15.19.6
Cashew nut shell oil (untreated)		3	2G	Cont.	No			Yes	R	T	B		No	
Caustic potash solution	1814	3	2G	Open	No	NF			O	No	No	N8	No	
Cetyl-Eicosyl methacrylate mixture		3	2G	Open	No			Yes	O	No	A, C,D		No	15.13, 16.6.1, 16.6.2

a	b	c	d	e	f	g			h	i	j	k	l	m
Product name	*UN number*	*Ship type*	*Tank type*	*Tank vents*	*Tank environmental control*	*Electrical equipment*			*Gauging*	*Vapour detection*	*Fire protection*	*Materials of construction*	*Respiratory and eye protection*	*Special requirements*
						Class	*Group*	*Flashpoint > 60°C*						
Chlorobenzene	1134	3	2G	Cont.	No	T1	IIA	No	R	F-T	B		No	
Chloroform	1888	3	2G	Cont.	No	NF			R	T	No		E	15.12
Chlorohydrins, crude		2	2G	Cont.	No		IIA	No	C	F-T	A		No	15.12, 15.19
2- or 3-Chloropropionic acid	2511	3	2G	Open	No			Yes	O	No	A	Y1	No	15.11.2 to 15.11.4, 15.11.6 to 15.11.8
Chlorosulphonic acid	1754	1	2G	Cont.	No	NF			C	T	No		E	15.11.2 to 15.11.8, 15.12, 15.16.2, 15.19
(*o*-, *m*-, *p*-) Chlorotoluenes	2238	3	2G	Cont.	No			No	R	F-T	B,C		No	
Coal tar naphtha	2553	3	2G	Cont.	No	T3	IIA	No	R	F-T	A,D		No	
Creosote		3	2G	Open	No	T2	IIA	Yes	O	No	B,D		No	15.19.6
Cresols, mixed isomers	2076	3	2G	Open	No	T1	IIA	Yes	O	No	B		No	
Crotonaldehyde	1143	2	2G	Cont.	No	T3	IIB	No	R	F-T	A		E	15.12, 15.16.1, 15.17
Cyclohexanone	1915	3	2G	Cont.	No	T2	IIA	No	R	F-T	A	N5	No	

a	b	c	d	e	f	g			h	i	j	k	l	m
Product name	UN number	Ship type	Tank type	Tank vents	Tank environmental control	Electrical equipment			Gauging	Vapour detection	Fire protection	Materials of construction	Respiratory and eye protection	Special requirements
						Class	Group	Flashpoint > 60°C						
Cyclohexylamine	2357	3	2G	Cont.	No	T3	IIA	No	R	F-T	A,D	N1	No	
Decyl acrylate		3	2G	Open	No	T3	IIA	Yes	O	No	A, C,D	N2	No	15.13, 16.6.1, 16.6.2
Dibutylamine	2248	3	2G	Cont.	No	T2	IIA	No	R	F-T	B,D	N4	No	
o-Dichlorobenzene	1591	3	2G	Cont.	No	T1	IIA	Yes	R	T	B,D	N5	No	
1,1-Dichloroethane	2362	3	2G	Cont.	No	T2	IIA	No	R	F-T	B		E	
Dichloroethyl ether	1916	2	2G	Cont.	No	T2	IIA	No	R	F-T	A	N5	No	
2,2-Dichloroisopropyl ether	2490	2	2G	Cont	No			Yes	R	T	B, C,D	N5	No	15.12, 15.17, 15.19
2,4-Dichlorophenol	2021	3	2G	Cont.	Dry			Yes	R	T	B, C,D	N1	No	15.19.6
1,2-Dichloropropane	1279	2	2G	Cont.	No	T1	IIA	No	R	F-T	B	Z	No	15.12
1,3-Dichloropropane		2	2G	Cont.	No	T1	IIA	No	R	F-T	B		No	15.12
Dichloropropene/Dichloropropane mixtures		2	2G	Cont.	No			No	C	F-T	B, C,D		E	15.12, 15.17, 15.18, 15.19

a	b	c	d	e	f	g			h	i	j	k	l	m
						Electrical equipment								
Product name	UN number	Ship type	Tank type	Tank vents	Tank environmental control	Class	Group	Flashpoint > 60°C	Gauging	Vapour detection	Fire protection	Materials of construction	Respiratory and eye protection	Special requirements
1,3-Dichloropropene	2047	2	2G	Cont.	No	T2	IIA	No	C	F-T	B		E	15.12, 15.17, 15 18, 15.19
2,2-Dichloropropionic acid		3	2G	Cont.	Dry			Yes	R	No	A	Y5	No	15.11.2, 15.11.4 15.11.6, 15 11.8
Diethanolamine		3	2G	Open	No	T1	IIA	Yes	O	No	A	N2	No	
Diethylamine	1154	3	2G	Cont.	No	T2	IIA	No	R	F-T	A	N1	E	15.12
Diethylenetriamine	2079	3	2G	Open	No	T2	IIA	Yes	O	No	A	N2	No	
Diethylethanolamine	2686	3	2G	Cont.	No	T2	IIA	No	R	F-T	A,D	N1	No	
Diethyl ether	1155	2	1G	Cont.	Inert	T4	IIB	No	C	F-T	A	N7	E	15.4, 15.14, 15.15, 15.19
Di-(2-ethylhexyl) phosphoric acid	1902	3	2G	Open	No			Yes	O	No	B, C,D	N2	No	
Diethyl sulphate	1594	2	2G	Cont.	No			Yes	C	T	A,D	N3	No	15.19.6
Diisobutylamine	2361	2	2G	Cont.	No			No	R	F-T	B,D	N1	No	15.12.3, 15.19.6
Diisopropanolamine		3	2G	Open	No	T2	IIA	Yes	O	No	A	N2	No	

a	b	c	d	e	f	g			h	i	j	k	l	m
Product name	UN number	Ship type	Tank type	Tank vents	Tank environmental control	Electrical equipment			Gauging	Vapour detection	Fire protection	Materials of construction	Respiratory and eye protection	Special requirements
						Class	Group	Flashpoint > 60°C						
Diisopropylamine	1158	2	2G	Cont.	No	T2	IIA	No	C	F-T	A	N2	E	15.12, 15.19
Dimethylamine aqueous, 45% or less	1160	3	2G	Cont.	No	T2	IIA	No	R	F-T	C,D	N1	E	15.12
Dimethylamine aqueous greater than 45% but not greater than 55%	1160	2	2G	Cont.	No			No	C	F-T	A, C,D	N1	E	15.12, 15.17, 15.19
Dimethylamine aqueous greater than 55% but not greater than 65%	1160	2	2G	Cont.	No			No	C	F-T	A, C,D	N1	E	15.12, 15.14, 15.17, 15.19
N,N-Dimethylcyclohexylamine	2264	2	2G	Cont.	No			No	R	F-T	A,C	N1	No	15.12, 15.17, 15.19.6
Dimethylethanolamine	2051	3	2G	Cont.	No	T3	IIA	No	R	F-T	A,D	N2	No	
Dimethylformamide	2265	3	2G	Cont.	No	T2	IIA	No	R	F-T	A,D		No	
1,4-Dioxane	1165	2	2G	Cont.	No	T4	IIB	No	C	F-T	A		No	15.12, 15.19
Diphenylmethane diisocyanate	2489	2	2G	Cont.	Dry			No[b]	C	T[b]	C[c],D	N5	No	15.12, 15.16.2, 15.17. 15.19.6
Di-*n*-propylamine	2383	3	2G	Cont.	No			No	R	F-T	A	N2	No	15.12.3, 15.19.6
Dodecyl diphenyl oxide disulphonate solution		3	2G	Open	No	NF			O	No	No		No	

a	b	c	d	e	f	g			h	i	j	k	l	m
Product name	UN number	Ship type	Tank type	Tank vents	Tank environmental control	Electrical equipment			Gauging	Vapour detection	Fire protection	Materials of construction	Respiratory and eye protection	Special requirements
						Class	Group	Flashpoint > 60°C						
Dodecyl methacrylate		3	2G	Open	No			Yes	O	No	A,C		No	15.13
Dodecyl-Pentadecyl methacrylate mixture		3	2G	Open	No			Yes	O	No	A, C,D		No	15.13, 16.6.1, 16.6.2
Epichlorohydrin	2023	2	2G	Cont.	No		IIB	No	C	F-T	A		E	15.12, 15.17, 15.19
Ethyl acrylate	1917	2	2G	Cont.	No	T2	IIB	No	R	F-T	A		E	15.13, 16.6.1, 16.6.2
N-Ethylbutylamine		3	2G	Cont.	No			No	R	F-T	A	N1	No	15.12.3, 15.19.6
N-Ethylcyclohexylamine		3	2G	Cont.	No			No	R	F-T	A,C	N1	No	15.19.6
Ethylene chlorohydrin	1135	2	2G	Cont.	No	T2	IIA	No	C	F-T	D		E	15.12, 15.17, 15.19
Ethylene cyanohydrin		3	2G	Open	No		IIB	Yes	O	No	A		No	
Ethylenediamine	1604	2	2G	Cont.	No	T2	IIA	No	R	F-T	A	N2	No	
Ethylene dibromide	1605	2	2G	Cont.	No	NF			C	T	No		E	15.12, 15.19.6
Ethylene dichloride	1184	2	2G	Cont.	No	T2	IIA	No	R	F-T	B	N4	No	15.19

a	b	c	d	e	f	g			h	i	j	k	l	m
Product name	UN number	Ship type	Tank type	Tank vents	Tank environmental control	Electrical equipment			Gauging	Vapour detection	Fire protection	Materials of construction	Respiratory and eye protection	Special requirements
						Class	Group	Flashpoint > 60°C						
2-Ethylhexyl acrylate		3	2G	Open	No	T3	IIB	Yes	O	No	A		No	15.13, 16.6.1, 16.6.2
2-Ethylhexylamine	2276	2	2G	Cont.	No			No	R	F-T	A	N2	No	15.12
Ethylidene norbornene		3	2G	Cont.	No			No	R	F-T	B, C,D	N4	No	15.12.1, 15 16.1, 15.19.6
Ethyl methacrylate	2277	3	2G	Cont.	No		IIA	No	R	F-T	B,D		No	15.13, 16.6.1, 16.6.2
2-Ethyl-3-propylacrolein		3	2G	Cont.	No		IIA	No	R	F-T	A		No	
Formaldehyde solutions, 45% or less	1198[d]	3	2G	Cont.	No	T2	IIB	No	R	F-T	A		E[e]	15.16.1
Formic acid	1779	3	2G	Cont.	No	T1	IIA	No	R	T	A	Y2/ Y3	E	15.11.2 to 15.11.4, 15.11.6 to 15.11 8
Furfural	1199	3	2G	Cont.	No	T2	IIB	No	R	F-T	A		No	15.16.1
Glutaraldehyde solutions, 50% or less		3	2G	Open	No	NF			O	No	No		No	15.16.1
Hexamethylenediamine solutions	1783	3	2G	Cont.	No			Yes	R	T	A	N2	No	15.19.6
Hexamethyleneimine	2493	2	2G	Cont.	No			No	R	F-T	A,C	N1	No	

a	b	c	d	e	f	g			h	i	j	k	l	m
Product name	*UN number*	*Ship type*	*Tank type*	*Tank vents*	*Tank environmental control*	*Electrical equipment*			*Gauging*	*Vapour detection*	*Fire protection*	*Materials of construction*	*Respiratory and eye protection*	*Special requirements*
						Class	*Group*	*Flashpoint > 60°C*						
Hydrochloric acid	1789	3	1G	Cont.	No	NF			R	T	No		E[f]	15.11
Hydrogen peroxide solutions, over 60% but not over 70%		2	2G	Cont.	No	NF			C	No	No		No	15.5, 15.19.6
2-Hydroxyethyl acrylate		2	2G	Cont.	No			Yes	C	T	A		No	15.12, 15.13, 15.19.6, 16.6.1, 16.6.2
Isobutyl acrylate	2527	2	2G	Cont.	No	T2	IIB	No	R	F-T	A		No	15.13, 16.6.1, 16.6 2
Isobutyraldehyde	2045	3	2G	Cont.	No	T3	IIA	No	O	F-T	A		No	15.16.1
Isophorone diamine	2289	3	2G	Cont.	No			Yes	R	T	A	N2	No	
Isophorone diisocyanate	2290	3	2G	Cont.	Dry			Yes	C	T	C[c],D	N5	No	15.12, 15.16.2, 15.17, 15.19.6
Isoprene	1218	3	2G	Cont.	No	T3	IIB	No	R	F	B		No	15.13, 15.14, 16.6.1, 16.6.2
Isopropylamine	1221	2	2G	Cont.	No	T2	IIA	No	C	F-T	C,D	N2	E	15.12, 15.14, 15.19
Isopropyl ether	1159	3	2G	Cont.	Inert			No	R	F	A		No	15.4.6, 15.13.3, 15.19.6
Isovaleraldehyde	2058	3	2G	Cont.	Inert	T3	IIB	No	R	F-T	A		No	15.4.6, 15.16.1

a	b	c	d	e	f	g			h	i	j	k	l	m
Product name	UN number	Ship type	Tank type	Tank vents	Tank environmental control	Electrical equipment			Gauging	Vapour detection	Fire protection	Materials of construction	Respiratory and eye protection	Special requirements
						Class	Group	Flashpoint > 60°C						
Maleic anhydride	2215	3	2G	Cont.	No			Yes	R	No	A[9],C		No	
Mesityl oxide	1229	3	2G	Cont.	No	T2	IIB	No	R	F-T	A		No	15.19.6
Methacrylic acid	2531	3	2G	Cont.	No			Yes	R	T	A	Y1	No	15.13, 16.6.1
Methyl acrylate	1919	2	2G	Cont.	No	T1	IIB	No	R	F-T	B		E	15.13, 16.6.1, 16.6.2
Methylamine solutions, 42% or less	1235	2	2G	Cont.	No				C	F-T	A, C,D	N1	E	15.12, 15.17, 15.19
2-Methyl-6-ethyl aniline		3	2G	Open	No			Yes	O	No	B, C,D		No	
Methylene chloride	1593	3	2G	Cont.	No	T1	IIA	Yes	R	T	No		No	
2-Methyl-5-ethylpyridine	2300	3	2G	Open	No		IIA	Yes	O	No	D	N4	No	
Methyl formate	1243	2	2G	Cont.	No			No	R	F-T	A		E	15.12, 15.14, 15.19
2-Methyl-2-hydroxy-3-butyne		3	2G	Cont.	No			No	R	F-T	A, C,D	N6	No	15.19.6
Methyl methacrylate	1247	2	2G	Cont.	No	T2	IIA	No	R	F-T	B		No	15.13, 16.6.1, 16.6.2

Product name	*b* *UN number*	*c* *Ship type*	*d* *Tank type*	*e* *Tank vents*	*f* *Tank environmental control*	*g* *Electrical equipment*			*h* *Gauging*	*i* *Vapour detection*	*j* *Fire protection*	*k* *Materials of construction*	*l* *Respiratory and eye protection*	*m* *Special requirements*
						Class	*Group*	*Flashpoint > 60°C*						
2-Methylpyridine	2313	2	2G	Cont.	No			No	C	F	A,C	N4	No	15.12.3, 15.19.6
α-Methylstyrene	2303	3	2G	Cont.	No	T1	IIB	No	R	F-T	D		No	15.13, 16.6.1, 16.6.2
Monoethanolamine	2491	3	2G	Open	No	T2	IIA	Yes	O	F-T	A	N2	No	
Monoethylamine		2	1G	Cont.	No	T2	IIA	No	C	F-T	C,D	N2	E	15.12, 15.14
Monoethylamine solutions, 72% or less	2270	2	2G	Cont.	No			No	C	F-T	A,C	N1	E	15.12, 15.14, 15.17, 15.19
Monoisopropanolamine		3	2G	Open	No	T2	IIA	Yes	O	F-T	A	N2	No	
Mononitrobenzene	1662	2	2G	Cont.	No	T1	IIA	Yes	C	T	D		No	15.12, 15.17, 15.18, 15.19
Morpholine	2054	3	2G	Cont.	No	T2	IIA	No	R	F	A	N2,Z	No	
Motor fuel anti-knock compounds	1649	2	1G	Cont.	No	T4	IIA	No	C	F-T	B,C		E	15.6, 15.12, 15.18, 15.19
Naphthalene, molten	2304	3	2G	Cont.	No	T1	IIA	Yes	R	No	A,D		No	
Nitric acid, 70% and over	2031 2032[h]	2	2G	Cont.	No	NF			C	T	No		E	15.11, 15.19

a	b	c	d	e	f	g			h	i	j	k	l	m
Product name	UN number	Ship type	Tank type	Tank vents	Tank environmental control	Electrical equipment			Gauging	Vapour detection	Fire protection	Materials of construction	Respiratory and eye protection	Special requirements
						Class	Group	Flashpoint > 60°C						
Nitric acid, less than 70%	2031	2	2G	Cont.	No	NF			R	T	No		E	15.11, 15.19
o-Nitrochlorobenzene	1578	2	2G	Cont.	No			Yes	C	T	B, C,D		No	15.12, 15.17, 15.18, 15.19
o-Nitrophenol, molten	1663	2	2G	Cont.	No			Yes	C	T	A, C,D		No	15.12, 15.19.6
1- or 2-Nitropropane	2608	3	2G	Cont.	No	T2	IIB	No	R	F-T	A		No	
(*o*- and *p*-)Nitrotoluene	1664	2	2G	Cont.	No		IIB	Yes	C	T	B		No	15.12, 15.17, 15.19
Oleum	1831	2	2G	Cont.	No	NF			C	T	No		E	15.11.2 to 15.11.8, 15.12.1, 15.16.2, 15.17, 15.19
Paraldehyde	1264	3	2G	Cont.	No	T3	IIB	No	R	F	A		No	
Pentachloroethane	1669	3	2G	Cont.	No	NF			R	T	No		No	15.12, 15.17
1,3-Pentadiene		3	2G	Cont.	No			No	R	F-T	B		No	15.13, 16.6
Phenol	2312	2	2G	Cont.	No	T1	IIA	Yes	C	T	A		No	15.12, 15.19
Phosphoric acid	1805	3	2G	Open	No	NF			O	No	No		No	15.11.1 to 15.11.4, 15.11.6 to 15.11.8

a	*b*	*c*	*d*	*e*	*f*	*g*			*h*	*i*	*j*	*k*	*l*	*m*
Product name	*UN number*	*Ship type*	*Tank type*	*Tank vents*	*Tank environmental control*	*Electrical equipment*			*Gauging*	*Vapour detection*	*Fire protection*	*Materials of construction*	*Respiratory and eye protection*	*Special requirements*
						Class	*Group*	*Flashpoint > 60°C*						
Phosphorus, yellow or white	2447	1	1G	Cont.	Pad + (vent or Inert)			No[k]	C	No	C		E	15.7, 15.19
Phthalic anhydride	2214	3	2G	Cont.	No	T1	IIA	Yes	R	No	D		No	
Polyethylene polyamines	2734[i] 2735	3	2G	Open	No			Yes	O	No	A	N2	No	
Polymethylene polyphenyl isocyanate	2206[i] 2207	2	2G	Cont.	Dry			No[b]	C	T[b]	C[c], D	N5	No	15.12, 15.16.2, 15.19.6
n-Propanolamine		3	2G	Open	No			Yes	O	No	A,D	N2	No	
β-Propiolactone		2	2G	Cont.	No		IIA	Yes	R	T	A		No	
Propionaldehyde	1275	3	2G	Cont.	No			No	R	F-T	A		E	15.16.1, 15.17
Propionic acid	1848	3	2G	Cont.	No	T1	IIA	No	R	F	A	Y1	E	15.11.2 to 15.11.4, 15.11.6 to 15.11.8
Propionic anhydride	2496	3	2G	Cont.	No	T2	IIA	Yes	R	T	A	Y1	No	
Propionitrile	2404	2	1G	Cont.	No	T1	IIB	No	C	F-T	A,D		E	15.12, 15.17, 15.18, 15.19

a	b	c	d	e	f	g			h	i	j	k	l	m
Product name	UN number	Ship type	Tank type	Tank vents	Tank environmental control	Electrical equipment			Gauging	Vapour detection	Fire protection	Materials of construction	Respiratory and eye protection	Special requirements
						Class	Group	Flashpoint > 60°C						
n-Propylamine	1277	2	2G	Cont.	Inert	T2	IIA	No	C	F-T	C,D	N2	E	15.12, 15.19
Propylene oxide	1280	2	2G	Cont.	Inert	T2	IIB	No	C	F-T	A,C	Z	No	15.8, 15.12.1, 15.14, 15.15, 15.19
Pyridine	1282	3	2G	Cont.	No	T1	IIA	No	R	F	A	N4	No	
Sodium borohydride, 15% or less/ Sodium hydroxide solution		3	2G	Open	No	NF			O	No	No	N1	No	
Sodium chlorate solutions, 50% or less		3	2G	Open	No	NF			O	No	No		No	15.9, 15.16.1, 15.19.6
Sodium dichromate solution, 70% or less		2	2G	Open	No	NF			C	No	No	N2	No	15.12.3, 15.19
Sodium hydrosulphide solution, 45% or less		3	2G	Cont.	Vent or pad (gas)	NF			R	T	No		No	15.16.1
Sodium hydroxide solution	1824	3	2G	Open	No	NF			O	No	No	N8	No	
Sodium hypochlorite solution, 15% or less		3	2G	Cont.	No	NF			R	No	No	N5	No	15.16.1
Sodium-2-mercaptobenzothiazol solution		3	2G	Open	No	NF			O	No	No	N1	No	
Styrene monomer	2055	3	2G	Cont.	No	T1	IIA	No	O	F	B	N4,Z	No	15.13, 16.6.1, 16.6.2

a	b	c	d	e	f	g			h	i	j	k	l	m
Product name	*UN number*	*Ship type*	*Tank type*	*Tank vents*	*Tank environmental control*	*Electrical equipment*			*Gauging*	*Vapour detection*	*Fire protection*	*Materials of construction*	*Respiratory and eye protection*	*Special requirements*
						Class	*Group*	*Flashpoint ≤ 60°C*						
Sulphur, liquid	2448	3	1G	Open	Vent or pad (gas)		T3	Yes[I]	O	F-T	No		No	15.10
Sulphuric acid	1830	3	2G	Open	No	NF			O	No	No		No	15.11, 15.16.2
Sulphuric acid, spent	1832	3	2G	Open	No	NF			O	No	No		No	15.11, 15.16.2
Tetrachloroethane	1702	3	2G	Cont.	No	NF			R	T	No		No	15.12, 15.17
Tetraethylenepentamine	2320	3	2G	Open	No			Yes	O	No	A	N1	No	
Tetrahydrofuran	2056	3	2G	Cont.	No	T3	IIB	No	R	F-T	A,D		No	
Toluenediamine	1709	2	2G	Cont.	No			Yes	C	T	B, C,D	N1	E	15.12, 15.17, 15.19
Toluene diisocyanate	2078	2	2G	Cont.	Dry	T1	IIA	Yes	C	F-T	C[C],D	N4	E	15.12, 15.16.2, 15.17, 15.19
o-Toluidine	1708	2	2G	Cont.	No			Yes	C	T	A,C		No	15.12, 15.17, 15.19
1,2,4-Trichlorobenzene	2321	3	2G	Cont.	No			Yes	R	T	C		No	15.19.6
1,1,2-Trichloroethane		3	2G	Cont.	No	NF			R	T	No		No	15.12.1

a	b	c	d	e	f	g			h	i	j	k	l	m
Product name	UN number	Ship type	Tank type	Tank vents	Tank environmental control	Electrical equipment			Gauging	Vapour detection	Fire protection	Materials of construction	Respiratory and eye protection	Special requirements
						Class	Group	Flashpoint > 60°C						
Trichloroethylene	1710	3	2G	Cont.	No	T2	IIA	Yes	R	T	No		No	15.12, 15.16.1, 15.17
1,2,3-Trichloropropane		2	2G	Cont.	No			Yes	C	T	B, C,D		No	15.12, 15.17, 15.19
Triethanolamine		3	2G	Open	No		IIA	Yes	O	No	A	N1	No	
Triethylamine	1296	2	2G	Cont.	No	T2	IIA	No	R	F-T	B	N2	E	15.12
Triethylenetetramine	2259	3	2G	Open	No	T2	IIA	Yes	O	No	A	N1	No	
Trimethylacetic acid		3	2G	Cont.	No			Yes	R	No	A,C	Y1	No	15.11.2 to 15.11.8
Trimethylhexamethylene diamine (2,2,4- and 2,4,4-isomers)	2327	3	2G	Open	No			Yes	O	No	A,C	N1	No	15.19.6
Trimethylhexamethylene diisocyanate (2,2,4- and 2,4,4-isomers)	2328	2	2G	Cont.	Dry			Yes	C	T	A,C[c]		No	15.12, 15.16.2, 15.17, 15.19.2
Trimethyl phosphite	2329	3	2G	Cont.	No			No	R	F-T	A,D		No	15.12.1, 15.16.2, 15.19.6
Tritolyl phosphate, containing 1% or more ortho-isomer	2574[j]	2	2G	Cont.	No	T2	IIA	Yes	C	No	B		No	15.12.3, 15.19
Urea, ammonium solution, containing aqua ammonia		3	2G	Cont.	No	NF			R	T	A	N4	No	

a	b	c	d	e	f	g			h	i	j	k	l	m
						Electrical equipment								
Product name	UN number	Ship type	Tank type	Tank vents	Tank environmental control	Class	Group	Flashpoint > 60°C	Gauging	Vapour detection	Fire protection	Materials of construction	Respiratory and eye protection	Special requirements
n-Valeraldehyde	2058	3	2G	Cont.	Inert	T3	IIB	No	R	F-T	A		No	15.4.6, 15.16.1
Vinyl acetate	1301	3	2G	Cont.	No	T2	IIA	No	O	F	A		No	15.13, 16.6.1, 16.6.2
Vinyl ethyl ether	1302	2	1G	Cont.	Inert	T3	IIB	No	C	F-T	A	N6	E	15.4, 15.13, 15.14, 15.19, 16.6.1, 16.6.2
Vinylidene chloride	1303	2	2G	Cont.	Inert	T2	IIA	No	R	F-T	B	N5	E	15.13, 15.14, 16.6.1, 16.6.2
Vinyl neodecanoate		3	2G	Open	No			Yes	O	No	B		No	15.13, 15.16.1, 16.6.1, 16.6.2
Vinyl toluene	2618	3	2G	Cont.	No		IIA	No	R	F	D	N1	No	15.13, 16.6.1, 16.6.2
Xylenols	2261	3	2G	Open	No		IIA	Yes	O	No	B		No	

a Applies to ammonia, aqueous, 28% or less, but not below 10%.

b If the product to be carried contains flammable solvents such that the flashpoint does not exceed 60°C, then special electrical systems and a flammable vapour detector should be provided.

c Although water is suitable for extinguishing open-air fires involving chemicals to which this footnote applies, water should not be allowed to contaminate closed tanks containing these chemicals because of the risk of hazardous gas generation.

d UN number 1198 only applies if flashpoint is below 60°C.

e Applies to formaldehyde solutions, 45% or less, but not below 5%.

f Applies to hydrochloric acid not below 10%.

g Dry chemical cannot be used because of the possibility of an explosion.

h UN number 2032 assigned to red fuming nitric acid.

i UN number depends on boiling point of substance.

j UN number assigned to this substance containing more than 3% of ortho-isomer.

k Phosphorus, yellow or white, is carried above its autoignition temperature and therefore flashpoint is not appropriate. Electrical equipment requirements may be similar to those for substances with a flashpoint above 60°C.

l Sulphur, liquid, has a flashpoint above 60°C, however electrical equipment should be certified safe for the gases evolved.

CHAPTER 18 — LIST OF CHEMICALS TO WHICH THE CODE DOES NOT APPLY*

1 The following are products which are not considered to come within the scope of the Code. This list may be used as a guide in considering bulk carriage of products whose hazards have not yet been evaluated.

2 Although the products listed in this chapter fall outside the scope of the Code, the attention of Administrations is drawn to the fact that some safety precautions may be needed for their safe transportation. Accordingly Administrations should prescribe appropriate safety requirements.

3 The products listed below may be subject to reconsideration upon the coming into force of the International Convention for the Prevention of Pollution from Ships, 1973/78.

Chapter 18	UN number
Acetone	1090
Amylacetate, commercial	1104
n-Amyl acetate	1104
sec-Amyl acetate	1104
n-Amyl alcohol	1105
sec-Amyl alcohol	1105
tert-Amyl alcohol	1105
Amyl alcohol, primary	1105
tert-Amylenes	—
Benzyl alcohol	—
n-Butyl acetate	1123
sec-Butyl acetate	1123
n-Butyl alcohol	1120
sec-Butyl alcohol	1120
tert-Butyl alcohol	1120
Butyl benzyl phthalate	—
Butylene glycol	—
γ-Butyrolactone	—
Calcium alkyl salicylate	—
Cumene	1918
Cyclohexane	1145
Cyclohexanol	—
p-Cymene	2046
n-Decyl alcohol	—
Diacetone alcohol	1148

* The product names are not always identical with the names given in the various editions of the Bulk Chemical Code (resolution A.212(VII)).

Chapter 18	UN number
Dibutyl phthalate	—
Dicyclopentadiene	2048
Diethylbenzene	2049
Diethylene glycol	—
Diethylene glycol diethyl ether	—
Diethylene glycol monobutyl ether	—
Diethylene glycol monobutyl ether acetate	—
Diethylene glycol monoethyl ether	—
Diethylene glycol monoethyl ether acetate	—
Diethylene glycol monomethyl ether	—
Diethylene glycol monomethyl ether acetate	—
Diisobutylene	2050
Diisobutyl ketone	1157
Diisobutyl phthalate	—
Diisooctyl phthalate	—
2,2-Dimethyloctanoic acid	—
Dioctyl phthalate	—
Dipentene	2052
Diphenyl ether	—
Dipropylene glycol	—
Dipropylene glycol monomethyl ether	—
Dodecyl alcohol	—
Dodecylbenzene	—
Dodecylphenol	—
2-Ethoxyethanol	1171
2-Ethoxyethyl acetate	1172
Ethyl acetate	1173
Ethyl acetoacetate	—
Ethyl alcohol	1170
Ethylbenzene	1175
Ethylcyclohexane	—
Ethylene carbonate	—
Ethylene glycol	—
Ethylene glycol methyl butyl ether	—
Ethylene glycol monobutyl ether	2369
Ethylene glycol monobutyl ether acetate	—
Ethylene glycol monomethyl ether	1188
Ethylene glycol monomethyl ether acetate	1189
Ethylene glycol monophenyl ether	—
2-Ethylhexanoic acid	—
Formamide	—
Furfuryl alcohol	2874
Glycerine	—
n-Heptane	1206
Heptanol, all isomers	—
Heptene, mixed isomers	2278

Chapter 18	UN number
n-Hexane	1208
Hexan-1-ol	2282
1-Hexene	2370
Hexylene glycol	—
Isoamyl acetate	1104
Isoamyl alcohol	1105
Isobutyl acetate	1213
Isobutyl alcohol	1212
Isobutyl formate	2393
Isodecyl alcohol	—
Isopentane	1265
Isopentene	2371
Isophorone	—
Isopropyl acetate	1220
Isopropyl alcohol	1219
Lactic acid	—
Latex	—
Methyl acetate	1231
Methyl alcohol	1230
Methylamyl acetate	1233
Methylamyl alcohol	2053
Methyl amyl ketone	1110
Methyl *tert*-butyl ether	2398
Methyl ethyl ketone	1193
Methyl isobutyl ketone	1245
2-Methyl-1-pentene	—
N-Methyl-2-pyrrolidone	—
Molasses	—
Naphtha solvent	1256
Nonane	1920
Nonyl alcohol	—
Nonylphenol	—
Octane	1262
Octanol, all isomers	—
Paraffin wax	—
n-Pentane	1265
n-Pentene	1108
Petrolatum	—
Petroleum naphtha	1255
Perchloroethylene	1897
Pinene	2368
Polypropylene glycols	—
n-Propyl acetate	1276
n-Propyl alcohol	1274
Propylene glycol	—
Propylene glycol monoethyl ether	—

Chapter 18	UN number
Propylene glycol monomethyl ether	–
Propylene tetramer	2850
Propylene trimer	2057
Sulpholane	–
Tall oil	–
Tetrahydronaphthalene	–
Toluene	1294
Tributyl phosphate	–
1,1,1-Trichloroethane	2831
Tridecanol	–
Triethylbenzene	–
Triethylene glycol	–
Triisopropanolamine	–
1,2,4-Trimethylbenzene	–
Tripropylene glycol	–
Tripropylene glycol monomethyl ether	–
Tritolyl phosphate (<1% ortho-isomer)	–
Trixylenyl phosphate	–
Turpentine	1299
Urea, ammonium nitrate solutions	–
Urea, ammonium phosphate solutions	–
White spirit	1300
Wines	–
Xylenes	1307

CHAPTER 19 – REQUIREMENTS FOR SHIPS ENGAGED IN THE INCINERATION AT SEA OF LIQUID CHEMICAL WASTE

19.1 General

19.1.1 Chapters 1 to 16 apply to incinerator ships, as relevant, and as supplemented or modified by the provisions of this chapter.

19.1.2 Information on the composition and the hazards of the waste to be incinerated should be made available to the Administration or port Administration, or both, as appropriate, which may prohibit carriage of those wastes deemed to be too hazardous to be carried in bulk.*

19.1.3 The following additional definitions apply:

.1 *Incinerator space* is a gastight space containing solely the incinerator and its associated auxiliaries.

.2 *Incinerator blower space* is a space containing the blowers which supply combustion air to the incinerator burners.

.3 *Dumping Convention* means the Convention on the Prevention of Marine Pollution by Dumping of Wastes and Other Matter at Sea, 1972.

.4 *Cargo area* is that part of the ship defined by 1.3.5, excluding incinerators and chemical waste piping leading to the incinerators.

19.1.4 During the periodical and intermediate surveys required under 1.5.2.1.2 and .3, all cargo tanks and the cargo piping system should be inspected for corrosion and the remaining thickness of material should be determined. Where severely corrosive wastes have been carried, inspections of cargo tanks and the cargo piping system for corrosion should be held annually and the remaining thickness of materials determined during those inspections.

19.2 Ship survival capability and location of cargo tanks

19.2.1 Ships subject to this chapter should comply with type 2 ship standards and with the requirements for location of cargo tanks in type 2 ships.

19.2.2 Waste mixtures containing substances which would require a type 1 ship standard may be carried in type 2 ships if solely for the purpose of incineration.

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* The environmental aspects of incineration and dumping of wastes are regulated by the Dumping Convention. In general, for incineration of waste, a permit from the appropriate authority of the Contracting Party to the Convention, where the loading port is situated, is required. Where the loading port is situated in a State not being a Contracting Party to the Convention, the Administration should issue a permit.

19.3 **Ship arrangements**

19.3.1 Liquid chemical wastes should not be stowed adjacent to oil fuel tanks except those tanks containing oil fuel to be used exclusively for incineration.

19.3.2 Tanks and pumps, other than those described in 19.3.3, which may contain liquids and which are to be used for the incineration process or for washing cargo pipes and cargo tanks may be located adjacent to cargo tanks and should be located within the cargo area. The provisions of 3.1 should apply to such tanks and equipment to the same extent as they apply to cargo tanks.

19.3.3 Where necessary, oil fuel tanks and fuel pumps directly feeding the incinerator burners during the process of pre-heating or supporting incineration may be located outside the cargo area provided the oil fuel used has a flashpoint above 60°C (closed cup test). (See also 19.5.3.)

19.3.4 Liquids which have been used for cleaning cargo pipes and cargo tanks as well as for pumproom drainage should be stored in a slop tank in the cargo area, for disposal in conformity with the technical guidelines annexed to the Dumping Convention. A cargo tank may be used as a slop tank. Pumps used for handling contaminated cleaning fluids should be located in the cargo area.

19.3.5 Where necessary, compliance with 3.2.1 need not be required in so far as accommodation spaces, service spaces, control stations and machinery spaces other than those of category A may be permitted forward of the cargo area, subject to an equivalent standard of safety and appropriate fire-extinguishing arrangements being provided to the satisfaction of the Administration.

19.3.6 If accommodation spaces, service spaces, control stations or machinery spaces other than those of category A are located forward of the cargo area in accordance with 19.3.5, the requirements of 3.2.3 should be applied by analogy; i.e. the specified distances should be measured from the after end of a house located forward of the cargo area.

19.3.7 The incinerator should be located outside the external perimeter of the cargo area. Alternative arrangements may, however, be considered by the Administration, provided an equivalent degree of safety is achieved.

19.3.8 The effect which combustion gases may have on adequate vision from the navigating bridge, on air intakes and openings into accommodation, service and machinery spaces, and on deck working areas and passageways should be considered.

19.3.9 Access to the incinerator space should be from the open deck. However, the incinerator control room and incinerator blower space may have direct access to the incinerator space provided that these spaces have an additional access from the open deck. Access openings of the incinerator space should be fitted with self-closing gastight doors.

19.4 **Cargo containment and incinerator standards**

19.4.1 Integral gravity tanks may be used for hazardous wastes.

19.4.2 The incinerator including burners should be designed and constructed to safety standards acceptable to the Administration*. For materials of construction the provisions of 6.1 apply.

19.4.3 The steel structure of the incinerator including supports and other fixtures should be designed for the most unfavourable static angle of heel within the range of 0° to 30°, taking into account the dynamic loads due to the ship's motion.

19.4.4 Suitable bricklining and insulation should be provided to ensure that any temperature rise will not impair the strength of the incinerator structure or the functioning of the associated auxiliaries and instruments and will not adversely affect personnel safety.

19.4.5 Means should be provided for measuring the temperature on the outside furnace surfaces. Means for alarms should be provided to indicate when the temperature approved by the Administration is exceeded and the process of incineration has to be stopped.

19.5 Cargo transfer

19.5.1 The requirements of 5.1 apply, except that cargo piping should as far as practicable be fitted in the cargo area and that cargo piping leading to the incinerator should:

.1 be fitted at least 760 mm inboard;

.2 if outside the cargo area, be on the open deck;

.3 be clearly marked; and

.4 be so designed as to allow draining and purging.

19.5.2 Arrangementss of the cargo piping and controls should be such as to preclude the discharge overboard of wastes intended to be incinerated during normal cargo handling operations.

19.5.3 Oil fuel and cargo piping systems may be connected in front of the burners, provided that three-way cocks are installed and the oil fuel pipes are fitted with two screw-down non-return valves inside the incinerator space.

19.5.4 Remote shutdown devices to cut out the supply of waste and fuel for incineration should be fitted at the control station and on the navigating bridge. Shutoff valves should be located in the cargo area. Where shutoff valves are remotely controlled, provision for local manual operation should be made, or a separate manually operated valve should be fitted.

19.5.5 Flanges of the loading manifold connections should be provided with shields, which may be portable, to guard against the danger of the cargo being sprayed. Drip trays should also be provided.

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* The standards set out by the Dumping Convention for the control of incineration of wastes and other matter at sea should also be observed.

19.6 Materials of construction

19.6.1 Section 6.2 – special requirements for materials – is replaced by the following:

.1 Aluminium, copper, copper alloys, zinc, galvanized steel or mercury should not be used for cargo tanks, pipelines, valves, fittings and other equipment which may come into contact with the liquid wastes or their vapour.

.2 Materials of construction having a melting point below 925°C, e.g. aluminium and its alloys, should not be used for external piping involved in cargo handling operations on ships intended for the carriage of wastes with a flashpoint not exceeding 60°C (closed cup test). Short lengths of external pipes connected to cargo tanks may be permitted by the Administration if they are provided with fire-resistant insulation.

.3 In determining the scantlings of the cargo system the corrosivity of the waste should be taken into account.

19.7 Tank vent systems

19.7.1 The provisions for controlled venting systems – chapter 8 and section 15.12 apply, except 8.2.1 and 15.12.3.

19.8 Cargo tank environmental control

19.8.1 When the recirculating drop line does not terminate near the bottom of the cargo tank, the tank should be inerted whenever wastes having a flashpoint not exceeding 60°C (closed cup test) are being recirculated to it.

19.8.2 When washing machines using liquids having a flashpoint not exceeding 60°C (closed cup test) are employed, the cargo tank should be inerted.

19.8.3 The oxygen content of the atmosphere in an inerted tank should not exceed 8% by volume in any part of the tank.

19.8.4 An audible and visual alarm should be provided to indicate when the pressure in the vapour space of an inerted cargo tank is less than 0.07 bar gauge.

19.9 Electrical installation

19.9.1 In incinerator spaces, incinerator blower spaces, and adjacent spaces having direct access thereto, the lighting systems, telephone and public address systems and general alarm systems should be of the certified safe type.

19.9.2 All other electrical installations which are fitted in the spaces referred to in 19.9.1 should be of the certified safe type unless the following conditions are complied with:

.1 It is assured that the spaces are adequately ventilated prior to activating installations not of a certified safe type. Interlocks should be provided between fans and the switch gear of such installations to ensure compliance with this requirement.

.2 Installations not of a certified safe type should be automatically switched off in case of loss of the pressure required by 19.11.2.1 and 19.11.3.1. A reasonable time delay may be permitted by the Administration before these installations are switched off.

.3 Installations not of a certified safe type should comply as a minimum with IP 55* or equivalent protection.

19.10 Fire protection and fire extinguishing

19.10.1 The incinerator space should be provided with a fixed foam fire-extinguishing system complying with regulation II-2/8 or II-2/9 of the 1983 SOLAS amendments. This system may be connected to the deck foam fire-extinguishing system.

19.11 Mechanical ventilation in the cargo area and in the incinerator location

19.11.1 For cargo pump rooms the provisions of 15.17 — increased ventilation requirements — apply.

19.11.2 The ventilation system of the incinerator space should be permanent, normally of the positive pressure type and independent of all other air supply systems.

.1 The air pressure should always be positive to the pressure within the furnace (see also 19.9.2.2).

.2 A minimum capacity of 45 changes of air per hour should be provided based upon the total volume of the incinerator space.

Consideration should be given to venting requirements during maintenance of burners.

19.11.3 The ventilation system of the incinerator blower space should be permanent, normally of the positive pressure type and independent of other air supply systems.

.1 The air pressure should always be positive to the pressure within the furnace (see also 19.9.2.2).

.2 A minimum capacity of 20 changes of air per hour should be provided based upon the total volume of the incinerator blower space.

19.12 Instrumentation and overflow control

19.12.1 Closed gauging devices described in 13.1.1.3 should be fitted and overflow control systems required in 15.19 should be provided.

19.12.2 Vapour detection instruments for toxic and flammable products described in 13.2 should be fitted.

19.13 Personnel protection

19.13.1 The safety equipment described in 14.2, including respiratory and eye protection for every person on board described in 14.2.8, should be provided.

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* Reference is made to the Recommendations published by the International Electrotechnical Commission and in particular to Publication 44.

APPENDIX

MODEL FORM OF INTERNATIONAL CERTIFICATE OF FITNESS FOR THE CARRIAGE OF DANGEROUS CHEMICALS IN BULK

INTERNATIONAL CERTIFICATE OF FITNESS FOR THE CARRIAGE OF DANGEROUS CHEMICALS IN BULK

(Official seal)

Issued under the provisions of the

INTERNATIONAL CODE FOR THE CONSTRUCTION AND EQUIPMENT OF SHIPS CARRYING DANGEROUS CHEMICALS IN BULK
(resolution MSC.4(48))

under the authority of the Government of

. . . . . .
(full official designation of country)

by . . . . . .
(full official designation of the competent person or organization recognized by the Administration)

Name of ship	Distinctive number or letters	Port of registry	Gross tonnage	Ship type (Code paragraph 2.1.2)[1]

Date on which keel was laid or on which the ship was at a similar stage of construction or (in the case of a converted ship) date on which conversion to chemical tanker was commenced:

. . . . . .

The Certificate should be drawn up in the official language of the issuing country. If the language used is neither English nor French, the text should include a translation into one of these languages.

The ship also complies fully with the following amendments to the Code:

. . . . . .

. . . . . .

The ship is exempted from compliance with the following provisions of the Code:

. . . . . .

. . . . . .

THIS IS TO CERTIFY:

1 .1 That the ship has been surveyed in accordance with the provisions of section 1.5 of the Code;

.2 that the survey showed that the construction and equipment of the ship complied with the relevant provisions of the Code;

*.3 that the ship is an incinerator ship complying also with the supplementary and modified requirements of chapter 19;

2 That the ship is suitable for the carriage in bulk of the following products, provided that all relevant operational provisions of the Code are observed.[2]

Products	Conditions of carriage (tank numbers etc.)

* Continued on attachment 1, additional signed and dated sheets.

Tank numbers referred to in this list are identified on attachment 2, signed and dated tank plan.

For incinerator ships enter "liquid chemical waste" in lieu of individual products.

* Delete as appropriate.

3 That, in accordance with *1.4 and *2.8.2, the provisions of the Code are modified in respect of the ship in the following manner:

4 That the ship must be loaded:

*.1 in accordance with the loading conditions provided in the approved loading manual, stamped and dated . . . . and signed by a responsible officer of the Administration, or of an organization recognized by the Administration;

*.2 in accordance with the loading limitations appended to this Certificate.

Where it is required to load the ship other than in accordance with the above instruction, then the necessary calculations to justify the proposed loading conditions should be communicated to the certifying Administration who may authorize in writing the adoption of the proposed loading condition.**

This certificate is valid until . . . .

Issued at . . . . 19 . .
(place of issue of certificate)

The undersigned declares that he is duly authorized by the said Government to issue this Certificate.

. . . .
(signature of official issuing the certificate and/or seal of issuing authority)

Notes on completion of Certificate:

1 "Ship type": Any entry under this column must relate to all relevant recommendations, e.g. an entry "type 2" should mean type 2 in all respects prescribed by the Code.

2 Paragraph 2 : Only products listed in chapter 17 of the Code, or which have been evaluated by the Administration in accordance with 1.1.3 of the Code, should be listed. In respect of the latter "new" products, any special requirements provisionally prescribed should be noted. It should be noted that for incinerator ships "liquid chemical waste" is to be entered in lieu of the individual product names.

* Delete as appropriate.

** Instead of being incorporated in the Certificate, this text may be appended to the Certificate if duly signed and stamped.

ENDORSEMENT FOR MANDATORY ANNUAL SURVEYS

THIS IS TO CERTIFY that at a mandatory annual survey required by 1.5.2.1.4 of the International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk, the ship was found to comply with the relevant provisions of the Code.

Signed: .....
(signature of authorized official)

Place: .....

Date: .....

(seal or stamp of the Authority, as appropriate)

Signed: .....
(signature of authorized official)

Place: .....

Date: .....

(seal or stamp of the Authority, as appropriate)

Signed: .....
(signature of authorized official)

Place: .....

Date: .....

(seal or stamp of the Authority, as appropriate)

Signed: .....
(signature of authorized official)

Place: .....

Date: .....

(seal or stamp of the Authority, as appropriate)

NOTE: An intermediate survey may take the place of a mandatory annual survey where the relevant provisions of 1.5.2.1.3 and 1.5.2.1.4 are complied with.

ENDORSEMENT FOR INTERMEDIATE SURVEYS

THIS IS TO CERTIFY that at an intermedaite survey required by 1.5.2.1.3 of the International Code for the Construction and Equipment of Ships Carrying Dangerous Chemicals in Bulk, the ship was found to comply with the relevant provisions of the Code.

Signed: .....
(signature of authorized official)

Place: .....

Date: .....

(seal or stamp of the Authority, as appropriate)

Signed: .....
(signature of authorized official)

Place: .....

Date: .....

(seal or stamp of the Authority, as appropriate)

ATTACHMENT 1 TO THE INTERNATIONAL CERTIFICATE OF FITNESS FOR THE CARRIAGE OF DANGEROUS CHEMICALS IN BULK

Continued list of products to those specified in section 3, and their conditions of carriage.

Products	Conditions of carriage (tank numbers, etc.)

Date . . . . . .
(as for certificate)

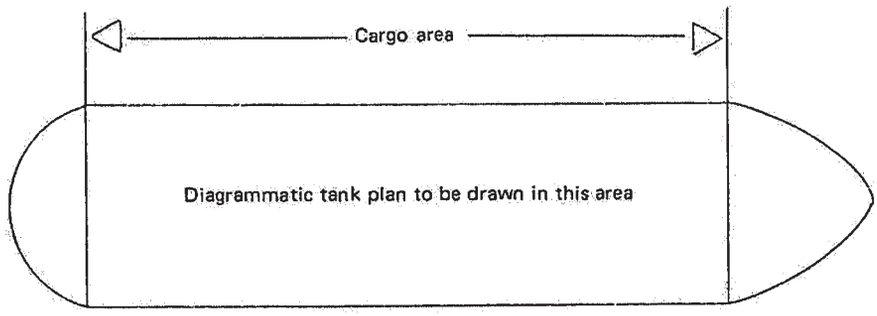
. . . . . .
(signature of official issuing the certificate and/or seal of issuing authority)

ATTACHMENT 2 TO THE INTERNATIONAL CERTIFICATE OF FITNESS FOR THE CARRIAGE OF DANGEROUS CHEMICALS

TANK PLAN (specimen)

Name of ship: . . . . . .

Distinctive number or letters: . . . . . .



Date . . . . . .
(as for certificate)

. . . . . .
(signature of official issuing the certificate and/or seal of issuing authority)