

二、執行上指職務的每月報酬為澳門元六千六百元。

二零二二年一月十九日

行政長官 賀一誠

第 2/2022 號行政長官公告

鑑於國際海事組織大會於一九九三年十一月四日透過第 A.744 (18) 號決議通過的《散貨船和油輪檢驗期間的強化檢查方案指南》適用於澳門特別行政區；

上述指南陸續經國際海事組織海上安全委員會和《1974 年國際海上人命安全公約》締約國政府會議按照公約第 VIII (b) 條和第 XI-1/2 條規定作出修正，而這些修正需要一個全面的修訂版本，以確保其規定的有效實施並維持儘可能高的安全水平；

國際海事組織在二零一一年十一月三十日的第二十七屆大會上，透過第 A.1049 (27) 號決議通過了《2011 年國際散貨船和油輪檢驗期間加強檢驗計劃規則（2011 年加強檢驗計劃規則）》（下稱“《2011 年加強檢驗計劃規則》”）。該規則於二零一四年一月一日在國際法律秩序上生效，包括對中華人民共和國及其澳門特別行政區生效；

國際海事組織海上安全委員會分別於二零一四年五月二十二日、二零一四年十一月二十一日和二零一六年五月十九日透過第 MSC.371 (93) 號決議、第 MSC.381 (94) 號決議和第 MSC.405 (96) 號決議，通過了對《2011 年加強檢驗計劃規則》的修正案。該等修正案分別於二零一六年一月一日、二零一六年七月一日和二零一八年一月一日在國際法律秩序上生效，包括對中華人民共和國及其澳門特別行政區生效；

基於此，行政長官根據第 3/1999 號法律《法規的公佈與格式》第五條（一）項和第六條第一款的規定，命令公佈：

——國際海事組織大會透過第 A.1049 (27) 號決議通過的《2011 年加強檢驗計劃規則》的中文和英文正式文本；

——國際海事組織海上安全委員會透過第 MSC.371 (93) 號決議通過的《2011 年加強檢驗計劃規則》修正案的中文和英文正式文本；

——國際海事組織海上安全委員會透過第 MSC.381 (94) 號決議通過的《2011 年加強檢驗計劃規則》修正案的中文和英文正式文本；

2. O exercício das funções acima referidas é remunerado pela quantia mensal de 6 600 patacas.

19 de Janeiro de 2022.

O Chefe do Executivo, *Ho Iat Seng*.

Aviso do Chefe do Executivo n.º 2/2022

Considerando que as Directrizes relativas ao Programa Reforçado de Inspeções no âmbito das Vistorias a Graneleiros e Petroleiros, adoptadas pela Assembleia da Organização Marítima Internacional (OMI) através da resolução A.744(18) em 4 de Novembro de 1993, são aplicáveis na Região Administrativa Especial de Macau;

Mais considerando que as referidas Directrizes foram objecto de sucessivas emendas pelo Comité de Segurança Marítima da OMI e pela Conferência dos Governos Contratantes da Convenção Internacional para a Salvaguarda da Vida Humana no Mar, 1974, ao abrigo do artigo VIII (b) e da norma XI-1/2 da mesma Convenção, e que tais emendas exigiram uma revisão abrangente a fim de garantir uma aplicação efectiva das suas normas e de assegurar a manutenção de um elevado nível de segurança operacional;

Considerando ainda que, em 30 de Novembro de 2011, na sua 27.ª sessão, a Assembleia da OMI, através da resolução A.1049 (27), adoptou o Código Internacional para o Programa Reforçado de Inspeções no âmbito das Vistorias a Graneleiros e Petroleiros, 2011 (Código ESP 2011), o qual entrou em vigor na ordem jurídica internacional, incluindo a República Popular da China e a sua Região Administrativa Especial de Macau em 1 de Janeiro de 2014;

Considerando igualmente que, em 22 de Maio de 2014, 21 de Novembro de 2014 e 19 de Maio de 2016, o Comité de Segurança Marítima da OMI, através das resoluções MSC.371(93), MSC.381(94) e MSC.405(96) respectivamente, adoptou as emendas ao Código ESP 2011, e que tais emendas entraram em vigor na ordem jurídica internacional, incluindo a República Popular da China e a sua Região Administrativa Especial de Macau, respectivamente em 1 de Janeiro de 2016, 1 de Julho de 2016 e 1 de Janeiro de 2018;

O Chefe do Executivo manda publicar, nos termos da alínea 1) do artigo 5.º e do n.º 1 do artigo 6.º da Lei n.º 3/1999 (Publicação e formulário dos diplomas):

– o Código ESP 2011 adoptado pela Assembleia da OMI através da resolução A.1049(27), nos seus textos autênticos em línguas chinesa e inglesa;

– as emendas ao Código ESP 2011 adoptadas pelo Comité de Segurança Marítima da OMI através da resolução MSC.371(93), nos seus textos autênticos em línguas chinesa e inglesa;

– as emendas ao Código ESP 2011 adoptadas pelo Comité de Segurança Marítima da OMI através da resolução MSC.381(94), nos seus textos autênticos em línguas chinesa e inglesa;

——國際海事組織海上安全委員會透過第MSC.405(96)號決議通過的《2011年加強檢驗計劃規則》修正案的中文和英文正式文本。

二零二二年一月十二日發佈。

行政長官 賀一誠

– as emendas ao Código ESP 2011 adoptadas pelo Comité de Segurança Marítima da OMI através da resolução MSC.405(96), nos seus textos autênticos em línguas chinesa e inglesa.

Promulgado em 12 de Janeiro de 2022.

O Chefe do Executivo, *Ho Iat Seng*.

2011 年國際散貨船和油船檢驗期間 加強檢驗計劃規則（2011 年加強檢驗計劃規則）

第 A.1049（27）號決議

2011 年 11 月 30 日通過

大會，

憶及《國際海事組織公約》關於大會在海上安全及防止和控制船舶造成海洋污染的規則和導則方面的職能的第十五條第（十）款，

還憶及大會第 A.744（18）號決議，大會以該決議通過了《散貨船和油船檢驗期間加強檢驗計劃導則》（以下稱“導則”），

注意到《1974 年國際海上人命安全公約》（《安全公約》）（以下稱：“公約”）1994 年締約國政府會議通過的公約第 XI-1/2 條使導則的各項規定根據公約成為強制性要求，

還注意到第 MSC.49（66）、MSC.105（73）、MSC.125（75）、MSC.144（77）、MSC.197（80）、MSC.261（84）號決議和 1997 年公約締約國政府會議第 2 號決議，海上安全委員會和公約締約國政府會議酌情按照公約第 VIII（b）條和第 XI-1/2 條規定，以這些決議通過了導則的各項修正案，

認識到對導則所做的這些修正需要形成一個全面的修訂版本，以確保其規定的有效實施並維持儘可能高的安全水平，

審議了海上安全委員會在其第 89 屆會議上提出的建議，

1. 通過《2011 年國際散貨船和油船檢驗期間加強檢驗計劃規則》

（《2011年加強檢驗計劃規則》），其文本載於本決議附件：

2. 請公約各締約國政府注意，《2011年加強檢驗計劃規則》將於公約第 XI-1 章的相關修正案生效時即行生效；
3. 要求本組織秘書長在上述公約第 XI-1 章修正案被通過後，將本決議及其附件中《2011年加強檢驗計劃規則》文本的核證無誤副本送發公約的所有締約國政府；
4. 還要求本組織秘書長在上述公約第 XI-1 章修正案被通過後，將本決議及其附件中該規則文本的副本送發非《安全公約》締約國政府的本組織所有會員國；
5. 進一步要求海上安全委員會不斷審議該規則，並根據使用中所獲得的經驗，在必要時對其進行修正。

附 件

2011 年國際散貨船和油船檢驗期間加強檢驗

計劃規則（2011 年加強檢驗計劃規則）

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- 1 總則**
 - 1.1 適用範圍
 - 1.2 定義
 - 1.3 修理
 - 1.4 驗船師
 - 1.5 厚度側量與近觀檢驗

- 2 換證檢驗**
 - 2.1 總則
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- 4.1 總則
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- 1.2 定義
- 1.3 修理
- 1.4 驗船師
- 1.5 厚度側量與近觀檢驗

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- 2.2 乾塢檢驗
- 2.3 處所保護
- 2.4 艙蓋和艙口圍板
- 2.5 全面和近觀檢驗範圍
- 2.6 厚度測量範圍
- 2.7 液艙壓力試驗範圍
- 2.8 確定符合公約第 XII/12 和 XII/13 條規定後的附加換證檢驗要求

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- 3.3 露天甲板、艙蓋和艙口圍板檢查
- 3.4 貨船檢查
- 3.5 壓載艙檢查
- 3.6 確定符合公約第 XII/12 和 XII/13 條規定後的附加年度檢驗要求

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- 4.2 船齡 5 至 10 年的雙舷側散貨船
- 4.3 船齡 10 至 15 年的雙舷側散貨船
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- 1 總則
 - 1.1 適用範圍
 - 1.2 定義
 - 1.3 修理
 - 1.4 驗船師
 - 1.5 厚度側量與近觀檢驗
- 2 換證檢驗
 - 2.1 總則

- 2.2 乾塢檢驗
- 2.3 液艙防腐系統
- 2.4 全面和近觀檢驗範圍
- 2.5 厚度測量範圍
- 2.6 液艙壓力試驗範圍

- 3 年度檢驗
 - 3.1 總則
 - 3.2 船體檢查
 - 3.3 露天甲板檢查
 - 3.4 貨泵艙和管隧（如有）檢查
 - 3.5 壓載艙檢查

- 4 中間檢驗
 - 4.1 總則
 - 4.2 船齡 5 至 10 年的油船
 - 4.3 船齡 10 至 15 年的油船
 - 4.4 船齡超過 15 年的油船

- 5 檢驗前準備
 - 5.1 檢驗計劃
 - 5.2 檢驗條件
 - 5.3 結構通道
 - 5.4 檢驗設備
 - 5.5 海上或錨泊檢驗
 - 5.6 檢驗計劃會議

- 6 船上文件
 - 6.1 總則
 - 6.2 檢驗報告案卷
 - 6.3 支持性文件
 - 6.4 船上文件審核

7 測厚程序

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1.1 適用範圍

- 1.2 定義
- 1.3 修理
- 1.4 驗船師
- 1.5 厚度側量與近觀檢驗

- 2 換證檢驗**
 - 2.1 總則
 - 2.2 乾塢檢驗
 - 2.3 液艙防腐系統
 - 2.4 全面和近觀檢驗範圍
 - 2.5 厚度測量範圍
 - 2.6 液艙壓力試驗範圍

- 3 年度檢驗**
 - 3.1 總則
 - 3.2 船體檢查
 - 3.3 露天甲板檢查
 - 3.4 貨泵艙和管隧（如有）檢查
 - 3.5 壓載艙檢查

- 4 中間檢驗**
 - 4.1 總則
 - 4.2 船齡 5 至 10 年的油船
 - 4.3 船齡 10 至 15 年的油船
 - 4.4 船齡超過 15 年的油船

- 5 檢驗前準備**
 - 5.1 檢驗計劃
 - 5.2 檢驗條件
 - 5.3 結構通道
 - 5.4 檢驗設備
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5.6 檢驗計劃會議

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附件 A

散貨船檢驗期間加強檢驗計劃規則

A 部分

單舷側結構散貨船檢驗期間加強檢驗計劃規則

1 總則

1.1 適用範圍

1.1.1 本規則應適用於除附件 A 的 B 部分第 1.2.1 段所界定的雙舷側散貨船以外的所有 500 總噸及以上的自航式散貨船。

1.1.2 本規則應適用於貨物長度區域內的貨船、隔離艙、管隧、空艙和燃油艙以及所有壓載艙處的船體結構和管路系統的檢驗。

1.1.3 本規則包含檢查、測厚和液艙試驗的最小範圍。在發現顯著腐蝕和/或結構缺陷時，應擴大檢驗範圍，並包括必要時進行附加近觀檢驗。

1.1.4 應符合公約第 XII/6.1 條規定的船舶應按附件 11 的要求進行附加厚度測量。

1.1.5 應符合第 MSC.168 (79) 號決議規定的船舶應按附件 15 的要求進行附加厚度測量。

1.1.6 對於混合貨艙佈置的散貨船，如某些貨艙為單舷側而其他的為雙舷側，則附件 A 的 B 部分要求應適用於雙舷側貨艙及其相關的邊艙。

1.1.7 應在按經修正的 1974 年《安全公約》第 I/10 條規定的檢驗期間進行檢驗。

1.2 定義

1.2.1 散貨船係指通常在裝貨處所建有單甲板、頂邊艙和底邊艙，且主要用於載運散裝乾貨的船舶，包括兼裝船。

1.2.2 壓載艙係指用於海水壓載的液艙，或適用時，對用於裝貨和海水壓載的處所，如已發現顯著腐蝕，將視作壓載艙。

1.2.3 處所係指獨立的艙室，包括貨艙、液艙以及鄰接貨艙、甲板和外殼板的隔離艙和空艙。

1.2.4 全面檢驗係指用於報告船體結構整體狀況和確定附加近觀檢驗範圍的檢驗。

1.2.5 近觀檢驗係指驗船師在近距離目視範圍內（即通常伸手可及處）對結構件細節進行的檢驗。

1.2.6 橫剖面係指垂直於船舶中線的船體橫剖面，包括所有板材等縱向構件，以及在甲板、舷側外板、船底板、內底板、底邊艙斜板、縱艙壁和頂邊艙斜底板上的縱骨及縱桁。

1.2.7 代表性處所係指能反映相似類型、用途和具有類似防腐蝕系統的其他處所的處所。當選擇代表性處所時，應考慮到其營運和修理史，以及可識別的臨界結構區域和/或可疑區域。

1.2.8 可疑區域係指呈現顯著腐蝕和/或驗船師認為易於快速損耗的區域。

1.2.9 顯著腐蝕係指通過腐蝕狀況評估表明其腐蝕量超過許用裕量

的 75%但尚處於可接受範圍內的腐蝕程度。對按國際船級社協會共同結構規範建造的船舶，顯著腐蝕係指通過腐蝕狀況評估表明其測量（或測厚）厚度介於 $t_{net} + 0.5\text{mm}$ 和 t_{net} 之間的腐蝕程度。

1.2.10 防腐系統通常可考慮全硬保護塗層。硬保護塗層通常係指環氧樹脂塗層或同等物。既非軟塗層亦非半硬塗層的其他塗層系統，如按生產廠的技術說明書應用和維護，可考慮作為替代品接受。

1.2.11 塗層狀況定義如下：

良好 係指僅有少量點狀鏽斑；

尚好 係指在扶強材的邊緣和焊縫的連接處塗層有局部脫落和/或所檢驗的區域中有超過 20%或更大範圍的輕度鏽蝕，但小於定義“差”的狀況；和

差 係指在檢驗的區域中有超過 20%或更大範圍的塗層普遍剝落，或有 10%或更大範圍的塗層產生硬質鏽皮。

1.2.12 臨界結構區域係指從計算中或從本船舶或類似船舶或姐妹船（適用時）的營運歷史中認定並需要進行檢測的、容易發生影響船舶結構整體性的破裂、屈曲或腐蝕的區域。

1.2.13 貨物長度區域係指包括貨艙和鄰近區域，含燃油艙、隔離艙、壓載艙和空艙的船舶部分。

1.2.14 中間檢驗係指在第二或第三次年度檢驗或其之間進行的檢驗。

1.2.15 及時徹底修理係指在檢驗期間完成的並使驗船師滿意的永久性修理，旨在消除需要批註的任何相關船級條件或遺留項目。

1.2.16 公約係指經修正的《1974 年國際海上人命安全公約》。

1.2.17 特殊考慮（與近觀檢驗和測厚有關）係指進行足夠的近觀檢查和測厚以確定塗層以下結構的實際平均狀況。

1.3 修理

1.3.1 任何與超過允許極限的結構蝕耗有關的損壞（包括屈曲、凹槽、脫開或斷裂）或大面積區域的蝕耗超過允許極限，若影響或主管機關認為將影響船舶的結構、水密或風雨密完整性，均應進行及時徹底修理（參見 1.2.15）。應考慮的區域包括：

- .1 舷側結構和舷側板；
- .2 甲板結構和甲板板；
- .3 船底結構和船底板；
- .4 內底結構和內底板；
- .5 內側結構和內側板；
- .6 水密或油密艙壁；
- .7 艙口蓋或艙口圍板；和
- .8 列於 3.3.10 中的項目。

在不能提供足夠修理設施的區域，主管機關可允許船舶直接駛往某一修理點。這可能要求船舶為該修理航次卸下貨物和/或進行臨時性修理。

1.3.2 此外，在檢驗發現腐蝕或結構缺陷時，如主管機關認為其中之一將影響船舶繼續營運，船舶應在繼續營運前採取補救措施。

1.4 驗船師

對 20,000 載重噸及以上的散貨船，應由兩名驗船師聯合執行在其船齡超過 10 年後的第一次計劃的換證檢驗(即第三次換證檢驗)，以及其後的所有換證和中間檢驗。對船齡在 10 年至 15 年之間的 100,000 載重噸及以上的散貨船，應由兩名驗船師執行中間檢驗。如由被認可組織進行檢驗，則這些驗船師應為該被認可組織專職聘用。

1.5 厚度測量與近觀檢驗

在任何檢驗中，即在換證檢驗、中間檢驗、年度檢驗或與這些檢驗範圍相同的其他檢驗中，對需要實施近觀檢驗的結構區域的測厚應與近觀檢驗同時進行。

2 換證檢驗

2.1 總則

2.1.1 換證檢驗可在第四次年度檢驗時開始，並可在其後一年中繼續進行，以在第五個周年日前完成。

2.1.2 檢驗計劃作為換證檢驗準備的一部分，應在換證檢驗前制定。厚度測量不應放在第四次年度檢驗之前進行。

2.1.3 除年度檢驗的要求外，檢驗還應包括足夠範圍的檢查、試驗和核查，以確保船體以及 2.1.5 所要求的相關管路處於合格狀況，並適合貨船構造安全證書新的有效期內其預定的用途，受到適當的維護和操作及到期接受各種定期檢驗。

2.1.4 所有貨艙、壓載艙、管隧、隔離艙和鄰接貨艙的空艙、甲板和外殼板都應進行檢查，這種檢查應輔以 2.6 和 2.7 所要求的厚度測量和試驗，以確保該結構的完整性始終有效。檢查應能足以發現可能存

在的顯著腐蝕、嚴重變形、斷裂、破損或其他結構蝕耗。

2.1.5 上述處所內的所有管系應在工作壓力下進行檢查和操作試驗並使現場驗船師滿意，以確保其密性和狀況保持合格狀態。

2.1.6 改建為空艙的壓載艙的檢驗範圍應結合壓載艙的要求予以特殊考慮。

2.1.7 中間檢驗和換證檢驗二者對處所的檢驗和測厚不應相互替代。

2.2 乾塢檢驗

2.2.1 乾塢檢驗應作為換證檢驗的一部分。在證書的五年期內應對船底外部至少進行兩次檢查。在所有情況下，船底檢查的最大間隔期不應超過 36 個月。

2.2.2 對船齡為 15 年及以上的船舶，應在乾塢進行船底外部檢查。對船齡小於 15 年的船舶，其未與換證檢驗一起進行的船底外部檢查，作為替代，可在船舶漂浮狀態下進行檢查。船舶在漂浮狀態下的檢查只有在船況令人滿意並具有合格的設備和合格人員時才能進行。

2.2.3 如乾塢檢驗未與換證檢驗一起完成，或如 2.2.1 中所述的 36 個月的最大間隔期未予滿足，則貨船構造安全證書應停止有效，直至乾塢檢驗完成。

2.2.4 如對貨艙和壓載艙下部的全面檢驗、近觀檢驗和厚度測量（如適用）尚未實施，則應按換證檢驗的適用要求進行。

註：貨艙和壓載艙下部係指輕壓載水線以下的部分。

2.3 處所保護

2.3.1 如設有壓載艙防腐系統，應檢查其狀況。對於壓載艙（不包括雙層底艙），如發現硬保護塗層處於 1.2.11 所界定的“差”狀況，且未換新，或已敷設軟塗層或半硬塗層，或從建造之時就未敷設硬保護塗層，則對所述艙應每年進行檢查。如驗船師認為必要，應進行測厚。如在壓載雙層底艙內發現硬保護塗層處於該種狀況，且未換新，或已敷設軟塗層或半硬塗層，或從建造之時就未敷設硬保護塗層，則對所述艙可每年進行檢查。如驗船師認為必要，或存在大面積腐蝕，應進行測厚。

2.3.2 如貨艙內設有硬保護塗層，且塗層處於“良好”狀況，近觀檢驗和厚度測量的範圍可予以特殊考慮。

2.4 艙蓋和艙口圍板

艙蓋和艙口圍板應經受下列檢驗：

2.4.1 除所有艙蓋和艙口圍板外，還應對 3.3 中列出的項目進行徹底檢查。

2.4.2 應檢查所有機械操作的艙蓋是否操作良好，包括：

- .1 開啟狀態下的積載和繫固；
- .2 關閉狀態下的適配性和密封有效性；和
- .3 液壓和動力部件、鋼索、鏈和連動裝置的操作試驗。

2.4.3 應通過沖水試驗或等效方法檢查所有艙蓋的密封裝置的有效性。

2.4.4 對艙蓋、艙口圍板及扶強材應按附件 2 進行厚度測量。

2.5 全面和近觀檢驗範圍

2.5.1 在換證檢驗時應對所有液艙和處所進行一次全面檢驗。對貨物長度區域內的燃油艙應進行如下檢驗：

第 1 次換證檢驗 船齡≤5 年	第 2 次換證檢驗 5 年<船齡≤10 年	第 3 次換證檢驗 10 年<船齡≤15 年	第 4 次及以後換 證檢驗 船齡>15 年
無	一個	兩個	半數，至少兩個
註： 1. 本要求適用於整體（結構）類型的液艙。 2. 如檢查中對液艙進行抽查，則每次換證檢驗都應輪流檢查不同的液艙。 3. 尖艙（各種用途）應在每次換證檢驗中進行內部檢查。 4. 在第三次換證檢驗及以後的換證檢驗時，應包括一個位於貨物區域的燃油深艙（如設置）。			

2.5.2 在換證檢驗時近觀檢驗的最低要求見附件 1。

2.5.3 驗船師在考慮到檢驗時處所的維護、防腐系統的狀況以及處所具有的結構佈置或構件根據可獲得的資料曾經在類似處所或類似船舶出現過缺陷的同時，可根據需要擴大近觀檢驗的範圍。

2.5.4 對於查明硬保護塗層處於“良好”狀況的處所內區域，按附件 1 要求的近觀檢驗範圍可予以特殊考慮。還參見 2.3.2。

2.6 厚度測量範圍

2.6.1 在換證檢驗時厚度測量的最低要求見附件 2。附件 11 提供的附加測厚導則適用於應符合公約第 XII/6.1 條要求的船舶上 1 號和 2 號貨艙之間的垂直槽形水密橫艙壁。對適用於應符合第 MSC.168 (79) 號決議要求的船舶舷側肋骨和肘板的附加測厚導則，參見 1.1.5

和附件 15。

2.6.2 應進行有代表性的厚度測量，以確定在所有貨艙和壓載艙內的外板肋骨和末端附件的總體和局部腐蝕程度。還應對橫艙壁板進行測厚，以確定其腐蝕程度。如驗船師通過近觀檢查確信無結構尺寸減小且敷設的硬保護塗層保持有效，則厚度測量的範圍可予以特殊考慮。

2.6.3 對 1.2.9 界定的顯著腐蝕區域的擴大厚度測量按附件 10 的規定進行，並可在 5.1 要求的檢驗計劃中作出附加規定。該擴大測厚應在檢驗完成之前進行。應檢查以前檢驗中確定的可疑區域。以前檢驗中確定的顯著腐蝕區域應進行測厚。

2.6.4 驗船師可根據需要進一步擴大厚度測量的範圍。

2.6.5 對於查明硬保護塗層處於 1.2.11 所界定的“良好”狀況的液艙內區域，按附件 2 要求的厚度測量範圍可由主管機關予以特殊考慮。

2.6.6 測厚的橫剖面應選擇在懷疑發生最大縮減或經甲板板測厚揭示的最大縮減處。

2.7 液艙壓力試驗範圍

2.7.1 所有壓載水艙、深艙以及在貨物長度區域內用於水壓載的貨艙的界限面應進行壓力試驗。對於燃油艙，僅對代表性液艙進行壓力試驗。

2.7.2 驗船師可根據需要擴大液艙試驗的範圍。

2.7.3 對壓載艙的邊界進行試驗的液體壓頭應至空氣管頂部。

2.7.4 對壓載的貨艙的邊界進行試驗的液體壓頭應至艙口頂部附近。

2.7.5 對燃油艙的邊界進行試驗的液體壓頭應至其各種服務狀態下液體可能上升的最高點。基於對燃油艙邊界的外部檢查的滿意結果和對船長關於已按要求進行壓力試驗的滿意結果陳述的確認，燃油艙的液艙密性試驗可予以特殊考慮。

2.7.6 如對雙層底艙和其他非設計用於裝載液體的處所的內部檢查和內底板檢查認為滿意，則可不進行試驗。

2.8 確定符合公約第 XII/12 和 XII/13 條規定後的附加換證檢驗要求

2.8.1 對符合公約第 XII/12 條關於貨艙、壓載艙和乾燥處所水位探測器要求的船舶，換證檢驗應包括檢查和測試進水探測系統及其報警裝置。

2.8.2 對符合公約第 XII/13 條關於泵系有效性要求的船舶，換證檢驗應包括檢查和測試用於排放和泵吸位於防撞艙壁前方的壓載艙的壓載水以及任何部位延伸至最前部貨艙前方的乾燥處所的艙底水的設備及其控制裝置。

3 年度檢驗

3.1 總則

年度檢驗應由一種檢查組成，其目的是儘實際可行地確保船體、露天甲板、艙蓋、艙口圍板和管路處於合格狀態，還應考慮到營運記錄、壓載艙防腐系統狀況和範圍以及檢驗報告案卷中確定的區域。

3.2 船體檢查

3.2.1 凡可見的船殼板及其關閉裝置均應進行檢查。

3.2.2 對水密貫穿件應儘實際可行地進行檢查。

3.3 露天甲板、艙蓋和艙口圍板檢查

3.3.1 應確認自上次檢驗以來，艙蓋、圍板及其緊固的密封裝置均無未經批准的變動。

3.3.2 對艙蓋和圍板只有在其關閉和開啟的狀態下均做檢查才能進行全面檢驗，並應包括驗證正常的開啟和關閉操作。因此，每次年度檢驗時，應對船舶前部至少 25%長度內的艙蓋裝置以及至少一個附加裝置進行開啟、關閉和艙蓋向每個方向完全開啟和關閉操作的檢驗，從而能確保在每五年期內對船上所有的艙蓋裝置至少進行一次評估；檢驗包括：

- .1 開啟狀態下的積載和繫固；
- .2 關閉狀態下的適配性和密封有效性；和
- .3 液壓和動力部件、鋼索、鏈和連動裝置的操作試驗。

艙蓋關閉應包括繫固所有周邊裝置，以及十字接頭楔耳或其他繫固設備。應特別注意船舶前部 25%長度內的艙蓋，因為該處波浪載荷通常最大。

3.3.3 如艙蓋操作和繫固有困難，則應由驗船師決定對上述 3.3.2 要求的附加裝置進行操作試驗。

3.3.4 如貨艙艙口繫固系統不能正常操作，則應在主管機關的監督下進行修理。如對艙蓋或圍板進行重大修理，則繫固裝置的強度應予加強並符合附件 13 的要求。

3.3.5 在每次年度檢驗時，應對每一艙蓋裝置的下列項目進行檢驗：

- .1 艙蓋板架，包括邊板，以及可在開啟位置進行近觀檢驗（以檢查腐蝕、裂紋或變形）的扶強材附件；
- .2 周邊和十字接頭的密封裝置（密封墊狀況和永久變形、兼裝船上柔性密封裝置、帶唇邊的密封墊、壓條、泄水槽和止回閥）；
- .3 夾緊裝置、壓條、楔耳（檢查損耗、調整，以及橡膠部件狀況）；
- .4 關閉的艙蓋定位裝置（變形和連接件）；
- .5 鏈或繩索滑輪；
- .6 導向裝置；
- .7 導軌和導輪；
- .8 制動裝置；
- .9 鋼索、傳動鏈、拉伸裝置和絞車副卷筒；
- .10 液壓系統、電動安全裝置和連鎖裝置；和
- .11 端部和板格間鉸鏈、銷釘和底座（如設有）。

3.3.6 在每次年度檢驗時，應對每一艙口處的圍板以及板、扶強材和肘板的腐蝕、裂紋和變形情況，尤其是圍板頂部，進行檢查，包括近觀檢驗。

3.3.7 如認為必要，可通過對密封壓力部件附加的沖水或堇粉水密試驗證實密封裝置的有效性。

3.3.8 對裝設木質或鋼質箱形的活動艙蓋者，應酌情確認以下項目

處於令人滿意狀況：

- .1 木質艙口蓋和活動橫樑，活動橫樑承座或插座及其緊固裝置；
- .2 鋼質箱形艙蓋，包括艙口蓋板的近觀檢驗；
- .3 防水帆布；
- .4 楔耳、壓條和楔子；
- .5 艙口緊固壓條及其緊固裝置；
- .6 承載座板/樑材和側板的邊緣；
- .7 導板和楔子；和
- .8 壓條、泄水槽和泄水管（如有）。

3.3.9 應檢查所有燃料艙透氣管上的防火網。

3.3.10 應檢查燃料艙和透氣管系統，包括通風筒。

3.4 貨艙檢查

3.4.1 對船齡 10 至 15 年的散貨船應進行如下檢驗：

- .1 對所有貨船的全面檢驗；
- .2 對肋骨至少 25% 的足夠範圍的近觀檢驗，以確定外板肋骨下部區域的狀況，包括舷側肋骨長度大約三分之一的下部、舷側肋骨末端連接以及前貨艙的鄰接舷側外板。如該程度的檢驗揭示需要採用補救措施時，應擴大檢驗範圍，包括所有外板肋骨、貨艙鄰接舷側外板的近觀檢

驗，以及所有剩餘貨艙足夠範圍的近觀檢驗；

- .3 在驗船師認為必要時，或存在大面積腐蝕時，應進行測厚。如測厚結果表明顯著腐蝕，應按附件 10 規定擴大測厚範圍。該擴大的測厚應在年度檢驗完成之前進行。應檢查以前檢驗中確定的可疑區域。對以前檢驗中確定的顯著腐蝕區域應進行測厚；
- .4 如查明貨艙內硬保護塗層處於“良好”狀況，近觀檢驗和測厚的範圍可予以特殊考慮；和
- .5 貨艙內的所有管系和貫穿件，包括舷外管路，應予以檢查。

3.4.2 對船齡超過 15 年的散貨船，應進行如下檢驗：

- .1 對所有貨艙的全面檢驗；
- .2 對肋骨至少 25% 的足夠範圍的近觀檢驗，以確定外板肋骨下部區域的狀況，包括舷側肋骨長度大約三分之一的下部、舷側肋骨末端連接以及前貨艙和另一選擇的貨艙的鄰接舷側外板。如該程度的檢驗揭示需要採用補救措施，應擴大檢驗範圍，包括所有外板肋骨、貨艙鄰接舷側外板的近觀檢驗，以及所有剩餘貨艙足夠範圍的近觀檢驗；
- .3 在驗船師認為必要時，或存在大面積腐蝕時，應進行測厚。如測厚結果表明顯著腐蝕，應按附件 10 規定擴大測厚範圍。該擴大的測厚應在年度檢驗完成之前進行。應檢查以前檢驗中確定的可疑區域。對以前檢驗中確定的

顯著腐蝕區域應進行測厚；

- .4 如查明貨艙內硬保護塗層處於“良好”狀況，近觀檢驗和測厚的範圍可予以特殊考慮；和
- .5 貨艙內的所有管系和貫穿件，包括舷外管路，應予以檢查。

3.5 壓載艙檢查

在由於換證檢驗和中間檢驗的結果而有要求時，應對壓載艙進行檢查。在主管機關認為必要時，或存在大面積腐蝕時，應進行測厚。如這些測厚結果表明有顯著腐蝕，則應按附件 10 規定擴大測厚範圍。該擴大的測厚應在檢驗完成之前進行。應檢查以前檢驗中確定的可疑區域。對以前檢驗中確定的顯著腐蝕區域進行測厚。

3.6 按附件 12 的要求對應符合公約第 XII/9 條規定的船舶的最前部貨艙附加年度檢驗要求

3.6.1 應符合公約第 XII/9 條規定的船舶係指滿足下列所有條件的船舶：

- .1 船長為 150m 及以上的單舷側結構散貨船；
- .2 載運密度為 $1,780\text{kg/m}^3$ 及以上的固體散裝貨物；
- .3 於 1999 年 7 月 1 日以前建造；和
- .4 其構造缺乏足夠數量的水密橫艙壁而不能使其在所有裝載工況下承受最前部貨艙的進水，並且不能在公約第 XII/4.4 條規定的令人滿意的平衡狀態下保持飄浮。

3.6.2 按公約第 XII/9 條規定，附件 12 中所列的附加檢驗要求應適用於此類船舶的最前部貨艙。

3.7 確定符合公約第 XII/12 和 XII/13 條規定後的附加年度檢驗要求

3.7.1 對符合公約第 XII/12 條關於貨艙、壓載艙和乾貨處所水位探測器要求的船舶，年度檢驗應包括檢查和隨機測試進水探測系統及其報警裝置。

3.7.2 對符合公約第 XII/13 條關於泵系有效性要求的船舶，年度檢驗應包括檢查和測試用於排放和泵吸位於防撞艙壁前方的壓載艙的壓載水以及任何部位延伸至最前部貨艙前方的乾燥處所艙底水的設備及其控制裝置。

4 中間檢驗

4.1 總則

4.1.1 對年度檢驗要求以外的附加項目，可在第二次或第三次年度檢驗時或其之間進行檢驗。

4.1.2 檢驗範圍依 4.2、4.3 和 4.4 中規定的船齡而定。

4.1.3 中間檢驗和換證檢驗所要求的處所的檢驗和測厚不應相互替代。

4.2 船齡 5 至 10 年的散貨船

4.2.1 壓載艙

4.2.1.1 對用於水壓載的艙，應對驗船師選擇的代表性艙進行全面檢

驗。代表性艙的選取，應在考慮到壓載艙的數量和類型的同時，包括首尾尖艙和其他類型的艙。如該全面檢驗表明無可見的結構缺陷，則檢查可限於核實防腐系統處於有效狀態。

4.2.1.2 如在水壓載艙內發現塗層狀況“差”、有腐蝕或其他缺陷，或從建造時起就未敷設硬保護塗層，則檢查應擴大至其他同類型的壓載艙。

4.2.1.3 如在壓載艙（雙層底艙除外）內發現硬保護塗層狀況“差”，且未換新，或已敷設軟塗層或半硬塗層，或從建造時起就未敷設硬保護塗層，則應對所述艙每年進行檢查，並在必要時進行測厚。如在壓載雙層底艙內發現塗層處於此種狀況，且已敷設軟塗層或半硬塗層，或未敷設硬保護塗層，則可對所述艙每年進行檢查。在驗船師認為必要時，或存在大面積腐蝕時，應進行測厚。

4.2.1.4 除上述要求之外，還應對上次換證檢驗中確定的可疑區域進行全面檢查和近觀檢驗。

4.2.2 貨艙

4.2.2.1 應對所有貨艙進行全面檢驗，包括對肋骨至少 25% 的足夠範圍的近觀檢驗，以確定下列部位的狀況：

- .1 前貨艙和另一選擇的貨艙內的肋骨，包括其上下端部附件、鄰接的舷側外板，以及橫艙壁；和
- .2 以前檢驗中發現的可疑區域。

4.2.2.2 根據 4.2.2.1 所述的全面檢驗和近觀檢驗結果，在驗船師認為必要時，應擴大該檢驗的範圍，以包括對該貨艙所有舷側肋骨和鄰接

的舷側外板的近觀檢驗，以及所有其餘貨艙足夠範圍的近觀檢驗。

4.2.3 厚度測量範圍

4.2.3.1 厚度測量應在足夠範圍內進行，以確定 4.2.2.1 所述的近觀檢驗區域內的總體腐蝕和局部腐蝕程度。在中間檢驗時對測厚的最低要求為在以前檢驗時發現的可疑區域。

4.2.3.2 如驗船師通過近觀檢驗確信無結構縮減，且查明硬保護塗層處於“良好”狀況，近觀檢驗和測厚的範圍可予以特殊考慮。

4.2.3.3 如發現顯著腐蝕，則應按附件 10 的規定擴大測厚範圍。該擴大的測厚應在檢驗完成之前進行。應檢查以前檢驗中確定的可疑區域。對以前檢驗中確定的顯著腐蝕區域應進行測厚。

4.3 船齡 10 至 15 年的散貨船

4.3.1 中間檢驗的要求應與 2 和 5.1 要求的前次換證檢驗的範圍相同。但是，除非現場驗船師認為必要，否則不要求進行燃油艙的內部檢查和所有液艙的壓力試驗。

4.3.2 在應用 4.3.1 時，中間檢驗可在第二次年度檢驗時開始，並可在其後一年中繼續進行，以在第三次年度檢驗時完成，替代應用 2.1.1。

4.3.3 在應用 4.3.1 時，水下檢驗可予以考慮，以替代 2.2 的要求。

4.4 船齡超過 15 年的散貨船

4.4.1 中間檢驗的要求應與 2 和 5.1 要求的前次換證檢驗的範圍相同。但是，除非現場驗船師認為必要，否則不要求進行燃油艙的內部檢查和所有液艙的壓力試驗。

4.4.2 在應用 4.4.1 時，中間檢驗可在第二次年度檢驗時開始，並可在其後一年中繼續進行，以在第三次年度檢驗時完成，替代應用 2.1.1。

4.4.3 在應用 4.4.1 時，乾塢檢驗應作為中間檢驗的一部分。如對貨艙和水壓載艙下部的全面檢驗、近觀檢驗和測厚（如適用）尚未實施，則應按中間檢驗的適用要求進行。

*註：*貨艙和壓載艙下部係指輕壓載水線以下的部分。

5 檢驗前準備

5.1 檢驗計劃

5.1.1 船東應與主管機關合作，在以下檢驗的任何部分開始前制定具體的檢驗計劃：

- .1 換證檢驗；和
- .2 船齡 10 年以上的散貨船的中間檢驗。

檢驗計劃應根據附件 4A 中的資料以書面形式制定。只有在制定檢驗計劃後才能開始進行檢驗。

5.1.1.1 在制定檢驗計劃前，船東應根據附件 4B 中的資料填寫檢驗計劃調查表，並送交主管機關。

5.1.1.2 中間檢驗的檢驗計劃可由經上次換證檢驗所作狀況評估報告補充的檢驗計劃以及隨後的相關檢驗報告組成。制定檢驗計劃應考慮到自上一次換證檢驗後對檢驗要求的任何修正。

5.1.2 在制定檢驗計劃時，應搜集和查閱下列文件，以選擇要進行

檢查的液艙、貨艙、區域和結構件：

- .1 檢驗狀況和基本的船舶資料；
- .2 6.2 和 6.3 中所述的船上文件；
- .3 主結構圖（尺寸圖），包括有關使用高強度鋼（HTS）的資料；
- .4 來自船級社和船東兩方面的有關以前檢驗和檢查報告；
- .5 關於船舶貨艙和液艙的使用、典型貨物和其他相關數據的資料；
- .6 關於新船防腐等級的資料；和
- .7 關於在船舶營運期間的有關維護保養等級的資料。

5.1.3 提交的檢驗計劃應說明並至少符合 2.7 及附件 1 和附件 2 分別對近觀檢驗、厚度測量和液艙試驗的要求，並應至少包括下列相關資料：

- .1 基本的船舶資料和概況；
- .2 主結構圖（尺寸圖），包括有關使用高強度鋼（HTS）的資料；
- .3 貨艙和液艙圖；
- .4 附有塗層的使用、保護和狀況資料的貨艙和液艙明細表；
- .5 檢驗條件（如：有關貨艙和液艙清潔、除氣、通風、照明等的資料）；

- .6 結構通道的設置和方法；
- .7 檢驗設備；
- .8 指定進行近觀檢驗的貨艙、液艙和區域（見 2.5）；
- .9 指定進行厚度測量的剖面（見 2.6）；
- .10 指定進行試驗的液艙（見 2.7）；和
- .11 與該船舶有關的損壞經歷。

5.1.4 主管機關應通知船東適合於該船舶的最大限度的可接受結構蝕耗程度。

5.1.5 也可使用附件 9 中的與散貨船加強檢驗計劃有關的技術評估導則。本導則是一套建議的方法，在認為必要和適當時，可由主管機關決定，結合制定所要求的檢驗計劃予以施用。

5.2 檢驗條件

5.2.1 船東應為安全地進行檢驗提供必要的設施。

5.2.2 為使現場驗船師能進行檢驗，船東和主管機關之間應商定提供合適和安全的通道。

5.2.3 檢驗計劃調查表中應提供通道細節。

5.2.4 如現場驗船師斷定安全的規定和要求的通道不合適時，不應進行相關處所的檢驗。

5.2.5 應可安全進入貨艙、液艙和處所。貨艙、液艙和處所應予除氣和適當通風。進入液艙、空艙或圍蔽處所前，應確認液艙內部空氣中無危險氣體並含足夠的氧氣。

5.2.6 在準備檢驗、測厚和徹底檢查時，所有處所應進行清掃，包括除去表面所有鬆動的腐蝕積垢。處所應充分清潔，做到無水、無垢、無髒物、無殘油等，以能揭示腐蝕、變形、裂紋、破損或其他結構蝕耗以及塗層狀況。但是，船東已經決定換新的結構區域只需進行清掃和去垢，以確定要換新的區域範圍。

5.2.7 應提供足夠的照明，以能揭示腐蝕、變形、裂紋、破損或其他結構蝕耗以及塗層狀況。

5.2.8 如已敷設軟塗層或半硬塗層，應為驗船師提供安全通道，以使其能驗證塗層的有效性和進行內部結構（可能包括塗層剝落的部分）的狀況評估。如無法提供安全通道，則軟塗層或半硬塗層應予以去除。

5.2.9 船東應指派至少一位對液艙和封閉處所檢查有經驗的人員始終陪伴現場驗船師。此外，由至少兩人組成的有經驗的後備人員應等候在被檢驗的液艙或處所的艙口處。後備組人員應不斷觀察液艙或處所內的工作情況，並應保持救生和撤離設備隨時可用。

5.2.10 在被檢查的貨艙、液艙或處所內的檢驗人員、甲板上的負責駕駛員和駕駛室（視情況而定）之間應安排通信系統。這些通信設備應在整個檢驗中始終保持工作狀態。

5.3 結構通道

5.3.1 對全面檢驗，應提供設施使驗船師能用安全和可行的方法檢查船體結構。

5.3.2 對除貨艙舷側肋骨以外的船體結構的近觀檢驗，應提供驗船師可接受的下列一個或多個通道裝置：

- .1 固定腳手架和穿過結構的通道；
- .2 臨時腳手架和穿過結構的通道；
- .3 升降機和可移動台架；
- .4 便攜式梯子；
- .5 艇或筏；和
- .6 其他等效設施。

5.3.3 對小於 100,000 載重噸的散貨船貨艙舷側肋骨的近觀檢驗，應提供驗船師可接受的下列一個或多個通道裝置：

- .1 固定腳手架和穿過結構的通道；
- .2 臨時腳手架和穿過結構的通道；
- .3 可接受長度不超過 5m 的便攜式梯子用於包括肘板的舷側肋骨下部的檢驗；
- .4 液壓臂升降台，如傳統的車載升降台、升降機和可移動台架；
- .5 艇或筏，但貨艙的結構容量應足以承受在所有水位的靜力載荷；和
- .6 其他等效裝置。

5.3.4 對 100,000 載重噸及以上的散貨船貨艙舷側肋骨的近觀檢驗，不接受使用便攜式梯子，而應提供驗船師可接受的下列一個或多個通道裝置：

船齡 10 年以下船舶的年度檢驗、中間檢驗和第一次換證檢驗：

- .1 固定腳手架和穿過結構的通道；
- .2 臨時腳手架和穿過結構的通道；
- .3 液壓臂升降台，如傳統的車載升降台、升降機和可移動台架；
- .4 艇或筏，但貨艙的結構容量應足以承受在所有水位的靜力載荷；和
- .5 其他等效裝置。

其後的中間檢驗和換證檢驗：

- .1 固定或臨時腳手架和穿過結構的通道，用於貨艙肋骨至少上部的近觀檢驗；
- .2 液壓臂升降台，如傳統的車載升降台，用於舷側肋骨的下部和中部的檢驗，作為腳手架的替代方式；
- .3 升降機和可移動台架；
- .4 艇或筏，但貨艙的結構容量應足以承受在所有水位的靜力載荷；和
- .5 其他等效裝置。

5.3.5 儘管有上述要求，對 3.4.1.2 要求的年度檢驗時“對肋骨至少 25% 的足夠範圍的近觀檢驗，以確定舷側外板肋骨下部區域的狀況，包括舷側肋骨長度約三分之一的下部、舷側肋骨末端連接以及前貨艙的鄰接舷側外板”和 3.4.2.2 要求的“另一選擇的貨艙”，可接受使

用設有固定梯子上端部的機械裝置的便攜式梯子。

5.4 檢驗設備

5.4.1 通常應使用超聲波檢測設備進行測厚。應按要求向驗船師證明該設備的精度。

5.4.2 如驗船師認為必要，可要求用下列一個或多個裂紋檢測方法：

- .1 射線照相設備；
- .2 超聲波探傷設備；
- .3 磁粉探傷設備；和/或
- .4 着色滲透劑。

5.4.3 檢驗期間應有可使用的測爆儀、測氧儀、呼吸器、救生索，攀登帶及其繩索、鉤子和哨笛及其使用說明和指導。應提供安全檢查清單。

5.4.4 應為安全有效進行檢驗提供足夠和安全的照明。

5.4.5 在檢驗期間，應有足夠的防護服（如：安全頭盔、手套、安全靴等）可供使用。

5.5 海上或錨泊檢驗

5.5.1 如驗船師能得到船上人員的必要協助，可接受在海上或錨泊時進行檢驗。檢驗所需的預防措施和程序應符合 5.1、5.2、5.3 和 5.4 中的要求。

5.5.2 在處所內的檢驗人員與在甲板上的負責駕駛員之間應安排通信系統。如使用艇或筏，該系統還應包括負責壓載水泵操作的人員。

5.5.3 只有在驗船師考慮到所提供的安全措施，包括氣象預報和船舶對可預見狀況的反應後表示同意，以及在液艙內水位預期的上升不超過 0.25m 的情況下，方可使用艇或筏對液艙或適用貨艙進行檢驗。

5.5.4 在使用筏或艇進行近觀檢驗時，應符合下列條件：

- .1 應僅使用即使一個浮箱破裂仍具有合格的剩餘浮力和穩性的耐用型氣脹式筏或艇；
- .2 艇或筏應拴於通道梯上，並另安排一人留守在能清晰看見該艇或筏的通道梯處；
- .3 所有參加人員都應有合適的救生衣；
- .4 液艙或貨艙內的水面應平靜（在所有可預見的情況下，液艙內預期的水位上升不應超過 0.25m），且水位應固定。任何時候當筏或艇在使用時，水位都不得上升；
- .5 液艙、貨艙或處所必須只含有乾淨的壓載水。水面上不允許有任何油層；和
- .6 任何時候都不允許水位與最深甲板下腹板面板的距離在 1m 以內，這樣檢驗人員通往艙口的直接逃生通道才不致被隔絕。只有在被檢查的艙壁間距上設有甲板通道人孔並開啟時才能考慮水位超出甲板橫材，這樣才能保證任何時候檢驗人員都可使用逃生通道。其他有效的通往甲板的逃生通道也可予以考慮。

5.5.5 如腹板深度為 1.5m 或以下，筏或艇可允許單獨用於在液艙或處所甲板下的區域的檢查。

5.5.6 如腹板深度超過 1.5m，筏或艇可僅允許單獨用於下列之一的情況：

.1 甲板下結構的塗層處於“良好”狀況，且無鏽蝕的跡象；
或

.2 如果在每一間距上設置一個允許安全出入的永久通道。
該通道應：

.1 通過每一間距內的垂直梯直接通向甲板，該梯在甲板下約 2m 處設有一個小平台；或

.2 通過在液艙每一端都設有通往甲板的梯子的縱向永久平台通向甲板。該平台應在液艙的全長範圍內佈置在與甲板下結構的筏運檢查所需要的最高水位的相同平面，或其上。為此，與最高水位對應的空餘量應假定在甲板橫框架的跨距中點和液艙長度中點處測量至距甲板板不大於 3m。

如上述條件都不能滿足，則應為甲板下區域的檢驗提供腳手架或其他等效設施。

5.5.7 5.5.5 和 5.5.6 所述的單獨使用筏或艇並不排除在檢驗過程中使用艇或筏在液艙範圍內的移動。

5.6 檢驗設計會議

5.6.1 在檢驗之前和檢驗期間，現場驗船師和船上船東代表要做好適當準備，進行密切合作，這是執行安全有效檢驗的重要一環。在船上檢驗期間應定期召開安全會議。

5.6.2 為確保檢驗能安全有效地進行，應在換證和中間檢驗的任何部分開始之前，召開由現場驗船師、現場船東代表、測厚公司測量人員（視情況而定）和船長或由船長或公司指派的具有相應資質的代表參加的檢驗計劃會議，以確定檢驗計劃中預見的所有佈置均已到位（還參見 7.1.2）。

5.6.3 會議中應討論的項目的示意性清單如下：

- .1 船舶計劃（即航線、靠碼頭和離碼頭操縱、靠泊時段、貨物和壓載作業等）；
- .2 測厚的規定和佈置（即通道、清潔/除垢、照明、通風、人員安全）；
- .3 測厚範圍；
- .4 認可標準（參見最小厚度表）；
- .5 考慮了塗層狀況和可疑區域/顯著腐蝕區域後確定的近觀檢驗和測厚範圍；
- .6 測厚的實施；
- .7 總體上和發現不均勻腐蝕/點蝕之處的代表性讀數的採集；
- .8 繪製出顯著腐蝕區域；和
- .9 現場驗船師、測厚公司測量人員以及船東代表之間就發現的相關問題進行溝通。

6 船上文件

6.1 總則

6.1.1 船東應獲取、提供並在船上保存 6.2 和 6.3 規定的文件，隨時供驗船師使用。6.2 中所述的狀況評估報告應包括一份英文譯文。

6.1.2 文件應在船舶的整個營運壽命期間保存在船上。

6.2 檢驗報告案卷

6.2.1 檢驗報告案卷應是船上文件的一個組成部分，包括：

- .1 結構檢驗報告（附件 6）；
- .2 狀況評估報告（附件 7）；和
- .3 測厚報告（附件 8）。

6.2.2 船東及主管機關的辦事處，或經主管機關認可的組織的辦事處，也應備有檢驗報告案卷可供使用。

6.3 支持性文件

船上應備有以下方面的附加文件可供使用：

- .1 5.1 要求的檢驗計劃，直至換證檢驗或中間檢驗（如適用）完成；
- .2 貨艙和壓載艙主結構圖；
- .3 以前修理史；
- .4 貨物和壓載史；
- .5 船上人員對以下方面的檢查：
 - .1 總體結構損耗；

.2 艙壁和管路泄漏；

.3 塗層或防腐系統狀況（如有）。報告製作格式如附件 3 所示；和

.6 任何其他有助於識別臨界結構區域和/或需要檢查的可疑區域的資料。

6.4 船上文件審核

檢驗前，驗船師應檢查船上文件資料的完整性及其內容，並以其為檢驗的基礎。

7 測厚程序

7.1 總則

7.1.1 如要求的測厚不是由代表主管機關的被認可組織進行，則應由被認可組織的驗船師在場見證測厚過程。驗船師在船上的時間應視監督該測厚過程的範圍而定。

7.1.2 測厚公司應參加在檢驗開始前舉行的檢驗計劃會議。

7.1.3 要求實施近觀檢驗的區域內的構件測厚應與近觀檢驗同步進行。

7.1.4 在任何情況下，測厚範圍應足以代表實際的平均狀況。

7.1.5 測厚程序要求見附件 14。

7.2 測厚公司的認證

測厚應由主管機關認可的組織根據附件 5 規定的原則予以認證的合格公司進行。

7.3 報告

7.3.1 應編製一份測厚報告並提交給主管機關。該報告應給出測量部位、所測得的厚度以及相應的原始厚度。此外，報告還應說明進行測厚的日期、測量設備的類型、測量人員的姓名及其資質，並由測厚人員簽字。測厚報告應遵循附件 8 建議的測厚程序中規定的原則。

7.3.2 驗船師應審核最終的測厚報告並在封面上會簽。

8 檢驗報告和評估

8.1 檢驗報告的評估

8.1.1 檢驗期間收集的船舶結構狀況的數據和資料應用於評估船舶的可接受性和連續結構完整性。

8.1.2 應由主管機關或經主管機關授權的被認可組織對資料進行分析並予以簽註，其分析的結論應作為狀況評估報告的一部分。

8.2 報告

8.2.1 檢驗報告原則參見附件 6。

8.2.2 當檢驗在不同的檢驗站分別進行時，檢驗的每一部分均應出具報告。其後的現場驗船師在繼續或完成檢驗之前，應可獲得已經檢查和/或試驗項目的清單（壓力試驗、測厚等）以及項目是否已做記錄的說明。

8.2.3 應向船東簽發附件 7 所示的檢驗狀況評估報告以及結果，並應將其留存在船上供以後檢驗時查閱。狀況評估報告應由主管機關或代表主管機關的被認可組織予以簽註。

附件 1

換證檢驗時的近觀檢驗要求

船齡≤5年	5年<船齡≤10年	10年<船齡≤15年	船齡>15年
第1次換證檢驗	第2次換證檢驗	第3次換證檢驗	第4次及以後換證檢驗
(A) 前貨艙內肋骨的 25%，在有代表性位置處 (A) 其餘貨艙內選擇的肋骨， (B) 每種類型的壓載水艙（即頂邊艙和底邊艙）選兩個代表性艙，在每個代表性壓載艙內檢查一個橫向強框架及附連的板和縱骨 (C) 兩個選擇的貨艙橫壁，包括上下凳的內部結構（如設有） (D) 所有貨艙艙口蓋和圍板（板和扶強材）	(A) 前貨艙內所有肋骨和其餘每一個貨艙內肋骨的 25%，包括其端部附件及鄰接的外板。 (A) 對 100,000 載重噸及以上的散貨船，前貨艙內所有肋骨和每一個其餘的貨艙內肋骨的 50%，包括其端部附件及鄰接的外板 (B) 在每個壓載艙內檢查一個橫向強框架及附連的板和縱骨 (B) 一個壓載艙內的前、後橫壁，包括扶強材系統 (C) 所有貨艙的橫壁，包括頂凳和底凳的內部結構（如設有） (D) 所有貨艙艙口蓋和圍板（板和扶強材） (E) 所有貨艙口之間開口線內的所有甲板板及其下方結構	(A) 前貨艙及另一個選擇的貨艙的所有肋骨和其餘每一個貨艙內肋骨的 50%，包括上、下端部附件及鄰接的外板 (B) 壓載水艙內的所有橫壁，包括扶強材系統 (B) 在每一水壓載艙內的所有橫框架及附連的板和縱骨 以下同第二次換證檢驗的 (C)、(D) 和 (E)	(A) 所有貨艙內的所有肋骨，包括上、下端部附件和鄰接的外板 以下同第 3 欄中的 (B) 至 (E)

(A) 貨艙橫向肋骨

(B) 水壓載艙內橫向強框架或水密橫艙壁。

(C) 貨艙橫艙壁板、扶強材和桁材。

(D) 貨艙艙口蓋和圍板。

(E) 貨艙口之間開口線內甲板板。

參見附件 8 的附錄 3 中對應於 (A)、(B)、(C)、(D) 和 (E) 區域的示意圖。

還參見附件 15 中應符合第 MSC.168 (79) 號決議的船舶舷側肋骨區域的示意圖。

註： 橫艙壁的近觀檢驗應在下列四個水平面上進行：

水平面 (a) 對無底凳船舶直接在內底板以上、封槽板 (如設有) 以上和卸貨板以上。

水平面 (b) 對有底凳船舶直接在底凳頂板以上及以下和卸貨板以上。

水平面 (c) 大約在艙壁高度的一半處。

水平面 (d) 直接在上甲板以下和頂邊艙附近及有頂凳船舶的頂凳底板以下或直接在頂邊艙以下。

附件 2

換證檢驗的測厚要求

船齡≤5 年	5 年<船齡≤10 年	10 年<船齡≤15 年	船齡>15 年
1	2	3	4
1 可疑區域	- 可疑區域 - 在貨物長度區域內； 貨艙艙口線外的甲板板的兩個橫剖面 - 按附件 1 經受近觀檢驗的構件的測量點，供總體評定並作記錄腐蝕形式用 - 上述第 2 點考慮的橫剖面處舷側乾濕交變列板 - 貨物長度區域外選擇的舷側乾濕交變列板 - 對適用於應符合第 MSC.168 (79) 號決議的船舶舷側肋骨及其肘板，參見 1.1.5 和附件 15 的附加測厚導則	- 可疑區域 - 在貨物長度區域內： - 貨艙艙口線外的每塊甲板板 - 貨艙艙口線外三個橫剖面，其中一個應在船中部區域內 - 按附件 1 經受近觀檢驗的構件的測量點，供總體評定並作記錄腐蝕形式用 - 貨物長度區域內所有舷側乾濕交變列板 - 貨物長度區域外選擇的舷側乾濕交變列板 - 對適用於應符合第 MSC.168 (79) 號決議的船舶舷側肋骨及其肘板，參見 1.1.5 和附件 15 的附加測厚導則 - 對應符合公約第 XII/6.1 條規定的船舶，按附件 12 的要求進行測厚導則	- 可疑區域 - 在貨物長度區域內： - 貨艙艙口線外的每塊甲板板 - 貨艙艙口線外三個橫剖面，其中一個應在船中部區域內 - 每塊船底板 - 第 3 欄的第 3 點 - 全長範圍內所有舷側乾濕交變列板 - 對適用於應符合第 MSC.168 (79) 號決議的船舶舷側肋骨及其肘板，參見 1.1.5 和附件 15 的附加測厚導則 - 對應符合公約第 XII/6.1 條規定的船舶，按附件 12 的要求進行

附件 3
船東檢查報告
結構狀況

船名：_____							
船東檢查報告—結構狀況							
液艙/貨艙號：_____							
鋼級： 甲板：_____ 舷側：_____							
船底：_____ 縱艙壁：_____							
構件	裂紋	屈曲	腐蝕	塗層狀況	凹蝕	改動/修理	其他
甲板：							
船底：							
舷側：							
舷側肋骨：							
縱艙壁：							
橫艙壁：							
進行修理的原因：							
進行的測厚（日期）：							
總體結果：							
過期檢驗：							
船級遺留項目：							
意見：							
檢查日期：_____							
檢查員：_____							
簽字：_____							

附件 4A

檢驗計劃

基本資料和概況

船名：
IMO 編號：
船旗國：
船籍港：
總噸位：
載重量（公噸）：
垂線間長（m）：
造船廠：
船體號：
被認可組織（RO）：
RO 的船舶標識號：
船舶建造日期：
船東：
測厚公司：

1 序言

1.1 範圍

1.1.1 本檢驗計劃包括在本規則中要求的貨物長度區域、貨艙、壓載艙（包括首尾尖艙）內進行全面檢驗、近觀檢驗、測厚和壓力試驗的最小範圍。

1.1.2 檢驗佈置和安全方面應經現場驗船師認可。

1.2 文件

按第 6 節的要求，制定檢驗計劃所用的全部文件應在檢驗期

間在船上可供使用。

2 貨艙、液艙和處所的佈置

本部分檢驗計劃應以圖紙或文字形式提供檢驗適用範圍內的貨艙、液艙和處所佈置的資料。

3 貨艙、液艙和處所的一覽表及其使用情況、塗層範圍和防腐保護系統的資料

本部分檢驗計劃應說明與檢驗計劃調查表中提供的船舶貨艙和液艙使用情況、塗層範圍和防腐保護系統資料有關的任何變化（並應予更新）。

4 檢驗條件

本部分檢驗計劃應提供有關的檢驗條件的資料，如：貨艙和液艙清洗、除氣、通風和照明等。

5 結構通道的設置和方法

本部分檢驗計劃應說明與檢驗計劃調查表中提供的結構通道的設置和方法的資料有關的任何變化（並應予更新）。

6 檢驗設備清單

本部分檢驗計劃應確定並列出為進行檢驗和所要求測厚提供的設備。

7 檢驗要求

7.1 全面檢驗

本部分檢驗計劃應確定並列出本船按 2.5.1 應進行全面檢驗

的處所。

7.2 近觀檢驗

本部分檢驗計劃應確定並列出本船按 2.5.2 應進行近觀檢驗的船體結構。

8 確定進行試驗的液艙

本部分檢驗計劃應確定並列出本船按 2.7 應進行液艙試驗的貨艙和液艙。

9 確定測厚的區域和剖面

本部分檢驗計劃應確定並列出按 2.6.1 應進行測厚的區域和剖面。

10 船體結構最小厚度

本部分檢驗計劃應按（a）或（b）詳細規定應進行檢驗的本船船體的最小厚度：

（a）根據本船的船體結構圖所附的損耗裕度表和原始厚度確定；

（b）根據下表確定：

區域或位置	建造時的原始厚度 (mm)	最小厚度 (mm)	顯著腐蝕厚度 (mm)
甲板			
板			
縱骨			
縱桁			
艙口間甲板板			
艙口間甲板扶強材			
船底			
板			
縱骨			
縱桁			
內底			
板			
縱骨			
縱桁			
肋板			
頂邊艙處的船側			
板			
縱骨			
底邊艙處的船側			
板			
縱骨			
液艙處的船側（如適用）			
板			
縱骨			
縱桁			
貨艙處的船側			
板			
舷側肋骨腹板			
舷側肋骨折板			
上肘板腹板			

區域或位置	建造時的原始厚度 (mm)	最小厚度 (mm)	顯著腐蝕厚度 (mm)
上肘板折板			
下肘板腹板			
下肘板折板			
縱艙壁（如適用）			
板			
縱骨（如適用）			
縱桁（如適用）			
橫艙壁			
板			
扶強材（如適用）			
頂凳板			
頂凳扶強材			
底凳板			
底凳扶強材			
頂邊艙內橫向強框架			
板			
折板			
扶強材			
底邊艙內橫向強框架			
板			
折板			
扶強材			
艙口蓋			
板			
扶強材			
艙口圍板			
板			
扶強材			

註：檢驗計劃應附有損耗裕度表。

11 測厚公司

本部分檢驗計劃應確定與檢驗計劃調查表提供的測厚公司資料有關的任何變化（如有）。

12 與船舶有關的損壞經歷

本部分檢驗計劃應使用如下表格，提供至少最近三年內，貨艙、壓載艙區域以及貨物長度區域內空艙處的船體損壞細節。對這些損壞區域應進行檢驗。

按本船位置分類的船體損壞

貨艙、液艙 或處所編號 或區域	可能的原因 (如已知)	損壞描述	位置	修理	修理日期

如損壞與設計有關，姐妹船或類似船舶的船體損壞（如有）

貨艙、液艙 或處所編號 或區域	可能的原因 (如已知)	損壞描述	位置	修理	修理日期

13 以前檢驗中確定的顯著腐蝕區域

本部分檢驗計劃應確定並列出以前檢驗中發現的顯著腐蝕區域。

14 臨界結構區域和可疑區域

本部分檢驗計劃應確定並列出臨界結構區域和可疑區域（如有此類信息）。

15 其他相關意見和信息

本部分檢驗計劃應提供與檢驗相關的任何其他意見和信息。

附 錄

附錄 1—圖紙清單

5.1.3.2 要求備有貨艙和壓載艙的主要結構圖（尺寸圖），包括有關使用高強度鋼（HTS）的資料。本檢驗計劃附錄應確定並列出作為檢驗計劃組成部分的主要結構圖。

附錄 2—檢驗計劃調查表

船東已提交的檢驗計劃調查表（附件 4B）應附於本檢驗計劃後。附錄 3—其他文件

本部分檢驗計劃應確定並列出作為本計劃組成部分的任何其他文件。

為符合 5.1.3 要求，由船東配合主管機關制定。

日期：

（經授權的船東代表的姓名和簽字）

日期：

（經授權的主管機關代表的姓名和簽字）

附件 4B**檢驗計劃調查表**

1 下述資料將使船東能配合主管機關制定一份符合本規則要求的檢驗計劃。關鍵是船東在填寫本調查表時提供最新的資料。填寫完成後的本調查表應能提供本規則要求的所有資料和材料。

概況

船名：

IMO 編號：

船旗國：

船籍港：

船東：

被認可組織：

被認可組織的船舶標識號：

總噸位：

載重量（公噸）：

建造日期：

關於為近觀檢驗和測厚提供通道的資料

2 船東應在下表中說明通往應進行近觀檢驗和測厚的結構的通道。近觀檢驗係指現場驗船師在近距離目視範圍內（即通常伸手可及）對結構件細節進行的檢驗。

貨艙/ 液艙號	結構	臨時 腳手架	筏	梯子	直接 通道	其他方法 (請說明)
F.P.	首尖艙					
A.P.	尾尖艙					
貨艙	艙口邊圍板					
	頂邊斜板					
	頂凳板					
	艙口間甲板					
	舷側外板、肋骨和肘板					
	橫艙壁					
	底邊艙板					
	底凳					
	內底					
邊艙	甲板下結構					
	舷側外板和結構					
	斜板和結構					
	腹板和艙壁					
底邊艙	底邊斜板和結構					
	舷側外板和結構					
	船底結構					
	腹板和艙壁					
	雙層底結構					
	頂凳內部結構					
	底凳內部結構					

腐蝕性（如高硫含量）散裝貨物的歷史

船東的檢查

3 船東應填寫類似以下格式的表（下表僅為示例），根據本規則的要求提供至少最近三年內其對貨物長度區域範圍內所有貨艙、壓載艙和空艙的詳細檢查結果。

液艙/貨艙號	防腐 (1)	塗層範圍 (2)	塗層狀況 (3)	結構蝕耗 (4)	貨艙和液艙歷史記錄 (5)
貨艙					
頂邊艙					
底邊艙					
雙舷側邊艙					
雙層底艙					
頂凳					
底凳					
首尖艙					
尾尖艙					
其他處所					

註：

指明用於油類/壓載的液艙。

1) HC=硬塗層 SC=軟塗層；

SH=半硬塗層 NP=無保護

2) U=上部 M=中部；

L=下部 C=全部

3) G=良好 F=尚好 P=差；

RC=重新敷設（過去3年期間）

4) N=無情況記錄； Y=情況記錄，情況說明應附於調查表之後

船東代表姓名：

簽字：_____

日期：_____

- 5) DR=破損和修理； L=滲漏；
CV=改建（說明應附於調查表之後）

港口國監管檢查報告

列出包含船體相關結構缺陷的港口國監督檢查報告，以及關於糾正缺陷的資料：

安全管理系統

列出有關船體維護的不合格項，包括相關的糾正措施：

經認可測厚公司的名稱和地址：

附件 5

認證船體結構測厚公司的程序

1 適用範圍

本指南適用於對有意從事船體結構測厚的公司的認證。

2 認證程序

提交文件

2.1 應提交下列文件給主管機關認可的組織審批：

- .1 公司概況，如組織和管理機構；
- .2 公司在船體結構測厚方面的經歷；
- .3 技術人員履歷、即技術人員作為測厚操作人員的經歷，對船體結構等的技術知識和經驗。操作人員應具有符合公認的行業無損檢測（NDT）標準的資質；
- .4 用於測厚的設備，如超聲波檢測設備及其維護/校正程序；
- .5 測厚人員指南；
- .6 測厚技術員的培訓計劃；和
- .7 按建議的測厚程序（參見附件 8）的測量記錄格式。

公司審核

2.2 在提交的文件經審查合格後，應對公司進行審核，以確認公司按照所提交的文件適當組織和管理，並確認其事實上有能力進行船

體結構測厚工作。

2.3 認證取決於其在船上的測厚操作演示以及出具令人滿意的報告。

3 發證

3.1 在 2.2 所述的公司審核和 2.3 所述的測厚操作演示結果均合格後，主管機關或由主管機關認可的組織應簽發認可證書，同時出具一份關於該公司的測厚操作體系已獲認證的通知。

3.2 對證書的換新/簽註應不超過三年的間隔進行一次，以驗證公司保持原認可條件。

4 對業已認證的測厚操作體系作任何變更的報告

如公司對業已認證的測厚操作體系作任何變更，則應立即向主管機關認可的組織提交變更報告。如經主管機關認可的組織認為必要，應進行重新審核。

5 撤銷證書

如遇下列情況可撤銷證書：

- .1 進行了不正確的測量，或報告結果有誤；
- .2 驗船師發現公司經認可的測厚操作體系存在任何缺陷；
和
- .3 公司未能按要求將上述 4 中所述的任何變更報告經主管機關認可的組織。

附件 6

檢驗報告原則

原則上，對應符合本規則要求的散貨船，驗船師應在其船體結構和管路系統的檢驗報告中包括下列與檢驗有關的內容。

1 總則

1.1 在下列情形裏，應形成檢驗報告：

- .1 涉及定期船體檢查，即相關的年度、中間和換證檢驗的開始、繼續和/或完成；
- .2 已發現結構破損/缺陷時；
- .3 已進行修理、換新或改裝時；和
- .4 已批註或消除船級條件（遺留項目）時。

1.2 報告應：

- .1 提供證據，表明已按適用的要求進行了規定的檢驗；
- .2 提供文件，表明檢驗中發現的情況、進行的修理以及批註或消除的船級條件（遺留項目）；
- .3 提供檢驗記錄（包括採取的措施），作為可核查文件記錄的組成部分。檢驗報告應置於按要求存放在船上的檢驗報告案卷中；
- .4 提供為未來檢驗做計劃的信息；和
- .5 提供可用於維護入級規範和須知的素材信息。

1.3 當檢驗在不同的檢驗站分別進行時，應為每一部分檢驗出具報告。其後的現場驗船師在繼續或完成檢驗之前，應可獲得已檢驗項目的清單、相關檢驗結果以及項目是否已做記錄的說明。還應列出已進行的測厚和液艙試驗，供下一位驗船師使用。

2 檢驗範圍

2.1 確定已進行全面檢驗的艙室。

2.2 確定已在每個壓載艙和貨艙內（包括艙蓋和圍板）進行近觀檢驗的位置，以及所使用的通道裝置的資料。

2.3 確定已在每個壓載艙和貨艙內（包括艙蓋和圍板）進行測厚的位置。

註： 確定進行近觀檢驗和測厚的位置應至少包括一份根據定期檢驗的類型和船齡對附件 A 規定的要求範圍相應的各結構構件進行描述的確證書。

如僅要求進行部分檢驗，即 25% 的外板肋骨、一個橫向強框架、兩個選擇的貨艙橫艙壁，應使用肋骨號確定每個壓載艙和貨艙內的位置。

2.4 對壓載艙和貨艙內保護塗層處於良好狀況而且已對近觀檢驗和/或測厚的範圍作特殊考慮的區域，應確定要做特殊考慮的結構。

2.5 確定應經受液艙試驗的液艙。

2.6 確定甲板上以及貨艙、壓載艙、管隧、隔離艙和空艙內的如下管路系統：

.1 已進行包括管系及其閥和附件的內部檢查和測厚在內的

相關檢查；和

.2 已進行工作壓力的操作試驗。

3 檢驗結果

3.1 每個相關液艙內保護塗層的類型、範圍和狀況（分為“良好”、“尚好”或“差”），包括確定安裝了陽極的液艙。

3.2 每個相關艙室的結構狀況及以下方面的資料：

.1 確定發現的情況，例如：

.1 腐蝕及對位置、類型和範圍的描述；

.2 顯著腐蝕的區域；

.3 裂紋/裂口及對位置和範圍的描述；

.4 屈曲及對位置和範圍的描述；和

.5 凹痕及對位置和範圍的描述；

.2 確定未發現結構破損/缺陷的艙室。報告可附草圖/照片加以補充；和

.3 測厚報告應由在船上監督測量工作的驗船師核實並簽字。

4 對發現的問題所採取的行動

4.1 每當現場驗船師認為需要進行修理時，應在編號的清單中標出應予修理的每一項目。每當進行修理時，應報告實施的修理的細節，具體提及編號的清單中的相關項目。

4.2 應報告已進行的修理並標明：

- .1 艙室；
- .2 結構構件；
- .3 修理方法（即：換新或改動），包括：
 - .1 鋼級和尺度（如與原始材料的區別）；
 - .2 草圖/照片，如適用；
- .4 修理範圍；和
- .5 無損檢測（NDT）/試驗。

4.3 對在檢驗時未完成的修理，船級條件/遺留項目中應規定該修理的具體完成期限。為向參與修理檢驗的驗船師提供正確和適當的資料，船級條件/遺留項目應足夠詳細，並標明應進行修理的每一項目。對大範圍修理的確定，可參考檢驗報告。

附件 7

狀況評估報告

在換證檢驗完成後簽發

船舶概況

船名：船級/主管機關標識號：
 前船級/主管機關標識號：
 IMO 編號：
 船籍港：船旗國：
 前船旗國：
 載重量：總噸位：
 （公噸）本國法定：
 國際噸位丈量公約（1969）：
 建造日期：船級符號：
 重大改建日期：
 改建類型：船東：
 前船東：

- 1 下列檢驗報告和文件業經簽署者審核，並查明合格。
- 2 檢驗狀況評估附於表 2。
- 3 換證檢驗已按本規則在（日期）完成。

狀況評估報告填寫人	姓名 簽字	職務
辦事處	日期	
狀況評估報告填寫人	姓名 簽字	職務
辦事處	日期	

所附的報告和文件：

- 1)
- 2)
- 3)
- 4)
- 5)

狀況評估報告目錄

第1部分 - 船舶概況	- 見首頁
第2部分 - 報告審核	- 檢驗地點和方法
第3部分 - 近觀檢驗	- 範圍（液艙/貨艙）
第4部分 - 測厚	- 參見測厚報告
	- 測量點一覽表
	- 單獨表格指明顯著腐蝕的處所及相應的：
	- 厚度減小
	- 腐蝕形式
第5部分 - 液艙/貨艙防腐系統	- 單獨表格指明：
	- 塗層位置
	- 塗層狀況（如適用）
第6部分 - 修理	- 處所/區域標識
第7部分 - 船級條件/船旗國要求	
第8部分 - 備忘錄	- 可接受的缺陷
	- 未來檢驗時的關注點，如可疑區域
	- 因塗層脫落而擴展的年度/中間檢驗
第9部分 - 結論	- 檢驗報告的評估/驗證說明

測厚摘錄

參見測厚報告

顯著腐蝕液艙/區域 ¹ 位置或深度鏽點位置 ³	厚度減小（%）	腐蝕形式 ²	備註 （如：參考所附草圖）

註：

- 1 顯著腐蝕，即允許損耗範圍的 75% - 100%。
- 2 P = 鏽點
C = 總體腐蝕
- 3 應註明所有鏽點密度達 20%或以上、損耗為顯著腐蝕範圍或鏽點的平均深度為實際板厚度的 1/3 或以上的船底板。

液艙/貨艙防腐系統

液艙/貨艙號 ¹	液艙/貨艙保護 ²	塗層狀況 ³	備註

註：

1 應列出所有壓載艙和貨艙。

2 C = 塗層

NP = 無保護

3 塗層狀況根據以下標準：

“良好” 係指僅有少量點狀鏽斑。

“尚好” 係指在扶強材的邊緣和焊縫的連接處塗層有局部脫落和/或所檢驗的區域中有超過 20%或更大範圍的輕度腐蝕，但小於定義“差”的狀況。

“差” 係指在檢驗的區域中有超過 20%或更大範圍的塗層普遍剝落，或有 10%或更大範圍的塗層產生硬質鏽皮。

如塗層狀況為“差”，應擴大年度檢驗的範圍，這應在狀況評估報告目錄第 8 部分中予以註明。

附件 8

建議的測厚程序

總則

- 1 本程序應用於記錄附件 A 的 A 部分所要求的厚度測量。
- 2 附錄 2 規定的報告格式 TM1-BC、TM2-BC(i)、TM2-BC(ii)、TM3-BC、TM4-BC、TM5-BC、TM6-BC、TM7-BC(i) 和 TM7-BC(ii) 應用於記錄厚度測量，並應說明最大允許減小量。可在附加的文件中說明最大允許減小量。
- 3 附錄 3 包含有關報告格式和厚度測量要求的圖解和說明。
- 4 報告格式（如適用）應以結構草圖上所示的數據加以補充。

附錄 1 船舶概況

附錄 2 測厚報告

附錄 3 測厚指導

附錄 1

船舶概況

船名：

IMO 編號：

船級/主管機關標識號：

船籍港：

總噸位：

載重噸：

建造日期：

船級社：

進行測厚的公司名稱：

測厚公司的認證機構：

證書號：

證書有效期自 至

測厚地點：

首次測量日期：

最後測量日期：

換證檢驗/中間檢驗日期：

測厚設備情況：

測量者資質：

報告編號： 頁數： 頁

測量者姓名： 驗船師姓名：

測量者簽字： 驗船師簽字：

公司公章： 主管機關：

公章

附錄 2

測厚報告

所有甲板板、所有船底外板或舷側外板厚度測量報告（TM1-BC）

船名：_____IMO 識別號：_____船級標識號：_____報告編號：_____

列板位置																	
板材位置	編號 或符 號	原始 厚度 (mm)	舢前讀數						舢後讀數						平均減 小量		最大允許 減小量 (mm)
			測量		減小量 P		減小量 S		測量		減小量 P		減小量 S				
			P	S	mm	%	mm	%	P	S	mm	%	mm	%	P	S	
舢前																	
第 12 塊前																	
第 11 塊																	
第 10 塊																	
第 9 塊																	
第 8 塊																	
第 7 塊																	
第 6 塊																	
第 5 塊																	
第 4 塊																	
第 3 塊																	
第 2 塊																	
第 1 塊																	
船中																	
舢後第 1 塊																	
第 2 塊																	
第 3 塊																	
第 4 塊																	
第 5 塊																	
第 6 塊																	
第 7 塊																	
第 8 塊																	
第 9 塊																	
第 10 塊																	
第 11 塊																	
第 12 塊																	

測量者簽字：_____

註－見下頁

TMI-BC 報告的註釋：

- 1 本報告應用於記錄下列厚度測量：
 - .1 貨物長度區域內的所有強力甲板板；
 - .2 貨物長度區域內的龍骨板、船底外板和舳列板；
 - .3 貨物長度區域內所有乾濕交變列板的舷側外板；
 - .4 貨物長度區域外選擇的乾濕交變列板的舷側外板。
- 2 應清楚示明如下列板位置：
 - .1 對於強力甲板，示明甲板邊板內列板的編號；
 - .2 對於船底板，示明龍骨板列板的編號；和
 - .3 對於舷側外板，示明舷頂列板以下列板在外板展開圖上的編號和字母。
- 3 僅對開口線外的甲板板列板予以記錄。
- 4 應對舳前和舳後的所有區域的板進行測厚。
- 5 所記錄的單點測量應代表多點測量的平均值。
- 6 最大允許減小量可在附加的文件中說明。

舷側外板和甲板板厚度測量報告（一、兩或三個橫剖面）（TM2-BC(i)）

船名：.....IMO 識別號：.....船級標識號：.....報告編號：.....

強力甲板和舷頂列板																						
列板位置	第...號肋骨的第一個橫剖面圖					第...號肋骨的第二個橫剖面圖					第...號肋骨的第三個橫剖面圖											
	編號 或 符號	原始 厚度 (mm)	測量		減小量 P mm	減小量 S mm	最大允 許減小 量(mm)	編號 或 符號	原始 厚度 (mm)	測量		減小量 P mm	減小量 S mm	最大允 許減小 量(mm)	編號 或 符號	原始 厚度 (mm)	測量		減小量 P mm	減小量 S mm	最大允 許減小 量(mm)	
			P	S						P	S						P	S				P
甲板邊板																						
舷內第 1 塊列板																						
第 2 塊																						
第 3 塊																						
第 4 塊																						
第 5 塊																						
第 6 塊																						
第 7 塊																						
第 8 塊																						
第 9 塊																						
第 10 塊																						
第 11 塊																						
第 12 塊																						
第 13 塊																						
第 14 塊																						
中間列板																						
舷頂列板																						
總數																						

註—見下頁

測量者簽字：.....

TM2-BC (i) 報告的註釋：

- 1 本報告應用於記錄強力甲板板和舷頂列板橫剖面的厚度測量：
貨物長度區域內一個、兩個或三個剖面，包括典型橫剖面圖表（附錄 3）中表明的結構項目（1）、（2）和（3）。
- 2 僅對開口線外的甲板板予以記錄。
- 3 頂部區域包括甲板板、甲板邊板和舷頂列板（包括圓形舷緣）。
- 4 應註明測量的確切肋骨號。
- 5 所記錄的單點測量應代表多點測量的平均值。
- 6 最大允許減小量可在附加的文件中說明。

舷側外板和甲板板厚度測量報告（一、兩或三個橫剖面）（TM2-BC(ii)）

船名：IMO 識別號：船級標識號：報告編號：

舷側外板																																	
列板位置	第.....號肋骨的第一個橫剖面圖										第....號肋骨的第二個橫剖面圖										第...號肋骨的第三個橫剖面圖												
	編號 或 符號	原始 厚度 (mm)	測量	減小量			最大允 許減小 量(mm)	編號 或 符號	原始 厚度 (mm)	測量	減小量			最大允 許減小 量(mm)	編號 或 符號	原始 厚度 (mm)	測量	減小量			最大允 許減小 量(mm)	編號 或 符號	原始 厚度 (mm)	測量	減小量			最大允 許減小 量(mm)					
				P	S	%					P	mm	%					P	S	%					P	mm	%		P	S	%	P	mm
舷頂列板下 第 1 塊列板																																	
第 2 塊																																	
第 3 塊																																	
第 4 塊																																	
第 5 塊																																	
第 6 塊																																	
第 7 塊																																	
第 8 塊																																	
第 9 塊																																	
第 10 塊																																	
第 11 塊																																	
第 12 塊																																	
第 13 塊																																	
第 14 塊																																	
第 15 塊																																	
第 16 塊																																	
第 17 塊																																	
第 18 塊																																	
第 19 塊																																	
第 20 塊																																	
龍骨列板																																	
艙底總數																																	

註—見下頁

測量者簽字：

TM2-BC (ii) 報告的註釋：

- 1 本報告應用於記錄橫剖面處舷側外板的厚度測量
貨物長度區域內一個、兩個或三個剖面，包括典型橫剖面圖表（附錄 3）中表明的結構項目（4）、（5）、（6）和（7）。
- 2 船底區域包括龍骨板、船底板和舳部板。
- 3 應註明測量的確切肋骨線。
- 4 所記錄的單點測量應代表多點測量的平均值。
- 5 最大允許減小量可在附加的文件中說明。

船名：	IMO 識別號：	船級標識號：	報告編號：

[illegible]

測量者簽字：

TM3-BC 報告的註釋：

- 1 本報告應用於記錄橫剖面處縱向構件的厚度測量：
貨物長度區域內一個、兩個或三個剖面，包括典型橫剖面圖表（附錄 3）中表明的相應結構項目（8）至（20）。
- 2 應註明測量的確切肋骨號。
- 3 所記錄的單點測量應代表多點測量的平均值。
- 4 最大允許減小量可在附加的文件中說明。

TM4-BC 報告的註釋：

- 1 本報告應用於記錄橫向構件的厚度測量，包括典型模剖面圖表（附錄 3）中表明的相應結構項目（23）至（25）。
- 2 測量區域的指導示於附錄 3。
- 3 所記錄的單點測量應代表多點測量的平均值。
- 4 最大允許減小量可在附加的文件中說明。

TM5-BC 報告的註釋：

- 1 本報告應用於記錄貨艙橫艙壁的厚度測量。
- 2 測量區域的指導示於附錄 3。
- 3 所記錄的單點測量應代表多點測量的平均值。
- 4 最大允許減小量可在附加的文件中說明。

船名:	IMO 識別號:	船級標識號:	報告編號:

[illegible]

註一見下頁

TM6-BC 報告的註釋：

- 1 本報告應用於記錄其他結構構件的厚度測量，包括典型模剖面圖表（附錄 3）中表明的相應結構項目（28）、（29）、（30）和（31）。
- 2 測量區域的指導示於附錄 3。
- 3 所記錄的單點測量應代表多點測量的平均值。
- 4 最大允許減小量可在附加的文件中說明。

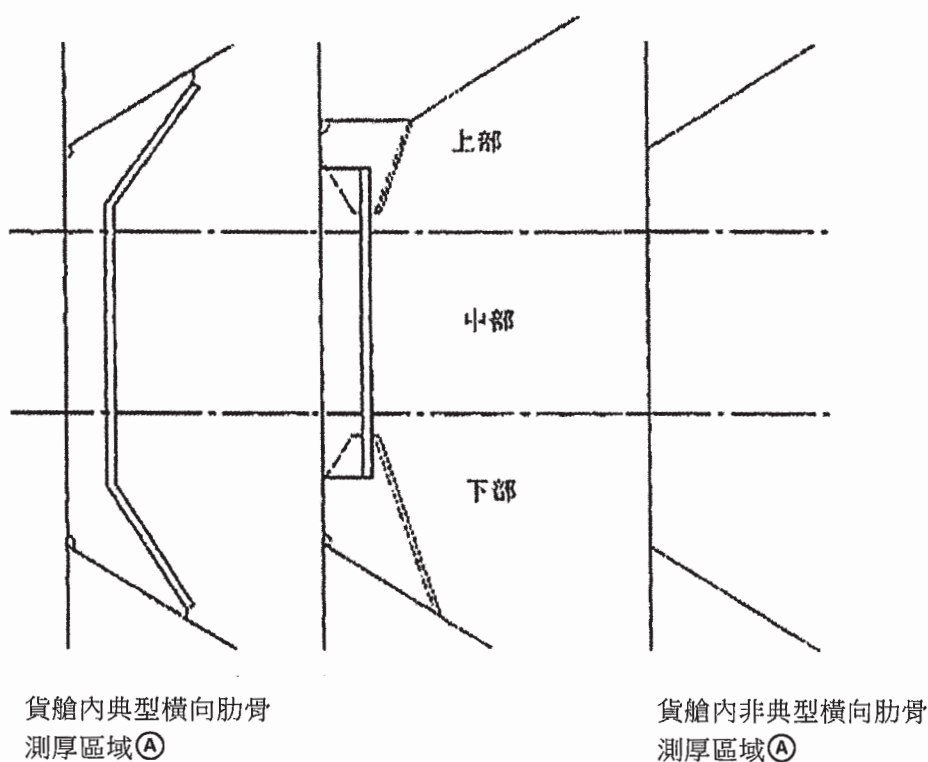
船名	IMO 識別號	船級標識號	報告編號
1	2	3	4
5	6	7	8
9	10	11	12
13	14	15	16
17	18	19	20
21	22	23	24
25	26	27	28
29	30	31	32
33	34	35	36
37	38	39	40
41	42	43	44
45	46	47	48
49	50	51	52
53	54	55	56
57	58	59	60
61	62	63	64
65	66	67	68
69	70	71	72
73	74	75	76
77	78	79	80
81	82	83	84
85	86	87	88
89	90	91	92
93	94	95	96
97	98	99	100

[illegible]

註一見下頁

TM7-BC(i) 報告的註釋：

- 1 本報告應用於記錄下列項目的厚度測量：
 - 貨艙橫向肋骨；和
 - 表明縱向和橫向構件的典型橫剖面圖表（附錄 3）中表明的結構項目（34）。
- 2 測量區域的指導示於附錄 3。
- 3 所記錄的單點測量應代表多點測量的平均值。
- 4 最大允許減小量可在附加的文件中說明。



貨艙舷側肋骨厚度測量報告 (TM7-BC(ii))

船名	IMO 識別號	船級標識號	報告編號

[illegible]

字簽者量測

TM7-BC(ii) 報告的註釋：

- 1 本報告應用於記錄適用第 MSC.168 (79) 號決議的貨艙橫向肋骨的厚度測量。
- 2 測量區域的指導示於附件 15。
- 3 應使用下列符號：

 t_M = 測得的厚度 (mm) ；

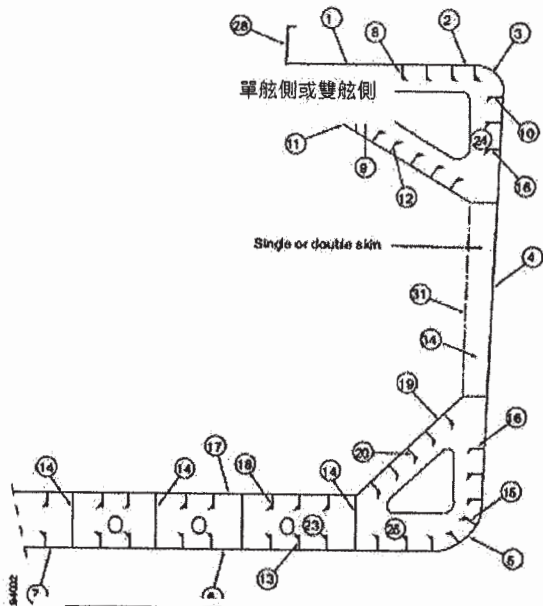
 t_{REN} = 按第 MSC.168 (79) 號決議附件 2 中 2.1.2 要求換新的厚度 ；

 t_{COAT} = $0.75 * (按第 MSC.168 (79) 號決議附件 1 第 3 段對肋板以及第 4 段對上下肘板要求的厚度 (mm))$ 。
- 4 最大允許減小量可在附加的文件中說明。

附錄 3

測厚指導

表明縱向和橫向構件的典型橫剖面



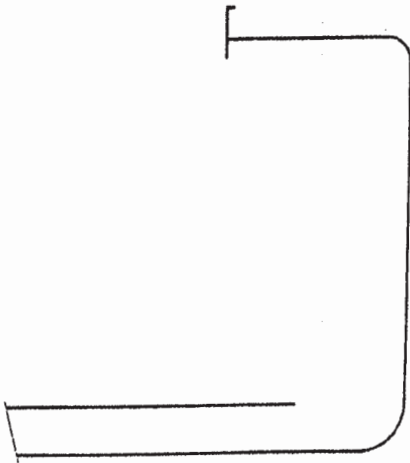
TM2-BC 測量報告		TM3-BC 測量報告	
(1) 強力甲板板		(8) 甲板縱骨	(16) 舷側縱骨
(2) 甲板邊板		(9) 甲板縱桁	(17) 內底板
(3) 舷頂列板		(10) 舷頂列板縱骨	(18) 內底縱骨
(4) 舷側板		(11) 頂邊艙斜板	(19) 底邊艙斜板
(5) 舳板		(12) 頂邊艙斜板縱骨	(20) 底邊艙斜板縱骨
(6) 船底外板		(13) 艙底縱骨	(21)
(7) 龍骨板		(14) 艙底縱桁	(22)
		(15) 舳縱骨	

TM4-BC 測量報告		TM6-BC 測量報告	
(23) 雙層底艙肋板		(28) 艙口圍板	
(24) 頂邊艙橫材		(29) 艙口間甲板板	
(25) 底邊艙橫材		(30) 艙口蓋	
(26)		(31) 內艙壁板	
(27)		(32)	
		(33)	

TM7-BC 測量報告	
(34) 實艙肋骨或隔板	

橫剖面輪廓

(用於典型橫剖面不適用的縱向和橫向構件)



TM2-BC 測量報告
(1) 強力甲板板
(2) 甲板邊板
(3) 舷頂列板
(4) 舷側板
(5) 舳板
(6) 船底外板
(7) 龍骨板

TM3-BC 測量報告	
(8) 甲板縱骨	(16) 舷側縱骨
(9) 甲板縱桁	(17) 內底板
(10) 舷頂列板縱骨	(18) 內底縱骨
(11) 頂邊艙斜板	(19) 底邊艙斜板
(12) 頂邊艙斜板縱骨	(20) 底邊艙斜板縱骨
(13) 艙底縱骨	(21)
(14) 艙底縱桁	(22)
(15) 舳縱骨	

TM4-BC 測量報告
(23) 雙層底艙肋板
(24) 頂邊艙橫材
(25) 底邊艙橫材
(26)
(27)

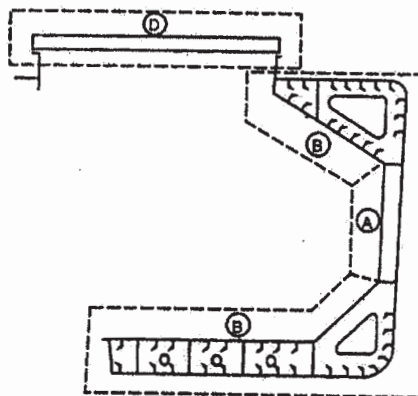
TM6-BC 測量報告
(28) 艙口圍板
(29) 艙口間甲板板
(30) 艙口蓋
(31)
(32)
(33)

TM7-BC 測量報告
(34) 貨艙肋骨或隔板

近觀檢驗和厚度測量區域

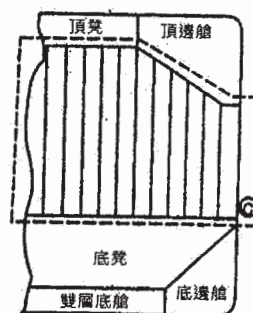
(與近觀檢驗要求相關的貨艙肋骨、
結構構件和橫艙壁的厚度測量典型區域)

典型橫剖面
A、B 和 D 區域



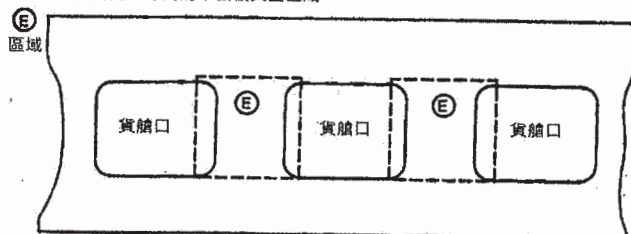
按 TM3-BC, TM4-BC, TM6-BC 和
TM7-BC 中適合者應報告的厚度

貨艙橫艙壁
C 區域



按 TM5-BC 應報告的厚度

貨艙口間開口線內的甲板板典型區域
E 區域



按 TM6-BC 應報告的厚度

附件 9

結合散貨船加強檢驗計劃的技術評估的導則-船體換證檢驗

1 引言

本導則包含與技術評估有關的資料和建議，可結合散貨船加強換證檢驗的計劃加以使用。如 5.1.5 所示，本導則是一套建議的方法，在認為必要和適當時，可由主管機關決定，結合制定所要求的檢驗計劃予以施用。

2 目的和原則

2.1 目的

本導則所述的技術評估的宗旨是幫助確定臨界結構區域、指定可疑區域，並把注意力放在那些極易發生損耗或損壞、或表明有損耗或損壞史的結構件或結構件區域。該資料可能有助於指定要進行測厚、近觀檢驗和液艙試驗的位置、區域、貨艙和液艙。

臨界結構區域係指已從計算中確定需進行檢測的區域或已從該船或類似船舶或姐妹船（如有）的營運史中確定易於出現損壞船舶結構完整性的裂紋、屈曲或腐蝕的區域。

2.2 最低要求

本導則不可用於降低 A 部分附件 1 和 2 以及 2.7 中分別對近觀檢驗、測厚和液艙試驗的要求，這些要求在任何情況下都應作為最低要求予以遵守。

2.3 時限

如同檢驗計劃的其他方面一樣，本導則所述的技術評估應由船東或經營人配合主管機關在換證檢驗開始之前完成，即在開始檢驗之前且通常在到期檢驗完成日期前至少 12 至 15 個月。

2.4 應予考慮的方面

2.4.1 特定船舶下列方面的技術評估可作為指定檢驗貨艙、液艙和區域的基礎，這些技術評估可包括對相關可能蝕耗的風險進行定量或定性評估：

- .1 設計特徵，如不同結構組件的應力等級、設計細節和高強度鋼的使用範圍；
- .2 與特定船舶及類似船舶（如有）的腐蝕、裂紋、屈曲、凹陷和修理有關的過去史；和
- .3 與所載貨物種類、液艙保護、以及貨艙和液艙的塗層（如有）狀況有關的資料。

2.4.2 對各種結構件和區域易損壞或易蝕耗的相關風險的技術評估，應根據諸如參考資料 3 所列的經認可原則和慣例進行評判和確定。

3 技術評估

3.1 總則

3.1.1 有三種基本類型的可能缺陷，它們可能成為與檢驗計劃有關的技術評估對象，即腐蝕、裂紋和屈曲。碰撞損壞通常不包含在檢驗計劃中，因為凹陷通常在備忘錄中註明且由驗船師作為常規情況進行

處理。

3.1.2 結合檢驗計劃過程開展的技術評估，原則上應按圖 1 的圖解形式表示，該圖表示如何結合檢驗計劃程序進行技術評估。該方法的依據是對基本上與下列有關的知識和經驗的一種風險評估：

.1 設計；和

.2 腐蝕。

3.1.3 應考慮設計中容易因振動、高應力或疲勞造成屈曲或裂紋的有關結構細節。

3.1.4 腐蝕與老化過程有關，並且與新船防腐系統的質量和營運中的後續維護密不可分。腐蝕也可導致裂紋和/或屈曲。

3.2 方法

3.2.1 設計細節

3.2.1.1 本船舶和類似船舶（如有）的損壞經歷，是計劃過程中使用的主要資料來源。此外，還應包括從設計圖紙中選擇的結構細節。

3.2.1.2 應考慮的典型損壞經歷由以下兩方面構成：

.1 裂紋的數量、範圍、位置和發生次數；和

.2 屈曲位置。

3.2.1.3 該資料可在檢驗報告和/或包括船東自查結果的船東案卷中找到。這些缺陷應予以分析、註明並標記在草圖上。

3.2.1.4 此外，還應利用一般經驗。例如，圖 2 表明根據經驗得出的容易受到結構性損壞的散貨船典型位置。而且，還應參照參考資料 3，

其中包括各種散貨船結構細節的典型損壞和所建議的修理方法目錄。

3.2.1.5 在使用此種圖表時，應一道審核主要結構圖紙，以便比對實際結構，並尋找容易受損壞的相似細節。見圖3中的舉例。

3.2.1.6 除使用上述圖表外，審核主要結構圖紙應包括核查已出現過裂紋的典型設計細節。造成損壞的因素應予以仔細考慮。

3.2.1.7 高強度鋼（HTS）的使用是一個重要因素。在使用普通低碳鋼時有着良好營運史的構件，在使用高強度鋼及其較高相關應力時，可能更易受損。甲板和船底結構的縱向材料使用高強度鋼的經驗普遍和總體上較好。在其他受到較高動應力的部位如舷側結構，使用高強度鋼的經驗則不那麼令人鼓舞。

3.2.1.8 在這一方面，根據相關方法對典型和重要的組件及構件的應力計算可能證明有用，並應予以考慮。

3.2.1.9 所選擇的在該過程中確定的結構區域應予以記錄，並標記在將要納入檢驗計劃的結構圖上。

3.2.2 腐蝕

3.2.2.1 為評估相關的腐蝕風險，通常應考慮以下資料：

- .1 液艙、貨艙和處所的使用狀況；
- .2 塗層狀況；
- .3 掃艙程序；
- .4 以前腐蝕損壞；
- .5 貨艙用作壓載艙的時間；

.6 貨艙和壓載艙的腐蝕風險；和

.7 鄰近加熱燃油艙的壓載艙位置。

3.2.2.2 參考資料 2 以典型狀況圖給出明確實例，其可用於判定和描述塗層狀況。

3.2.2.3 對於散貨船，應基於參考資料 3 進行評估，同時基於船齡以及為制定檢驗計劃而收集的資料得出的船舶狀況的相關資料。

3.2.2.4 應列出各種貨艙、液艙和處所，相應指明腐蝕風險。

3.2.3 近觀檢驗和測厚的位置

3.2.3.1 根據腐蝕風險表和設計經驗的評估，可指定初次近觀檢驗和測厚（剖面）的位置。

3.2.3.2 通常應指定已判定具備最大腐蝕風險的貨艙、液艙和處所內的測厚剖面。

3.2.3.3 最初應根據最大腐蝕風險指定進行近觀檢驗的液艙、貨艙和處所，並應始終包括壓載艙。選擇的原則是隨船齡的增長或在資料缺乏或不可靠時增大範圍。

參考資料

- 1 油船結構合作論壇（TSCF），“油船結構檢查和狀況評估指導手冊，1986”。
- 2 油船結構合作論壇（TSCF），“油船結構狀況評估和維護，1992”。
- 3 國際船級社協會（IACS），“散貨船：船體結構檢驗、評估和修理導則，2007”。

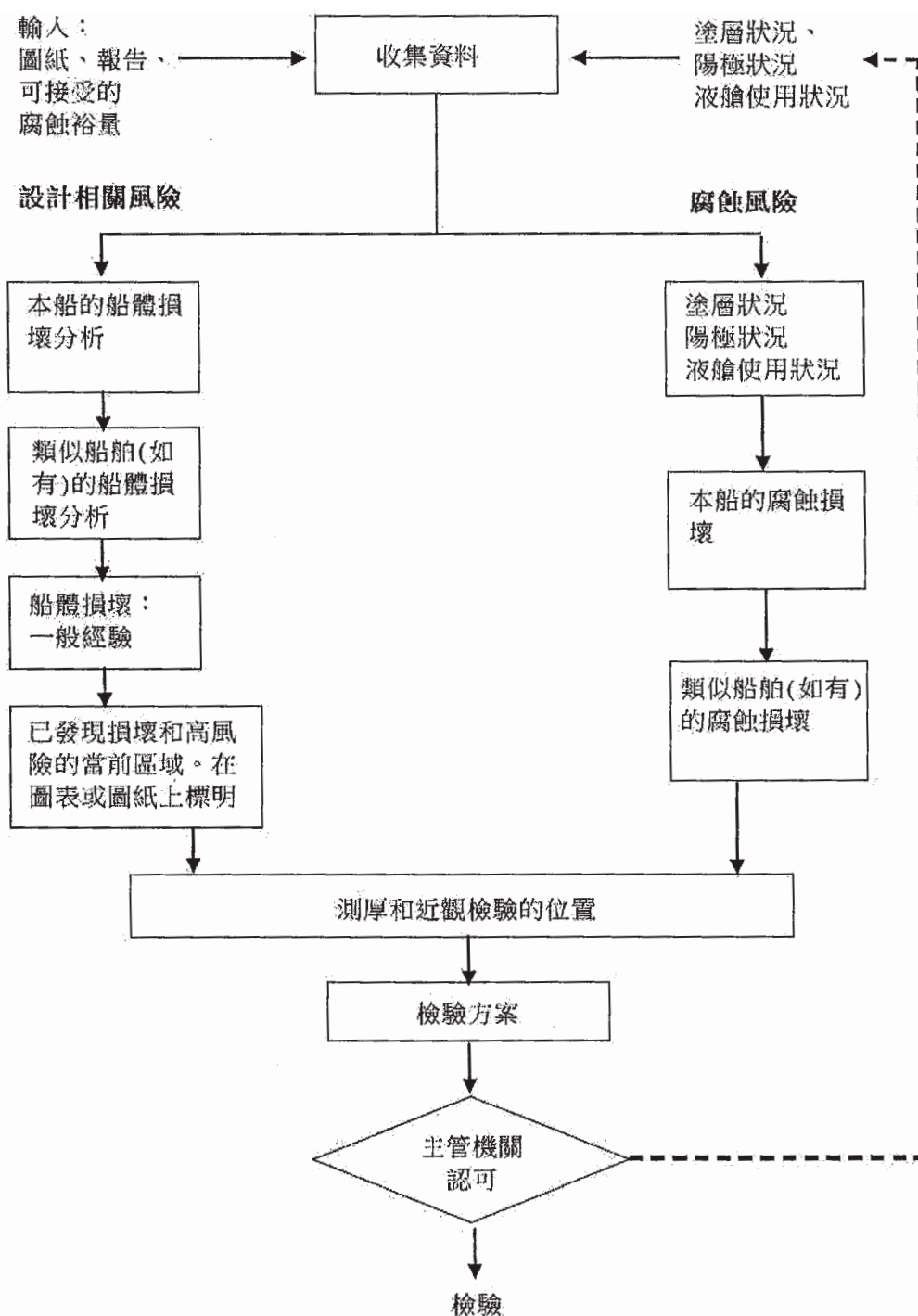


圖1-技術評估和檢驗計劃過程

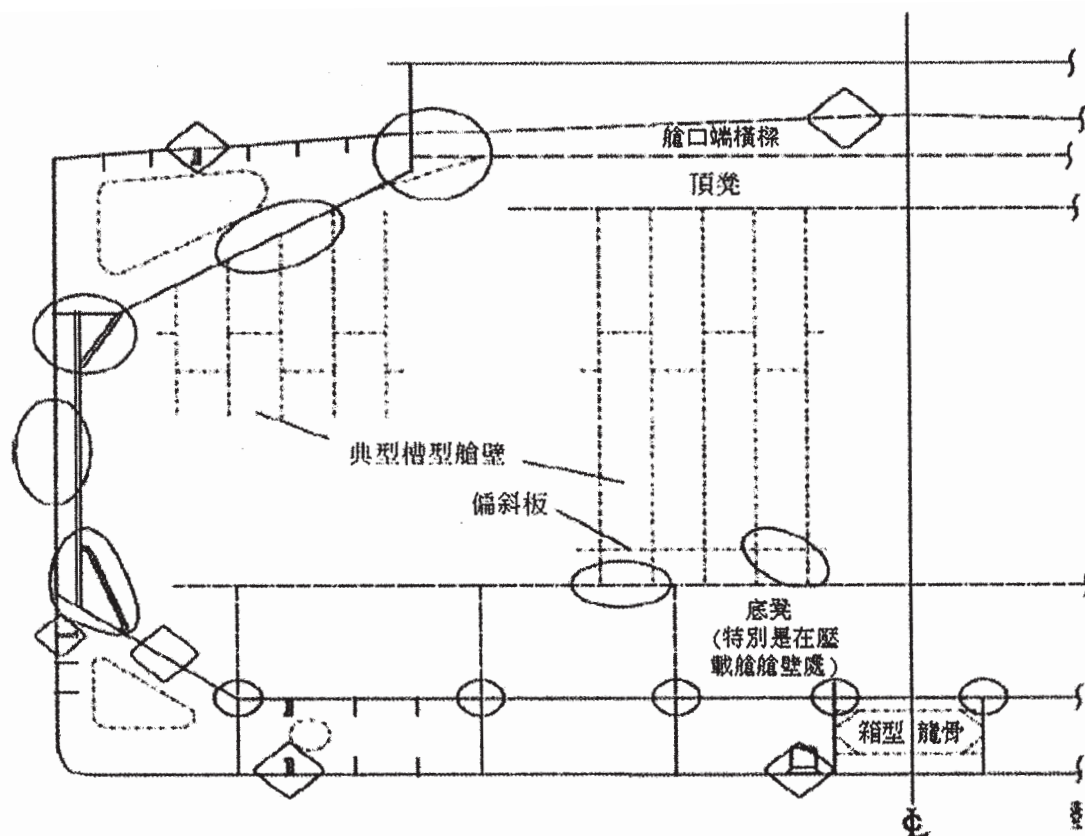


圖2-容易受到結構損壞或腐蝕的典型位置

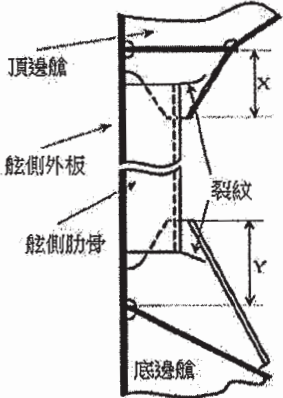
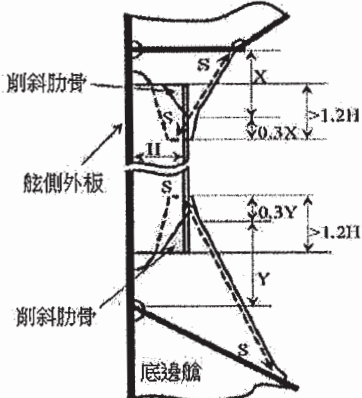
散貨船		船體結構檢驗、評估和修理導則	
第 1 部分	貨艙區域	示例序號	
區域 3	貨艙舷側結構	1-a	
損壞細節		肋骨端部肘板裂紋	
損壞示意圖  分離式肘板構造		修理示意圖  S = 削斜端	
損壞原因註解： 1. 該類型的損壞由應力集中造成。		修理註解： 1. 對於小裂紋，可以鑄成 V 形坡口、打磨、進行無損探傷檢查並重新焊接。 2. 對於較大/明顯的裂紋，應考慮切割並局部/全部肋骨肘板換新。如進行肘板換新，肋骨端可以削斜以達到軟化的目的。 3. 為謹慎起見，在肘板的界面處，應把軟趾與底邊艙板結構綜合考慮。 4. 應注意在延伸的肘板臂長處的邊艙結構，即安裝與肘板相符的加強件。	

圖 3 - 典型損壞和修理示例 (根據參考資料 3 複製)

附件 10

顯著腐蝕區域的測厚範圍要求

散貨船貨物區域內換證檢驗

舷側外板

結構件	測量範圍	測量形式
1 船底板和舷側外板	a 可疑的板及其鄰接的四塊板	a 縱骨之間的每個板格作五點形測量
	b 在液艙和貨艙處要測量的細節見其他表	
2 船底/舷側縱骨	在可疑區域處最少三根縱骨	在縱骨腹板同一橫截線上測三個點，在折板上測三個點

貨艙內橫艙壁

結構件	測量範圍	測量形式
1. 底凳	a 與內底板的連接焊縫 25mm 以內的橫向範圍	a 在 1m 長的扶強材間作五點形測量
	b 與底凳頂板的連接焊縫 25mm 以內的橫向範圍	b 同上
2. 橫艙壁	a 大約在中間高度處的橫向範圍	a 在約 1m ² 板面上作五點形測量
	b 在鄰近上甲板或頂凳底板（對設有頂凳的船舶）以下的橫向範圍	b 在約 1m ² 板面上作五點形測量

甲板結構，包括橫向甲板條、主貨艙口、艙口蓋、艙口圍板和頂邊艙

結構件	測量範圍	測量形式
1 橫向甲板條	可疑的橫向甲板條	在 1m 長的甲板下扶強材之間作五點形測量
2 甲板下扶強材	a 橫向構件	a 在每端和跨距中點作五點形測量
	b 縱向構件	b 在腹板和折板上作五點形測量
3 艙口蓋	a 側板和端板（即裙板），每塊板上三個位置	a 在每個位置上作五點形測量
	d 縱向三條帶：向舷外兩列和中心線處一列	b 每條帶測量五個點
4 艙口圍板	圍板的每邊和每端：下部 1/3 處一條帶，上部 2/3 處一條帶	每條帶（即邊圍板或端圍板）測量五個點
5 頂邊壓載水艙	a 水密橫艙壁： i 艙壁下部 1/3 ii 艙壁上部 2/3 iii 扶強材	i 在 1m ² 板面上作五點形測量 ii 在 1m ² 板面上作五點形測量 iii 在 1m 長度上作五點形測量
	b 兩個代表性制蕩橫艙壁： i 艙壁下部 1/3 ii 艙壁上部 2/3 iii 扶強材	i 在 1m ² 板面上作五點形測量 ii 在 1m ² 板面上作五點形測量 iii 在 1m 長度上作五點形測量
	c 三處代表性的強肋骨之間的斜板： i 艙的下部 1/3 位置處 ii 艙的上部 2/3 位置處	i 在 1m ² 板面上作五點形測量 ii 在 1m ² 板面上作五點形測量
	d 可疑的縱骨和鄰接縱骨	d 在 1m 長腹板和折板上各作五點形測量
	6 主甲板板	可疑的板和鄰接的四塊板
	7 主甲板縱骨	測量的板處至少三根縱骨
8 強肋骨/橫向構件	可疑的板	在 1m ² 板面上作五點形測量

雙層底和底邊艙結構

結構件	測量範圍	測量形式
1 內底/雙層底板	可疑的板及其所有鄰接的板	在 1m 長縱骨之間的每一個板格作五點形測量
2 內底/雙層底縱骨	所測量板處的三根縱骨	在縱骨腹板同一橫截線上測量三個點，縱骨折板上測量三個點
3 縱桁或橫向肋板	可疑的板	在約 1m ² 板面上作五點形測量
4 水密艙壁（水密肋板）	a 艙下部的 1/3	a 在 1m ² 板面上作五點形測量
	b 艙上部的 2/3	b 每隔一塊板在 1m ² 板面上作五點形測量
5 強框架	可疑的板	在 1m ² 板面上作五點形測量
6 船底/舷側縱骨	可疑區域處至少三根縱骨	在腹板同一橫截線上測量三個點，折板上測量三個點

貨艙

結構件	測量範圍	測量形式
1 舷側肋骨	可疑的肋骨和每根鄰接的肋骨	a 在每端和跨距中點，腹板和折板各作五點形測量
		b 在外板和底邊艙斜板的焊縫 25mm 以內作五點形測量

附件 11

第 1 號和第 2 號貨艙之間垂直槽形水密橫艙壁測量導則

1 為證實符合公約第 XII/1.7 條界定的散貨船艙壁和雙層底強度標準，有必要進行測量，以確認結構的一般狀況和垂直槽形水密橫艙壁可能修理和 / 或加強的範圍。

2 考慮到由公約第 XII/1.7 條界定的散貨船艙壁和雙層底強度標準中規定的屈曲模式，在進行艙壁強度評估時，關鍵是確定本附則圖 1 和圖 2 所示的臨界位置處減小的板厚。

3 應在下述水平面進行測量。為了充分評估各個垂直槽形艙壁，應測量在下面給定的每一水平面內每一槽形面板、腹板、卸貨板和封槽板。

水平面 (a) 無底凳的船舶 (見圖 1)：

位置：

- 卸貨板線以上約 200mm 槽形面板寬度中央；
- 槽形面板之間的封槽板的中央，如設有；
- 卸貨板中央；
- 卸貨板線以上約 200mm 槽形腹板寬度中央。

水平面 (b) 有底凳的船舶 (見圖 2)：

位置：

- 卸貨板線以上約 200mm 槽形面板寬度中央；

- 槽形面板之間的封槽板的中央，如設有；
- 卸貨板中央；
- 卸貨板線以上約 200mm 槽形腹板寬度中央。

水平面（c） 有底凳或無底凳的船舶（見圖 1 和圖 2）：

位置：

- 約在槽形高度一半處的槽形面板和腹板寬度中央。

4 如在這些水平面內板厚有變化，則應對較薄的板作測量。

5 鋼板換新和/或加強應符合公約第 XII/1.7 條界定的散貨船艙壁和雙層底強度標準。

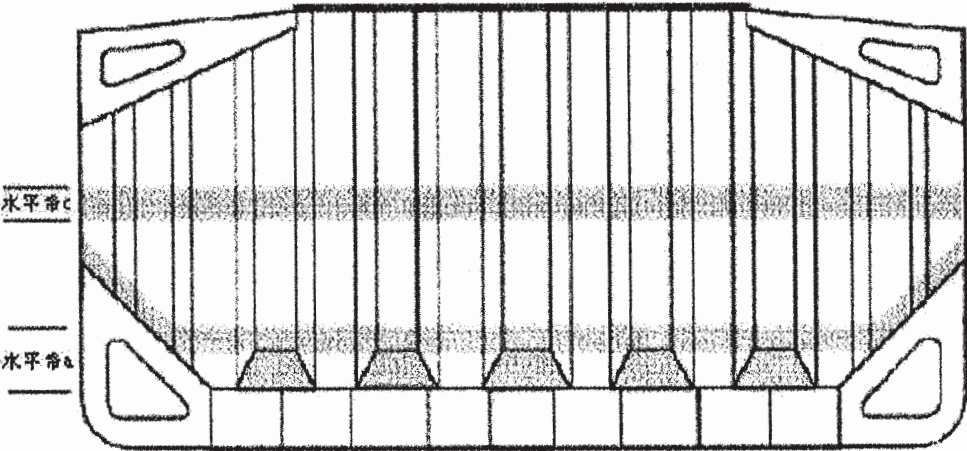


圖 1 - 無底凳的船舶

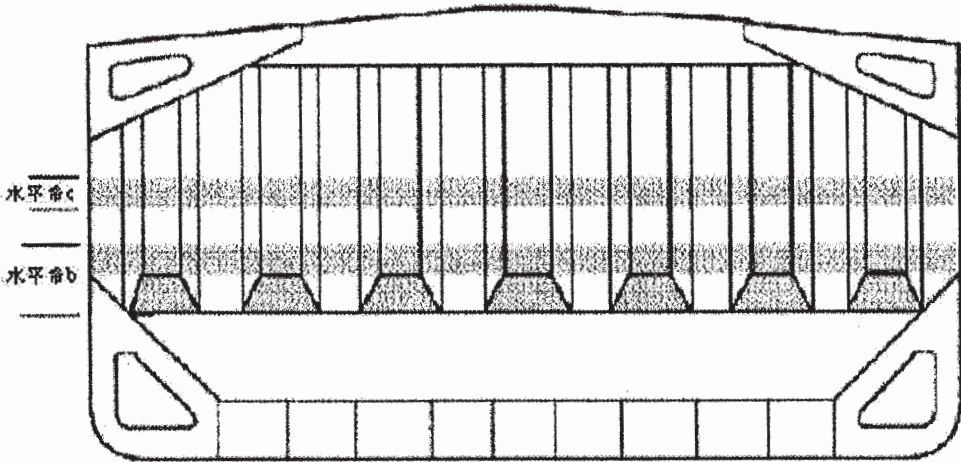


圖 2 - 有底凳的船舶

附件 12

對應符合本公約第 XII/9 條的船舶的最前部貨艙 附加年度檢驗要求

1 總則

對 5 年以上船齡的散貨船，除本規則第 3 章規定的年度檢驗要求外，年度檢驗還應包括對下列項目的檢查。

2 檢驗範圍

2.1 船齡為 5 年至 15 年的散貨船

2.1.1 應對最前部貨艙進行全面檢驗，包括足夠範圍（至少對 25% 的肋骨）的近觀檢驗，以確認下列狀況：

- .1 舷側肋骨，包括其上、下端部附件、鄰接的外板及橫艙壁；和
- .2 以前換證檢驗所發現的可疑區域。

2.1.2 根據上述 2.1.1 進行全面和近觀檢驗的結果，如驗船師認為必要，近觀檢驗範圍應擴大至該貨艙所有的舷側肋骨和鄰接的外板。

2.2 船齡為 15 年以上的散貨船

應對最前部貨艙進行全面檢驗，包括近觀檢驗，以確認下列狀況：

- .1 所有舷側肋骨，包括其上、下端部附件、鄰接的外板及

橫艙壁；和

.2 以前換證檢驗所發現的可疑區域。

3 厚度測量範圍

3.1 應在足夠範圍內進行測厚，以確認以上 2.1 和 2.2 中所述的近觀檢驗區普遍腐蝕和局部腐蝕的程度。最低測厚要求是對以前換證檢驗所發現的可疑區域進行測厚。如發現顯著腐蝕，應按附件 10 的要求擴大測厚範圍。

3.2 如驗船師對近觀檢驗結果滿意，即結構沒有減薄且保護塗層（如有時）仍保持有效，則可免予測厚。

4 特殊考慮

如發現下述註釋提到的最前部貨艙內的保護塗層處於良好狀況，則近觀檢驗和測厚範圍可予以特殊考慮。

註釋：

對於現有散貨船，當船東對上述貨艙選擇敷設塗層或重新敷設塗層時，可考慮近觀檢驗和測厚檢驗的範圍。對現有船舶的貨艙敷設塗層前，應在驗船師在場情況下確定構件尺寸。

附件 13**散貨船貨艙蓋繫固裝置強度****1 繫固裝置**

繫固裝置的強度應符合下列要求：

- .1 應通過在圍板和艙蓋結構上適當間隔的裝置（螺栓、楔或類似裝置）對艙蓋板格進行繫固。確定布置和間距時，應根據艙蓋的類型和尺寸以及繫固裝置間的艙蓋邊緣剛度，充分考慮到風雨密的有效性。

- .2 每一繫固裝置的淨橫剖面積不應小於：

$$A = 1.4 a/f \text{ (cm}^2\text{)}$$

式中：

a = 繫固裝置間距，不得小於 2m；

$$f = (\sigma_y / 235)^e ;$$

σ_y = 規定的用鋼最小上屈服應力，N/mm²，不得大於臨界抗拉強度的 70%；

$$e = 0.75, \text{ 對 } \sigma_y > 235$$

$$1.0, \text{ 對 } \sigma_y \leq 235。$$

對於面積超過 5m² 的艙口，頂桿或螺栓的淨直徑應不小於 19mm。

- .3 在艙蓋、圍板和十字接頭之間，應通過繫固裝置保持足

以達到風雨密性的密封條壓力。對壓力大於 5 N/mm 的密封條，橫剖面積應按直接比例增加。應規定密封條壓力。

- .4 蓋板邊緣的剛度應足以保持繫固裝置間足夠的密封壓力。邊緣構件的慣性力矩， I ，不應小於：

$$I = 6 p a^4 (\text{cm}^4)$$

式中：

p = 密封條壓力，N/mm，至少 5 N/mm

a = 繫固裝置間距，m。

- .5 繫固裝置結構應可靠並緊密地與艙口圍板、甲板或艙蓋連接。每個蓋板上的單點繫固裝置應具有基本相同的剛度特性。
- .6 如安裝了桿子羊角，則應有彈性墊圈或減振器。
- .7 如採用液壓羊角，則應有良好的設備確保在液壓系統失效時羊角仍被機械固定在關閉位置。

2 制動器

2.1 應通過制動器對第 1 號和第 2 號艙口蓋進行有效繫固，以防止壓力為 175 kN/m² 時產生的橫向力。

2.2 應通過制動器對第 2 號艙口蓋進行有效繫固，以防止壓力為 175 kN/m² 時產生的對前端的縱向力。

2.3 應通過制動器對第 1 號艙口蓋進行有效繫固，以防止壓力為

230 kN/m² 時產生的對前端的縱向力。如安裝了首樓，該壓力可降至 175 kN/m²。

2.4 在制動器及其支撐結構，以及在制動器焊喉處計算的等效應力不應超過許可值 $0.8\sigma_y$ 。

3 材料和焊接

如安裝符合本附件的制動器或繫固裝置，其包括焊條在內的製造材料應使主管機關滿意。

附件 14

測厚的程序要求

1 總則

船體結構檢驗所要求的測厚，如果不是由船級社自身進行，則應被驗船師見證。驗船師登輪應被記錄。這同樣適用於航行中進行的測厚。

2 檢驗會議

2.1 在換證或中間檢驗開始前，應召開由現場驗船師、現場船東代表和測厚公司代表和船長或由船長或公司指派的具有相應資質的代表參加的會議，以確保檢驗和測厚能夠安全且有效地在船上實施。

2.2 在會議上，應就以下事項對與測厚操作人員及船東代表的交流溝通達成一致：

- .1 定期的測厚報告；和
- .2 如果發現如下問題，立即通知驗船師：
 - .1 過度的和/或大面積腐蝕或重要的點蝕/凹槽；和
 - .2 結構缺陷，如屈曲、斷裂和變形的結構；
 - .3 脫開的和/或洞穿的結構；和
 - .4 焊縫的腐蝕。

2.3 檢驗報告應表明會議召開的時間、地點和參加人員（驗船師、船東代表和測厚公司代表的姓名）。

3 對船上測厚過程的監督

3.1 在全面檢驗船上代表性處所後，驗船師應決定測厚的最終範圍和位置。

3.2 如果船東希望在全面檢驗之前開始測厚，驗船師應建議：在全面檢驗過程中，計劃的測厚範圍和位置要受到確認。根據結果，驗船師可要求進行附加測厚。

3.3 驗船師應選擇所取證讀數可代表該區域的平均結構狀況的位置，以此指導測量操作。

3.4 主要用於評估會影響船體樑強度的腐蝕程度的測厚應以系統的方式進行，以使所有要求的縱向構件得到測量。

3.5 如果測厚表明顯著腐蝕或損耗超過允許的減小量，驗船師應指定進行附加測厚之處，以便劃清顯著腐蝕區域，並確認需維修/換新的構件。

3.6 需要進行近觀檢驗的區域的結構測厚，應與近觀檢驗同時進行。

4 審核和驗證

4.1 測厚完成後，驗船師應確認不需要進一步測量或指明需要附加的測量。

4.2 如本導則允許經驗船師特殊考慮後減小測厚範圍，對該特殊考慮應酌情報告。

4.3 如果已進行部分測厚，應報告剩下的測厚範圍，以供下一位驗船師使用。

附件 15

符合第 MSC.168 (79) 號決議要求的單舷側散貨船

舷側肋骨和肘板的測厚導則

1 總則

為驗證符合第 MSC.168 (79) 號決議的要求，應進行厚度測量，以決定結構的總體狀況和確定對舷側肋骨及肘板的腹板和折板可能作鋼構件換新或採取其他措施的範圍。

2 舷側肋骨和肘板的區域

2.1 就鋼構件換新、噴砂處理和塗層而言，應確定 A、B、C 和 D 四個區域，如圖 1 所示。

2.2 A 和 B 區域應視為最關鍵的區域。

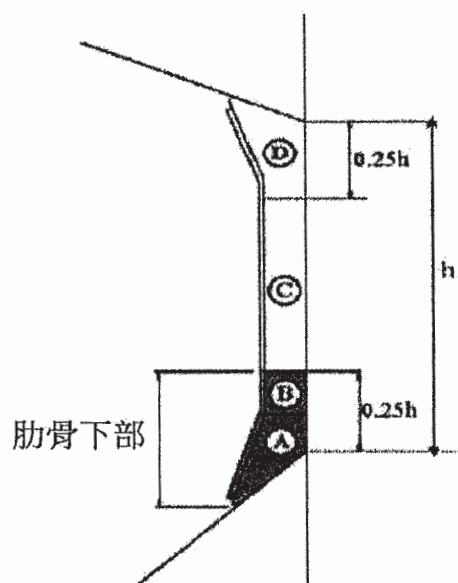


圖1 - 舷側肋骨和肘板的區域

3 點腐蝕和接縫腐蝕

3.1 鏽斑能形成各式各樣的形狀，其中一些應在評估之前予以磨平。

3.2 點腐蝕可以在塗層氣泡下發現，故鼓泡的塗層應在檢查之前鏟除。

3.3 測量點腐蝕或接縫腐蝕的剩餘厚度，一般用超聲波傳感器（一般 10mm 直徑）是不夠的，應使用一種袖珍傳感器（3-5mm 直徑）。測厚公司應使用鏽斑規測量點腐蝕或縫隙腐蝕的深度，並計算剩餘厚度。

基於面積的評估

3.4 這是第 MSC.168 (79) 號決議附件 2 的第 2.5 段規定的方法，並基於根據圖 2 確定的密度。

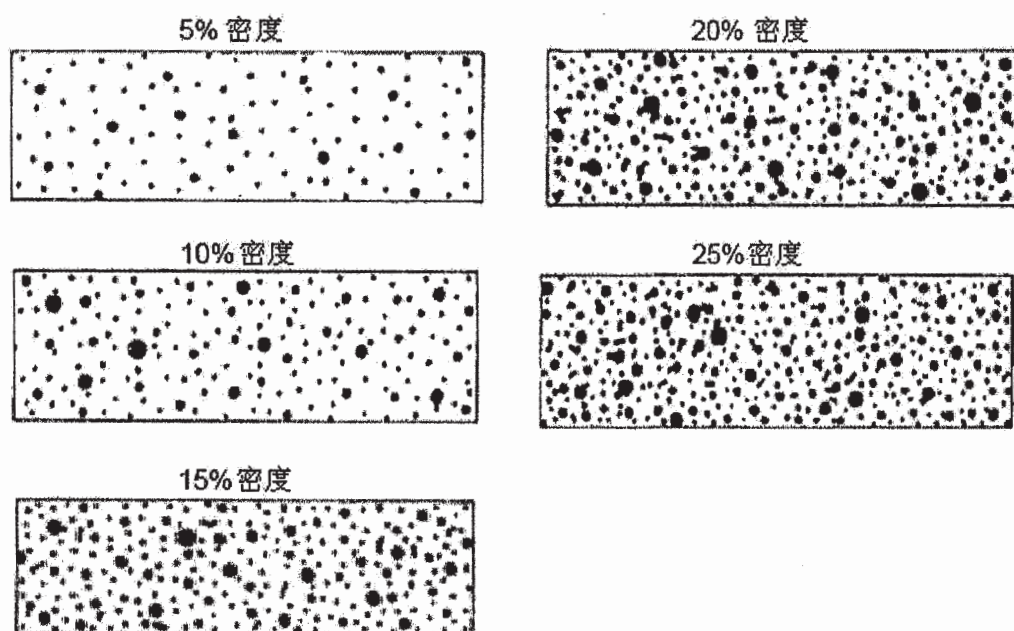


圖2 - 點腐蝕密度圖表 (密度5%-25%)

3.5 如在一個區域內點腐蝕密度大於 15%（見圖 2），則應進行測厚，以決定點腐蝕的程度。15%僅指在板一面的點腐蝕或接縫腐蝕。

3.6 假使上述界定的點腐蝕很明顯（超過 15%），則在點腐蝕最多部位，應將 300mm 直徑或更大的區域（或如在附連舷側肋骨的肋骨折板或舷側外板、底邊艙斜板或頂邊艙斜板上，這樣的區域不切實際，一個相當的長方形）清潔出白（裸金屬），且在清潔區域內 5 個最深點腐蝕處測厚。至少這些點腐蝕的任何一點均應作測厚並作記錄。

3.7 任何點腐蝕或接縫腐蝕的可接受最小剩餘厚度應為：

- .1 對在貨艙邊肋骨腹板和折板的點腐蝕或接縫腐蝕，建造厚度的 75%。
- .2 對在附連貨艙邊肋骨的舷側板、底邊艙和頂邊艙斜板的點腐蝕或接縫腐蝕，在其每側達 30 mm 的寬度上，建造厚度的 70%。

4 測厚方法

4.1 測量的邊肋骨數目，應與船齡相對應的換證檢驗或中間檢驗所測數目相等。應按如下規定對每一區域作代表性測量。

4.2 如結構件相對於建造厚度未呈現厚度減小，並且發現塗層仍在“如新”的狀態（即無塗層脫落或無鏽），則主管機關或經主管機關認可的組織可對測厚範圍予以特殊考慮。

4.3 當發現測厚讀數接近臨界值時，測量的貨艙肋骨數應予增加。

4.4 如應對某一貨艙內個別肋骨按照第 MSC.168（79）號決議進行換新或採取其他措施，則該貨艙內所有肋骨應予測厚。

4.5 散貨船舷側肋骨可使用各種構造方式。有些舷側肋骨有面板（T 型剖面），有些舷側肋骨有折板，有些舷側肋骨有球緣板。就測厚而言，使用面板和折板型材應認為是相似的，腹板和面板或腹板和折板兩者都應進行測量。如使用球緣板，則應用通常的方法測量球緣板的腹板，如有要求，其剖面模數應予特殊考慮。

A、B 和 D 區域的測量

腹板

4.6 對 A、B 和 D 區域的測厚形式應用五點形，見圖 3。五點形是在腹板的高度和垂直方向上與高度同樣的長度面積內測五點。測厚報告應反映平均讀數。

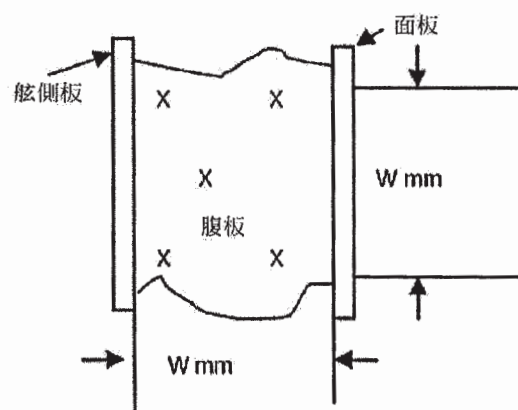


圖 3 - 腹板上典型的五點形

C 區域的測厚

腹板

4.7 根據 C 區域處腹板的狀況，腹板可在 C 區域長度上測量三個點的讀數，並取其平均值。該平均值應與允許的厚度比較。如腹板已普遍腐蝕，則應擴大至如上述的五點形。

剖面 a) 和剖面 b) (折板和舷側板) 的測厚

4.8 當下肘板長度或深度不滿足第 MSC.168 (79) 號決議附件 1 的要求時，應對剖面 a) 和剖面 b) 進行測厚，以計算第 MSC.168 (79) 號決議附件 2 中第 3.4 段要求的實際剖面模數（見圖 4）。在剖面 a) 和剖面 b) 處肋骨的每一邊（即前和後）的折板上至少應測取 2 個點的讀數。

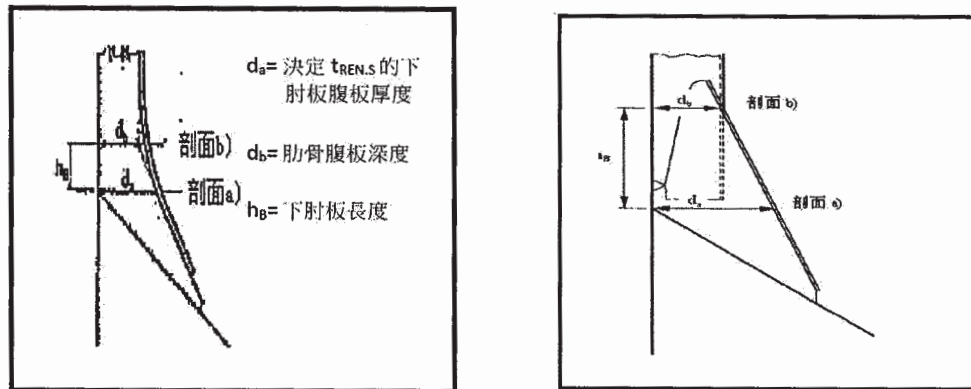


圖4 - 剖面 a)和剖面 b)

5 貨艙舷側肋骨測厚報告

見附件 8 附錄 2 中表 TM7-BC(ii)。

參考文件

國際船級社協會藍皮書：統一要求 UR Z10.2 (Rev.27 2009) — 散貨船船體檢驗，附件 V。

第 MSC.168 (79) 號決議 — 單舷側結構散貨船舷側結構標準和衡準。

B 部分

雙舷側結構散貨船檢驗期間加強檢查計劃規則

1 總則

1.1 適用範圍

1.1.1 本規則應適用於所有 500 總噸及以上的雙舷側結構自航式散貨船。

1.1.2 本規則應適用於貨物長度區域內的貨艙、隔離艙、管隧、空艙和燃油艙，以及所有壓載艙處的船體結構和管路系統的檢驗。

1.1.3 本規則包含檢查、測厚和液艙試驗的範圍。如發現顯著腐蝕和/或結構缺陷時，應擴大檢驗範圍，並包括必要時進行附加近觀檢驗。

1.1.4 對於混合貨艙布置的散貨船，如某些貨艙為單舷側而其他的為雙舷側，則附件 A 的 A 部分要求應適用於單舷側貨艙。

1.1.5 應在公約第 I/10 條規定的檢驗期間進行檢驗。

1.2 定義

1.2.1 雙舷側散貨船係指通常在裝貨處所建有單甲板、頂邊艙和底邊艙，且主要用於載運散裝乾貨的船舶，包括礦砂船和兼裝船，其所有貨艙採用雙舷側板圍閉作為邊界（而不論邊艙的寬度如何）。

1.2.2 壓載艙係指僅僅用於海水壓載的液艙，或適用時，對用於裝貨和海水壓載的處所，如在其艙內已發現顯著腐蝕，將視作壓載艙。

就檢驗而言，兩舷邊艙即使與頂邊艙或底邊艙連接，也應視作一個獨立液艙。

1.2.3 *處所*係指獨立的艙室，包括貨艙、液艙以及鄰接貨艙、甲板和外殼板的隔離艙和空艙。

1.2.4 *全面檢驗*係指用於報告船體結構整體狀況和確定進行附加近觀檢驗範圍的檢驗。

1.2.5 *近觀檢驗*係指驗船師在近距離目視範圍內（即通常伸手可及）對結構件細節進行的檢驗。

1.2.6 *橫剖面*係指垂直於船舶中線的船體橫剖面，包括所有板材等縱向構件，以及在甲板、舷側外板、船底板、內底板、底邊艙斜板、內側板、頂邊艙斜板以及縱艙壁上的縱骨和縱桁。

1.2.7 *代表性處所*係指能反映相似類型、用途和具有類似防腐蝕系統的其他處所的處所。當選擇代表性處所時，應考慮到其營運和修理史，以及可識別的臨界結構區域和/或可疑區域。

1.2.8 *可疑區域*係指呈現顯著腐蝕和/或驗船師認為易於快速損耗的區域。

1.2.9 *顯著腐蝕*係指通過腐蝕狀況評估表明其腐蝕量超過許用裕量的75%但尚處於可接受範圍內的腐蝕程度。對按國際船級社協會共同結構規範建造的船舶，顯著腐蝕係指通過腐蝕狀況評估表明其測量（或測厚）厚度介於 $t_{\text{net}} + 0.5\text{mm}$ 和 t_{net} 之間的腐蝕程度。

1.2.10 *防腐系統*通常可考慮全硬保護塗層。硬保護塗層通常係指環氧樹脂塗層或同等物。既非軟塗層亦非半硬塗層的其他塗層系統，如

按生產廠的技術說明書應用和維護，可考慮作為替代品接受。

1.2.11 塗層狀況定義如下：

良好 係指僅有少量點狀鏽斑；

尚好 係指在扶強材的邊緣和焊縫的連接處塗層有局部脫落和/或所檢驗的區域中有超過 20%或更大範圍的輕度鏽蝕，但小於定義“差”的狀況；

差 係指在檢驗的區域中有超過 20%或更大範圍的塗層普遍剝落，或有 10%或更大範圍的塗層產生硬質鏽皮。

1.2.12 臨界結構區域係指從計算中或從本船舶或類似船舶或姐妹船（適用時）的營運歷史中認定並需要進行檢測的、容易發生影響船舶結構整體性的破裂、屈曲或腐蝕的區域。

1.2.13 貨物長度區域係指包括所有貨艙和鄰近區域，含燃油艙、隔離艙、壓載艙和空艙的船舶部分。

1.2.14 中間檢驗係指在第二或第三次年度檢驗或其之間進行的檢驗。

1.2.15 及時徹底修理係指在檢驗期間完成的並使驗船師滿意的永久性修理，旨在消除需要批註的任何相關船級條件或遺留項目。

1.2.16 公約係指經修正的《1974 年國際海上人命安全公約》。

1.2.17 特殊考慮（與近觀檢驗和測厚有關）係指進行足夠的近觀檢查和測厚以確定塗層以下結構的實際平均狀況。

1.3 修理

1.3.1 任何與超過允許極限的結構蝕耗有關的損壞（包括屈曲、凹槽、脫開或斷裂）或大面積區域的蝕耗超過允許極限，若影響或主管機關認為將影響船舶的結構、水密或風雨密完整性，均應進行及時徹底修理（參見 1.2.15）。應考慮的區域包括：

- .1 舷側結構和舷側板；
- .2 甲板結構和甲板板；
- .3 船底結構和船底板；
- .4 內底結構和內底板
- .5 內側結構和內側板
- .6 水密或油密艙壁；
- .7 艙蓋或艙口圍板；和
- .8 列於 3.3.10 中的項目。

在不能提供足夠修理設施的區域，主管機關可允許船舶直接駛往某一修理點。這可能要求船舶為該修理航次卸下貨物和/或進行臨時性修理。

1.3.2 此外，在檢驗發現腐蝕或結構缺陷時，如主管機關認為其中之一將影響船舶繼續營運，船舶應在繼續營運前採取補救措施。

1.4 驗船師

對 20,000 載重噸及以上的散貨船，應由兩名驗船師聯合執行在其船齡超過 10 年後的第一次計劃的換證檢驗（即第三次換證檢驗），以及其後的所有換證和中間檢驗。如由被認可組織進行檢驗，

則這些驗船師應為該被認可組織專職聘用的。

1.5 厚度測量與近觀檢驗

在任何檢驗中，即在換證檢驗、中間檢驗、年度檢驗或與這些檢驗範圍相同的其他檢驗中，對需要實施近觀檢驗的結構區域的測厚應與近觀檢驗同時進行。

2 換證檢驗

2.1 總則

2.1.1 換證檢驗可在第四次年度檢驗時開始，並可在其後一年中繼續進行，以在第五個周年日前完成。

2.1.2 檢驗計劃作為換證檢驗準備的一部分，應在換證檢驗前制定。厚度測量不應放在第四次年度檢驗之前進行。

2.1.3 除年度檢驗的要求外，檢驗還應包括足夠範圍的檢查、試驗和核查，以確保船體以及 2.1.5 所要求的相關管路處於合格狀況，並適合貨船構造安全證書新的有效期內其預定的用途，受到適當維護和操作及到期接受各種定期檢驗。

2.1.4 所有貨艙、壓載艙，包括雙層底艙和兩舷邊艙、管隧、隔離艙和鄰接貨艙的空艙、甲板和外殼板都應進行檢查，這種檢查應輔以 2.6 和 2.7 要求的厚度測量和試驗，以確保該結構的完整性保持有效。檢查應能足以發現可能存在的顯著腐蝕、嚴重變形、斷裂、破損或其他結構蝕耗。

2.1.5 上述處所內的所有管系應在工作壓力下進行檢查和操作試驗並使現場驗船師滿意，以確保其密性和狀況保持合格狀態。

2.1.6 改建為空艙的壓載艙的檢驗範圍應結合壓載艙的要求予以特殊考慮。

2.1.7 中間檢驗和換證檢驗二者對處所的檢驗和測厚不應相互替代。

2.2 乾塢檢驗

2.2.1 乾塢檢驗應作為換證檢驗的一部分。在證書的五年期內應對船底外部至少進行兩次檢查。在所有情況下，船底檢查的最大間隔期不應超過 36 個月。

2.2.2 對船齡為 15 年及以上的船舶，應在乾塢進行船底外部檢查。對船齡小於 15 年的船舶，其未與換證檢驗一起進行的船底外部檢查，作為替代，可在船舶漂浮狀態下進行檢查。船舶在漂浮狀態下的檢查只有在船況令人滿意並具有合適的設備和合格人員時才能進行。

2.2.3 如乾塢檢驗未與換證檢驗期間的加強檢驗一起完成，或如 2.2.1 中所述的 36 個月的最大間隔期未予滿足，則貨船構造安全證書應停止有效，直至乾塢檢驗完成。

2.2.4 如對貨艙和壓載艙下部的全面檢驗、近觀檢驗和厚度測量（如適用）尚未實施，則應按換證檢驗的適用要求進行。

註：貨艙和壓載艙下部係指輕壓載水線以下的部分。

2.3 處所保護

2.3.1 如設有壓載艙防腐系統，應檢查其狀況。對於壓載艙（不包括雙層底艙），如發現硬保護塗層處於 1.2.11 所界定的“差”狀況，且未換新，或已敷設軟塗層或半硬塗層，或從建造之時就未敷設硬保

護塗層，則對所述艙應每年進行檢查。如驗船師認為必要，應進行測厚。如在壓載雙層底艙內發現硬保護塗層處於該種狀況，且未換新，或已敷設軟塗層或半硬塗層，或從建造之時就未敷設硬保護塗層，則對所述艙可每年進行檢查。如驗船師認為必要，或存在大面積腐蝕，應進行測厚。

2.3.2 如貨艙內設有硬保護塗層，且塗層處於“良好”狀況，近觀檢驗和厚度測量的範圍可予以特殊考慮。

2.4 艙蓋和艙口圍板

艙蓋和艙口圍板應經受下列檢驗：

2.4.1 除所有艙蓋和艙口圍板外，還應對 3.3 中列出的項目進行徹底檢查。

2.4.2 應檢查所有機械操作的艙蓋是否操作良好，包括：

- .1 開啟狀態下的堆裝和繫固；
- .2 關閉狀態下的適配性和密封有效性；和
- .3 液壓和動力部件、鋼索、鏈和連動裝置的操作試驗。

2.4.3 應通過沖水試驗或等效方法檢查所有艙蓋的密封裝置的有效性。

2.4.4 對艙蓋、艙口圍板及扶強材應按附件 2 進行厚度測量。

2.5 全面和近觀檢驗範圍

2.5.1 在換證檢驗時應對所有液艙和處所進行一次全面檢驗。對貨物長度區域內的燃油艙應進行如下檢驗：

第 1 次換證檢驗 船齡≤5 年	第 2 次換證檢驗 5 年<船齡≤10 年	第 3 次換證檢驗 10 年<船齡≤15 年	第 4 次及以後換證檢驗 船齡>15 年
無	1 個	2 個	半數，至少 2 個
註： 1. 本要求適用於整體（結構）類型的液艙。 2. 如檢查中對液艙進行抽查，則每次換證檢驗都應輪流檢查不同的液艙。 3. 尖艙（各種用途）應在每次換證檢驗中進行內部檢查。 4. 在第 3 次換證檢驗及以後的換證檢驗時，應包括一個位於貨物區域的燃油深艙（如設置）。			

2.5.2 關於換證檢驗時近觀檢驗的最低要求可分別參見附件 1 附錄 1 對雙舷側散貨船（不包括礦砂船）和附件 1 附錄 2 對礦砂船的要求。

2.5.3 驗船師在考慮到檢驗時處所的維護、防腐系統的狀況以及處所具有的結構布置或構件根據可獲得的資料曾經在類似處所或類似船舶出現過缺陷的同時，可根據需要擴大近觀檢驗的範圍。

2.5.4 對於查明硬保護塗層處於“良好”狀況的處所內區域，按附件 1 要求的近觀檢驗範圍可予以特殊考慮（還參見 2.3.2）。

2.6 厚度測量範圍

2.6.1 換證檢驗時厚度測量的最低要求參見附件 2。

2.6.2 應進行有代表性的厚度測量，以確定在所有壓載艙內的橫向強肋骨的總體和局部腐蝕程度。還應對橫艙壁板進行測厚，以確定其腐蝕程度。如驗船師通過近觀檢驗確信無結構尺寸減小且敷設的硬保護塗層保持有效，則厚度測量的範圍可予以特殊考慮。

2.6.3 對 1.2.9 界定的顯著腐蝕區域的擴大厚度測量按附件 10 的規定進行，並可在 5.1 要求的檢驗計劃中作出附加規定。該擴大測厚應在檢驗完成之前進行。應檢查以前檢驗中確定的可疑區域。以前檢驗中確定的顯著腐蝕區域應進行測厚。

2.6.4 驗船師可根據需要進一步擴大厚度測量的範圍。

2.6.5 對於查明硬保護塗層處於 1.2.11 所界定的“良好”狀況的液艙內區域，按附件 2 要求的厚度測量範圍可由主管機關予以特殊考慮。

2.6.6 測厚的橫剖面應選擇在懷疑發生最大縮減或經甲板板測厚揭示的最大縮減處。

2.7 液艙壓力試驗範圍

2.7.1 所有壓載艙、深艙以及在貨物長度區域內用於水壓載的貨艙的界限面應進行壓力試驗。對於燃油艙，僅對代表性液艙進行壓力試驗。

2.7.2 驗船師可根據需要擴大液艙試驗的範圍。

2.7.3 對壓載艙的邊界進行試驗的液體壓頭應至空氣管頂部。

2.7.4 對壓載的貨艙的邊界進行試驗的液體壓頭應至艙口頂部附近。

2.7.5 對燃油艙的邊界進行試驗的液體壓頭應至其各種服務狀態下液體可能上升的最高點。基於對燃油艙邊界的外部檢查的滿意結果和對船長關於已按要求進行壓力試驗的滿意結果陳述的確認，燃油艙的液艙密性試驗可予以特殊考慮。

2.7.6 如對雙層底艙和其他非設計用於裝載液體的處所的內部檢查和內底板檢查認為滿意，則可不進行試驗。

2.8 確定符合公約第 XII/12 和 XII/13 條規定後的附加換證檢驗要求

2.8.1 對符合公約第 XII/12 條關於貨艙、壓載艙和乾燥處所水位探測器要求的船舶，換證檢驗應包括檢查和測試進水探測系統及其報警裝置。

2.8.2 對符合公約第 XII/13 條泵系有效性要求的船舶，換證檢驗應包括檢查和測試用於排放和泵吸位於防撞艙壁前方的壓載艙的壓載水以及任何部位延伸至最前部貨艙前方的乾燥處所的艙底水的設備，及其控制裝置。

3 年度檢驗

3.1 總則

年度檢驗應由旨在盡實際可行地確保船體、露天甲板、艙蓋、艙口圍板和管路處於合格狀態的檢查所構成，並應考慮到營運記錄、壓載艙防腐系統狀況和範圍以及檢驗報告案卷中確定的區域。

3.2 船體檢查

3.2.1 凡可見的船殼板及其關閉裝置均應進行檢查。

3.2.2 對水密貫穿件應盡實際可行進行檢查。

3.3 露天甲板、艙蓋和艙口圍板檢查

3.3.1 應確認自上次檢驗以來，艙蓋、圍板及其緊固和密封裝置，

均無未經批准的變動。

3.3.2 對艙蓋和圍板的全面檢驗只有通過在開啟和關閉狀態下的檢驗方有可能，並應包括驗證正常的開啟和關閉操作。因此，每次年度檢驗時，應對船舶前部 25%長度內的艙蓋裝置以及至少一個附加裝置進行開啟、關閉和艙蓋向每個方向完全開啟和關閉操作的檢驗，從而能確保在每五年期內對船上所有的艙蓋裝置至少進行一次評估；檢驗包括：

- .1 開啟狀態下的堆裝和繫固；
- .2 關閉狀態下的適配性和密封有效性；和
- .3 液壓和動力部件、鋼索、鏈和連動裝置的操作試驗。

艙蓋關閉應包括繫固所有周邊裝置，以及十字接頭楔耳或其他繫固設備。應特別注意船舶前部 25%長度內的艙蓋，因為該處波浪載荷通常最大。

3.3.3 如艙蓋操作和繫固有困難，則應由驗船師決定對上述 3.3.2 要求的附加裝置進行操作試驗。

3.3.4 如貨艙繫固系統不能正常操作，則應在主管機關的監督下進行修理。如對艙蓋或圍板進行重大修理，則繫固裝置的強度應予以加強並符合附件 11 的要求。

3.3.5 在每次年度檢驗時，應對每一艙蓋裝置的下列項目進行檢驗：

- .1 艙蓋板架，包括邊板，以及可在開啟位置進行近觀檢驗（以檢查腐蝕、裂紋或變形）的扶強材附件；
- .2 周邊和十字接頭的密封裝置（密封墊狀況和永久變形、

兼裝船上柔性密封裝置、帶唇邊的密封墊、壓條、泄水槽和止回閥)；

- .3 夾緊裝置、壓條、楔耳（檢查損耗、調整，以及橡膠部件狀況）；
- .4 關閉的艙蓋定位裝置（變形和連接件）；
- .5 鏈或繩索滑輪；
- .6 導向裝置；
- .7 導軌和導輪；
- .8 制動裝置；
- .9 鋼索、傳動鏈、拉伸裝置和絞車副捲筒；
- .10 液壓系統、電動安全裝置和連鎖裝置；和
- .11 端部和板格間鉸鏈、銷釘和底座（如設有）。

3.3.6 在每次年度檢驗時，應對每一艙口處的圍板以及板、扶強材和肘板的腐蝕、裂紋和變形情況，尤其是圍板頂部，進行檢查，包括近觀檢驗。

3.3.7 如認為必要，可通過對密封壓力部件附加的沖水或堽粉水密試驗證實密封裝置的有效性。

3.3.8 對裝設木質或鋼質箱形的活動艙蓋者，應確認以下項目處於令人滿意狀況：

- .1 木質艙口蓋和活動橫樑，活動橫樑承座或插座及其緊固裝置；

- .2 鋼質箱形艙蓋，包括艙口蓋板的近觀檢驗；
- .3 防水帆布；
- .4 楔耳、壓條和楔子；
- .5 艙口緊固壓條及其緊固裝置；
- .6 承載座板/樑材和側板的邊緣；
- .7 導板和楔子；和
- .8 壓條、泄水槽和泄水管（如有）。

3.3.9 應檢查所有燃料艙透氣管上的防火網。

3.3.10 應檢查燃料艙和透氣管系統，包括通風筒。

3.4 貨艙檢查

3.4.1 對船齡 10 至 15 年的雙舷側散貨船應進行如下檢驗：

- .1 對兩個選擇的貨艙的全面檢驗；
- .2 在驗船師認為必要時，或存在大面積腐蝕時，應進行測厚。如測厚結果表明顯著腐蝕，應按附件 10 的規定擴大測厚範圍。該擴大的測厚應在檢驗完成之前進行。應檢查以前檢驗中確定的可疑區域。以前檢驗中確定的顯著腐蝕區域應進行測厚；和
- .3 貨艙內的所有管系和貫穿件，包括舷外管路，應予以檢查。

3.4.2 對船齡超過 15 年的雙舷側散貨船應進行如下檢驗：

- .1 對所有貨艙的全面檢驗；
- .2 在驗船師認為必要時，或存在大面積腐蝕時，應進行測厚。如測厚結果表明顯著腐蝕，應按附件 10 規定擴大測厚範圍。該擴大的測厚應在檢驗完成之前進行。應檢查以前檢驗中確定的可疑區域。以前檢驗中確定的顯著腐蝕區域應進行測厚；和
- .3 貨艙內的所有管系和貫穿件，包括舷外管路，應予以檢查。

3.5 壓載艙檢查

在由於換證檢驗和中間檢驗的結果而有要求時，應對壓載艙進行檢查。在驗船師認為必要時，或存在大面積腐蝕時，應進行測厚。如測厚結果表明有顯著腐蝕，則應按附件 10 的規定擴大測厚範圍。該擴大的測厚應在檢驗完成之前進行。應檢查以前檢驗中確定的可疑區域。以前檢驗中確定的顯著腐蝕區域應進行測厚。

3.6 確定符合公約第 XII/12 和 XII/13 條規定後的附加年度檢驗要求

3.6.1 對符合公約第 XII/12 條關於貨艙、壓載艙和乾燥處所水位探測器要求的船舶，年度檢驗應包括檢查和隨機測試進水探測系統及其報警裝置。

3.6.2 對符合公約第 XII/13 條關於泵系有效性要求的船舶，年度檢驗應包括檢查和測試用於排放和泵吸位於防撞艙壁前方的壓載艙的壓載水以及任何部位延伸至最前部貨艙前方的乾燥處所艙底水的設備及其控制裝置。

4 中間檢驗

4.1 總則

4.1.1 對年度檢驗要求以外的附加項目，可在第二次或第三次年度檢驗時或其之間進行檢驗。

4.1.2 檢驗範圍依 4.2、4.3 和 4.4 中規定的船齡而定。

4.1.3 中間檢驗和換證檢驗所要求的處所的檢驗和測厚不應相互替代。

4.2 船齡 5 至 10 年的雙舷側散貨船

4.2.1 壓載艙

4.2.1.1 對用於水壓載的艙，驗船師應選擇代表性艙進行全面檢驗。代表性艙的選取，應在考慮到壓載艙的數量和類型的同時，包括艏艙、尖艙和其他類型的艙。如該全面檢驗表明無可見的結構缺陷，則檢查可限於核實防腐系統處於有效狀態。

4.2.1.2 如在水壓載艙內發現塗層狀況“差”、腐蝕或其他缺陷，或從建造時起就未敷設硬保護塗層，則檢查應擴大至其他同類型的壓載艙。

4.2.1.3 如在壓載艙（雙層底艙除外）內發現硬保護塗層狀況“差”，且未換新，或已敷設軟塗層或半硬塗層，或從建造時起就未敷設硬保護塗層，則應對所述艙每年進行檢查，並在必要時進行測厚。如在壓載雙層底艙內發現硬保護塗層處於此種狀況，且已敷設軟塗層或半硬塗層，或未敷設硬保護塗層，則可對所述艙每年進行檢查。在驗船師認為必要時，或存在大面積腐蝕時，應進行測厚。

4.2.1.4 除上述要求之外，還應對上次換證檢驗中確定的可疑區域進行全面檢驗和近觀檢驗。

4.2.2 貨艙

4.2.2.1 應對所有貨艙進行全面檢驗。

4.2.2.2 根據 4.2.2.1 所述的全面檢驗結果，在驗船師認為必要時，該檢驗應擴大至包括對驗船師選擇的貨艙結構區域的近觀檢驗。

4.2.3 厚度測量範圍

4.2.3.1 厚度測量應在足夠範圍內進行，以確定根據 4.2.2.2 的要求和按 4.2.1.4 的規定應做近觀檢驗的區域內的總體和局部腐蝕程度。

4.2.3.2 如驗船師通過近觀檢驗確信無結構縮減，且查明硬保護塗層處於“良好”狀況，近觀檢驗和測厚的範圍可予以特殊考慮。

4.2.3.3 如發現顯著腐蝕，則應按附件 10 的規定擴大測厚範圍。該擴大的測厚應在檢驗完成之前進行。應檢查以前檢驗中確定的可疑區域。以前檢驗中確定的顯著腐蝕區域應進行測厚。

4.2.3.4 如查明貨艙內硬保護塗層處於“良好”狀況，近觀檢驗和測厚的範圍可予以特殊考慮。

4.3 船齡 10 至 15 年的雙舷側散貨船

4.3.1 中間檢驗的要求應與 2 和 5.1 要求的上次換證檢驗的範圍相同。但是，除非現場驗船師認為必要，否則不要求進行燃油艙的內部檢查和所有液艙的壓力試驗。

4.3.2 在應用 4.3.1 時，中間檢驗可在第二次年度檢驗時開始，並可

在其後一年中繼續進行，以在第三次年度檢驗時完成，替代應用 2.1.1。

4.3.3 在應用 4.3.1 時，水下檢驗可予以考慮，以替代 2.2 的要求。

4.4 船齡超過 15 年的雙舷側散貨船

4.4.1 中間檢驗的要求應與 2 和 5.1 要求的上次換證檢驗的範圍相同。但是，除非現場驗船師認為必要，否則不要求進行燃油艙的內部檢查和所有液艙的壓力試驗。

4.4.2 在應用 4.4.1 時，中間檢驗可在第二次年度檢驗時開始，並可在其後一年中繼續進行，以在第三次年度檢驗時完成，替代應用 2.1.1。

4.4.3 在應用 4.4.1 時，乾塢檢驗應作為中間檢驗的一部分。如對貨艙和水壓載艙下部的全面檢驗、近觀檢驗和測厚（如適用）尚未實施，則應按中間檢驗的適用要求進行。

註：貨艙和壓載艙下部係指輕壓載水線以下的部分。

5 檢驗前準備

5.1 檢驗計劃

5.1.1 船東應與主管機關合作，在以下檢驗的任何部分開始前制定具體的檢驗計劃：

- .1 換證檢驗；和
- .2 船齡 10 年以上的雙舷側散貨船的中間檢驗。

檢驗計劃應根據附件 4A 中的資料以書面形式制定。只有在

制定檢驗計劃後才能開始進行檢驗。

5.1.1.1 在制定檢驗計劃前，船東應根據附件 4B 中的資料填寫檢驗計劃調查表，並送交主管機關。

5.1.1.2 中間檢驗的檢驗計劃可由經上次換證檢驗所作狀況評估報告補充的檢驗計劃以及隨後的相關檢驗報告組成。

5.1.1.3 制定檢驗計劃應考慮自上一次換證檢驗後對檢驗要求的任何修改。

5.1.2 在制定檢驗計劃時，應搜集和查閱下列文件用以選擇要進行檢查的液艙、貨艙、區域和結構件：

- .1 檢驗狀況和基本的船舶資料；
- .2 6.2 和 6.3 中所述的船上文件；
- .3 主結構圖（尺寸圖），包括有關使用高強度鋼（HTS）的資料；
- .4 來自船級社和船東兩方面的有關上次檢驗和檢查報告；
- .5 關於船舶貨艙和液艙的使用、典型貨物和其他相關數據的資料；
- .6 關於新船防腐等級的資料；和
- .7 關於在船舶營運時有關的維護保養等級的資料。

5.1.3 提交的檢驗計劃應說明並至少符合附件 1 和附件 2 及 2.7 分別對近觀檢驗、厚度測量和液艙試驗的要求，並應至少包括下列相關資料：

- .1 基本的船舶資料和概況；
- .2 主結構圖（尺寸圖），包括有關使用高強度鋼（HTS）的資料；
- .3 貨艙和液艙圖；
- .4 附有塗層的使用、保護和狀況資料的貨艙和液艙明細表；
- .5 檢驗條件（如：有關貨艙和液艙清潔、除氣、通風、照明等的資料）；
- .6 通道的設置和方法；
- .7 檢驗設備；
- .8 指定進行近觀檢驗的貨艙、液艙和區域（見 2.5）；
- .9 指定進行厚度測量的剖面（見 2.6）；
- .10 指定進行試驗的液艙（見 2.7）；和
- .11 與該船舶有關的損壞經歷。

5.1.4 主管機關應通知船東適合於該船舶的最大限度的可接受結構蝕耗程度。

5.1.5 也可使用附件 9 中的與雙舷側散貨船加強檢驗計劃有關的技術評估導則。本導則是一套建議的方法，在認為必要和適當時，可由主管機關決定，結合制定所要求的檢驗計劃予以施用。

5.2 檢驗條件

5.2.1 船東應為安全地進行檢驗提供必要的設施。

5.2.2 為使現場驗船師能進行檢驗，船東和主管機關應商定合適和安全的通道設施。

5.2.3 檢驗計劃調查表中應提供通道設施細節。

5.2.4 在現場驗船師斷定安全的規定和要求的通道不合適時，不應進行相關處所的檢驗。

5.2.5 應可安全進入貨艙、液艙和處所。貨艙、液艙和處所應予以除氣和適當通風。進入液艙、空艙或圍蔽處所前，應確認液艙內部空氣中無危險氣體並含足夠的氧氣。

5.2.6 在準備檢驗、測厚和徹底檢查時，所有處所應進行清掃，包括除去表面所有鬆動的腐蝕積垢。處所應充分清潔，做到無水、無垢、無髒物、無殘油等，以能揭示腐蝕、變形、裂紋、破損或其他結構蝕耗以及塗層狀況。但是，船東已經決定換新的結構區域只需進行清掃和去垢，以確定要換新的區域範圍。

5.2.7 應提供足夠的照明，以能揭示腐蝕、變形、裂紋、破損或其他結構蝕耗以及塗層狀況。

5.2.8 如已敷設軟塗層或半硬塗層，應為驗船師提供安全通道，以使其能驗證塗層的有效性和進行內部結構（可能包括塗層剝落的部分）的狀況評估。如無法提供安全通道，則軟塗層或半硬塗層應予以去除。

5.2.9 船東應指派至少一位對液艙和封閉處所檢查有經驗的人員始終陪伴現場驗船師。此外，由至少兩人組成的有經驗的後備人員應等候在被檢驗的液艙或處所的艙口處。後備組人員應不斷觀察液艙或處所內的工作情況，並應保持救生和撤離設備隨時可用。

5.2.10 在被檢查的貨艙、液艙或處所內的檢驗人員、甲板上的負責駕駛員和駕駛室（視情況而定）之間應安排通信系統。這些通信設備應在整個檢驗中始終保持工作狀態。

5.3 結構通道

5.3.1 對全面檢驗，應提供設施使驗船師能用安全和可行的方法檢查船體結構。

5.3.2 對近觀檢驗，應提供驗船師可接受的下列一個或多個通道裝置：

- .1 固定腳手架和穿過結構的通道；
- .2 臨時腳手架和穿過結構的通道；
- .3 升降機和可移動台架；
- .4 可攜式梯子；
- .5 艇或筏；和
- .6 其他等效設施。

5.4 檢驗設備

5.4.1 通常應使用超聲波檢測設備進行測厚。應按要求向驗船師證明該設備的精度。

5.4.2 如驗船師認為必要，可要求用下列一個或多個裂紋檢測方法：

- .1 射線照相設備；
- .2 超聲波探傷設備；

.3 磁粉探傷設備；和

.4 着色滲透劑。

5.4.3 檢驗期間應有可使用的測爆儀、測氧儀、呼吸器、救生索，攀登帶及其繩索、鉤子和哨笛及其使用說明和指導。應提供安全檢查清單。

5.4.4 應為安全有效地進行檢驗提供足夠和安全的照明。

5.4.5 在檢驗期間，應有足夠的防護服（如：安全頭盔、手套、安全靴等）可供使用。

5.5 海上或錨泊檢驗

5.5.1 如驗船師能得到船上人員的必要協助，可接受在海上或錨泊時進行檢驗。檢驗所需的預防措施和程序應符合 5.1、5.2、5.3 和 5.4 中的要求。

5.5.2 在被檢查的處所內的檢驗人員與在甲板上的負責駕駛員之間應布置通信系統。如使用艇或筏，該系統還應包括負責壓載水泵操作的人員。

5.5.3 只有在驗船師考慮到所提供的安全措施，包括氣象預報和船舶對可預見狀況的反應後表示同意，以及在液艙內水位預期的上升不超過 0.25m 的情況下，方可使用艇或筏對液艙或適用貨艙進行檢驗。

5.5.4 在使用筏或艇進行近觀檢驗時，應符合下列條件：

- .1 應僅使用即使一個浮箱破裂仍具有合格的剩餘浮力和穩性的耐用型氣脹式筏或艇；

- .2 艇或筏應拴於通道梯上，並另安排一人留守在能清晰看見該艇或筏的通道梯處；
- .3 所有參加人員都應有合適的救生衣；
- .4 液艙或貨艙內的水面應平靜（在所有可預見的情況下，液艙內預期的水位上升不應超過 0.25m），且水位應固定。任何時候當筏或艇在使用時，水位都不得上升；
- .5 液艙、貨艙或處所必須只含有乾淨的壓載水。水面上不允許有任何油層；和
- .6 任何時候都不允許水位與最深甲板下腹板面板的距離在 1m 以內，這樣檢驗人員通往艙口的直接逃生通道才不致被隔絕。只有在被檢查的艙壁間距上設有甲板通道人孔並開啟時才能考慮水位超出甲板橫材，這樣才能保證任何時候檢驗人員都可使用逃生通道。其他有效的通往甲板的逃生通道也可予以考慮。

5.5.5 如腹板深度為 1.5m 或以下，筏或艇可允許單獨用於在液艙或處所甲板下的區域的檢查。

5.5.6 如腹板深度超過 1.5m，筏或艇可僅允許單獨用於下列之一的情況：

- .1 甲板下結構的塗層處於“良好”狀況，且無鏽蝕的跡象；
或
- .2 如果在每一間距上設置一個允許安全進出的永久通道。
該通道應：

- .1 通過每一間距內的垂直梯直接通向甲板，該梯在甲板下約 2m 處設有一個小平台；或
- .2 通過在液艙每一端都設有通往甲板的梯子的縱向永久平台通向甲板。該平台應在液艙的全長範圍內布置在與甲板下結構的筏運檢查所需要的最高水位的相同平面，或其上。為此，與最高水位對應的空餘量應假定在甲板橫框架的跨距中點和液艙長度中點處測量至距甲板板不大於 3m。

如上述條件都不能滿足，則應為甲板下區域的檢驗提供腳手架或其他等效裝置。

5.5.7 5.5.5 和 5.5.6 所述的單獨使用筏或艇並不排除在檢驗過程中使用艇或筏在液艙範圍內的移動。

5.6 檢驗計劃會議

5.6.1 在檢驗之前和檢驗期間，現場驗船師和船上船東代表要做好適當準備，進行密切合作，這是執行安全有效檢驗的重要一環。在船上檢驗期間應定期召開安全會議。

5.6.2 為確保檢驗能安全有效地進行，應在換證和中間檢驗的任何部分開始之前，召開由現場驗船師、現場船東代表、測厚公司測量人員（視情況而定）和船長或由船長或公司指派的具有相應資質的代表參加的檢驗計劃會議，以確定檢驗計劃中預見的所有布置均已到位（還參見 7.1.2）。

5.6.3 會議中應討論的項目的示意性清單如下：

- .1 船舶計劃（即航線、靠碼頭和離碼頭操縱、靠泊時段、貨物和壓載作業等）；
- .2 測厚的規定和布置（即通道、清潔/除垢、照明、通風、人員安全）；
- .3 測厚範圍；
- .4 認可標準（參見最小厚度表）；
- .5 考慮了塗層狀況和可疑區域/顯著腐蝕區域後確定的近觀檢驗和測厚範圍；
- .6 測厚的實施；
- .7 總體上和發現不均勻腐蝕/點蝕之處的代表性讀數的採集；
- .8 繪製出顯著腐蝕區域；和
- .9 現場驗船師、測厚公司測量人員以及船東代表之間就發現的相關問題進行溝通。

6 船上文件

6.1 總則

6.1.1 船東應獲取、提供並在船上保存 6.2 和 6.3 規定的文件，隨時供驗船師使用。6.2 中所述的狀況評估報告應包括一份英文譯文。

6.1.2 文件應在船舶的整個營運壽命期間保存在船上。

6.2 檢驗報告案卷

6.2.1 檢驗報告案卷應是船上文件的一個組成部分，包括：

- .1 結構檢驗報告（附件6）；
- .2 狀況評估報告（附件7）；和
- .3 測厚報告（附件8）。

6.2.2 船東及主管機關的辦事處，或經主管機關認可的組織的辦事處，也應備有檢驗報告案卷可供使用。

6.3 支持性文件

6.3.1 船上應備有以下方面的附加文件可供使用：

- .1 5.1 要求的檢驗計劃，直至換證檢驗或中間檢驗（如適用）完成；
- .2 貨艙和壓載艙主結構圖；
- .3 以前修理史；
- .4 貨物和壓載史；
- .5 船上人員對以下方面的檢查：
 - .1 總體結構損耗；
 - .2 艙壁和管路泄漏；和
 - .3 塗層或防腐系統狀況（如有）。報告製作格式如附件3所示；和
- .6 任何其他有助於識別臨界結構區域和/或需要檢查的可疑區域的資料。

6.4 船上文件審核

檢驗前，驗船師應檢查船上文件資料的完整性及其內容，並將其作為檢驗的基礎。

7 測厚程序

7.1 總則

7.1.1 如要求的測厚不是由代表主管機關的被認可組織進行，則應由被認可組織的驗船師在場見證測厚過程。驗船師在船上的時間應視監督該測厚過程的範圍而定。

7.1.2 測厚公司應參加在檢驗開始前舉行的檢驗計劃會議。

7.1.3 結構測厚所處位置如需進行近觀檢驗，則此種測厚應與近觀檢驗同時進行。

7.1.4 在任何情況下，測厚範圍應足以代表實際的平均狀況。

7.1.5 測厚程序要求見附件 12。

7.2 測厚公司的認證

測厚應由主管機關認可的組織根據附件 5 規定的原則予以認證的合格公司進行。

7.3 報告

7.3.1 應編制一份測厚報告並提交給主管機關。該報告應給出測量部位、所測得的厚度以及相應的原始厚度。此外，報告還應說明進行測厚的日期、測量設備的類型、測量人員的姓名及其資質，並由測厚人員簽字。測厚報告應遵循附件 8 建議的測厚程序中規定的原則。

7.3.2 驗船師應審核最終的測厚報告並在封面上會簽。

8 檢驗報告和評估

8.1 檢驗報告的評估

8.1.1 檢驗期間收集的船舶結構狀況的數據和資料應用於評估船舶的可接受性和連續結構完整性。

8.1.2 應由主管機關或經主管機關授權的被認可組織對資料進行分析並予以簽註，其分析的結論應作為狀況評估報告的一部分。

8.2 報告

8.2.1 檢驗報告原則見附件 6。

8.2.2 當檢驗在不同的檢驗站分別進行時，檢驗的每一部分均應出具報告。其後的現場驗船師在繼續或完成檢驗之前，應可獲得已經檢查和/或試驗項目的清單（壓力試驗、測厚等）以及項目是否已做記錄的說明。

8.2.3 應向船東簽發附件 7 所示的檢驗狀況評估報告以及結果，並應將其留存在船上供以後檢驗時查閱。狀況評估報告應由主管機關或代表主管機關的被認可組織予以簽註。

附件 1

換證檢驗時的近觀檢驗要求

附錄 1 - 雙舷側散貨船換證檢驗時的近觀檢驗最低要求，不包括礦砂船

船齡≤5 年	5 年<船齡≤10 年	10 年<船齡≤15 年	船齡> 15 年
第 1 次換證檢驗	第 2 次換證檢驗	第 3 次換證檢驗	第 4 次換證檢驗
每種類型兩個代表性水壓載艙內各一個橫向強框架及附連的板和縱骨。這包括任何一側的最前部頂邊艙和雙舷側水壓載艙。(A) 兩個選擇的貨艙橫艙壁，包括頂凳、底凳的內部結構（當設有）。(C) 所有貨艙艙口蓋和艙口圍板（板和扶強材）。(D)	在每個水壓載艙內的一個橫向強框架及附連的板和縱骨（如適用）。(A) 在一個包括頂邊艙、底邊艙和雙舷側壓載艙的橫剖面內的前後橫艙壁，包括其扶強材系統。(A) 最前面的雙舷側艙內普通橫向框架肋骨的 25%。(B) 每個貨艙內一道橫艙壁，包括頂凳、底凳的內部結構（如設有）。(C) 所有貨艙艙口蓋和艙口圍板（板和扶強材）。(D) 所有貨艙口之間，貨艙開口邊緣內的所有甲板板和甲板下結構。(E)	在每個水壓載艙內所有橫向強框架及附連的板和縱骨（如適用）。(A) 在每一水壓載艙內的所有橫艙壁，包括其扶強材系統。(A) 所有的雙舷側艙內普通橫向框架肋骨的 25%。(B) 所有貨艙橫艙壁，包括頂凳、底凳的內部結構（如設有）。(C) 所有貨艙艙口蓋和艙口圍板（板和扶強材）。(D) 所有貨艙口之間，貨艙開口邊緣內的所有甲板板和甲板下結構。(E)	在每個水壓載艙內所有橫向強框架及附連的板和縱骨（如適用）。(A) 在每一水壓載艙內的所有橫艙壁，包括其扶強材系統。(A) 所有雙舷側艙內的所有普通橫向框架肋骨。(B) 以下與第 3 欄的 (C) - (E) 相同

(A)、(B)、(C)、(D) 和 (E) 是近觀檢查和測厚區域（見附件 8 附錄 3 草圖）

(A) 頂邊艙、底邊艙和雙舷側壓載艙內的橫向強框架或水密橫艙壁。艙艙尖艙內的橫向強框架係指一個完整的橫向環狀強框架，包括鄰接

的結構件。

- (B) 雙舷側艙內的普通橫向框架肋骨。
- (C) 貨艙橫艙壁、板、扶強材和縱桁。
- (D) 貨艙艙口蓋和艙口圍板。
- (E) 貨艙口之間貨艙開口邊線內甲板板和甲板下結構。

註： 橫艙壁近觀檢驗應在以下四個水平面進行：

水平面 (a)： 對無底凳船直接在內底板以上、封槽板（如設有）
以上和卸貨板以上。

水平面 (b)： 對有底凳船直接在底凳頂板以上及以下和卸貨板以
上。

水平面 (c)： 大約在艙壁高度的一半處。

水平面 (d)： 直接在上甲板以下和頂邊艙附近及有頂凳船的頂凳
底板以下或直接在頂邊艙以下。

附錄 2

礦砂船換證檢驗時的近觀檢驗最低要求

船齡 < 5 年	5 年 < 船齡 ≤ 10 年	船齡 > 10 年
第 1 次換證檢驗	第 2 次換證檢驗	第 3 次及以後換證檢驗
一個完整的強肋骨環，包括鄰近的邊壓載艙構件。(A) 一道橫艙壁下部，包括縱桁材系統和鄰近的一個壓載艙構件。(A)	所有完整的強肋骨環，包括鄰近的一個邊壓載艙構件。(A) 一根甲板橫樑，包括臨近的每一剩餘壓載艙內甲板構件。(A) 完整的前和後橫艙壁，包括縱桁材系統和鄰近的一個邊壓載艙構件。(A) 一道橫艙壁下部，包括縱桁材系統和鄰近的剩餘壓載艙構件。(A)	所有完整的強肋骨環，包括鄰近的每一個壓載艙構件。(A) 所有完整的橫艙壁，包括縱桁材系統和鄰近的每一個壓載艙構件。(A) 一道完整的強肋骨環，包括鄰近的每一個邊空艙構件。(A) 如主管機關或經主管機關認可的組織認為必要，附加空艙的強肋骨環。(A)
兩道選擇的貨艙橫艙壁，包括頂凳和底凳（如設置）的內部構件。(C)	每個貨艙的一道橫艙壁，包括頂凳和底凳（如設置）的內部構件。(C)	所有貨艙的橫艙壁，包括頂凳和底凳（如設置）的內部構件。(C)
所有貨艙蓋和艙口圍（板和加強筋）。(D)	所有貨艙蓋和艙口圍板（板和加強筋）。(D)	所有貨艙蓋和艙口圍（板和加強筋）。(D)
	所有甲板板和貨艙口之間艙口開口線以內的甲板下構件。(E)	所有甲板板和貨艙口之間艙口開口線以內的甲板下構件。(E)

(A)、(C)、(D) 和 (E) 是近觀檢驗和測厚的區域（見附件 8 附錄 3 草圖）

(A) 邊壓載艙和空艙內的橫向強肋骨或水密橫艙壁。艙艙尖艙內的橫向強肋骨，係指一個完整的橫強肋骨環，包括鄰接構件；

(C) 貨艙橫艙壁板、扶強材和縱桁；

(D) 貨艙艙口蓋和艙口圍板；

(E) 貨艙口之間貨艙開口邊線以內甲板板和甲板下結構。

註： 橫艙壁近觀檢驗應在以下四個水平面進行：

水平面（a）： 對無底凳船直接在內底板以上、封槽板（如設有）
以上和卸貨板以上；

水平面（b）： 對有底凳船直接在底凳頂板以上及以下和卸貨板
以上；

水平面（c）： 大約在艙壁高度的一半處；

水平面（d）： 直接在上甲板以下和頂邊艙附近及有頂凳船的頂
凳底板以下或直接在頂邊艙以下。

附件 2

換證檢驗時的測厚要求

船齡≤5 年	5 年<船齡≤10 年	10 年<船齡≤15 年	船齡> 15 年
第 1 次換證檢驗	第 2 次換證檢驗	第 3 次換證檢驗	第 4 次換證檢驗
1 可疑區域	1 可疑區域 2 在貨物長度區域內： 貨艙艙口線外的甲板板的兩個橫剖面 3 按附件 1 經受近觀檢驗的構件的測量點，供總體評定並作記錄腐蝕形式用 4 上述第 2 點考慮的橫剖面處舷側乾濕交變列板 5 貨物長度區域外選擇的舷側乾濕交變列板	1 可疑區域 2 在貨物長度區域內： .1 貨艙艙口線外的每塊甲板板 .2 貨艙艙口線外兩個橫剖面，其中一個在船中部區域內 3 按附件 1 經受近觀檢驗的構件的測量點，供總體評定並作記錄腐蝕形式用 4 貨物長度區域內所有舷側乾濕交變列板 5 貨物長度區域外選擇的舷側乾濕交換列板	1 可疑區域 2 在貨物長度區域內： .1 貨艙艙口線外的每一塊甲板板 .2 貨艙艙口線外三個橫剖面，其中一個在船中部區域內 .3 每塊船底板 3 第 3 欄的第 3 點 4 全長範圍內所有舷側乾濕交變列板

附件 3

船東檢查報告

結構狀況

船名：.....							
船東檢查報告-結構狀況							
液艙/貨艙號：.....							
鋼級： 甲板：..... 舷側：.....							
船底：..... 縱艙壁：.....							
構件	裂紋	屈曲	腐蝕	塗層狀況	鏽點	改動/修理	其他
甲板：							
船底：							
舷側：							
舷側肋骨：							
縱艙壁：							
橫艙壁：							
進行修理的原因：							
進行的測厚（日期）：							
總體結果：							
過期檢驗：							
船級遺留項目：							
意見：							
檢查日期：.....							
檢查員：.....							
簽字：.....							

附件 4A

檢驗計劃

基本資料和概況

船名：
IMO編號：
船旗國：
船籍港：
總噸位：
載重量（公噸）：
垂線間長度（m）：
造船廠：
船體號：
被認可組織（RO）：
RO的船舶標識號：
船舶建造日期：
船東：
測厚公司：

1 序言

1.1 範圍

1.1.1 本檢驗計劃包括在本規則中要求的貨物長度區域、貨艙、壓載艙（包括艏艙尖艙）內進行全面檢驗、近觀檢驗、測厚和壓力試驗的最小範圍。

1.1.2 檢驗布置和安全方面應經現場驗船師認可。

1.2 文件

按第 6 節的要求，制定檢驗計劃所用的全部文件應在檢驗期間在船上可供使用。

2 貨艙、液艙和處所的布置

本部分檢驗計劃應以圖紙或文字形式提供檢驗適用範圍內的貨艙、液艙和處所布置的資料。

3 貨艙、液艙和處所的一覽表及其使用情況、塗層範圍和防腐系統的資料

本部分檢驗計劃應說明與檢驗計劃調查表中提供的船舶貨艙和液艙使用情況、塗層範圍和防腐系統資料有關的任何變化（並更新資料）。

4 檢驗條件

本部分檢驗計劃應提供有關的檢驗條件的資料，如：貨艙和液艙清洗、除氣、通風和照明等。

5 結構通道的設置和方法

本部分檢驗計劃應指明與檢驗計劃調查表中提供的結構通道的設置和方法的資料有關的任何變化（並更新資料）。

6 檢驗設備清單

本部分檢驗計劃應確定並列出為進行檢驗和所要求測厚提供的設備。

7 檢驗要求

7.1 全面檢驗

本部分檢驗計劃應確定並列出本船按 2.5.1 應進行全面檢驗的處所。

7.2 近觀檢驗

本部分檢驗計劃應確定並列出本船按 2.5.2 應進行近觀檢驗的船體結構。

8 確定進行試驗的液艙

本部分檢驗計劃應確定並列出本船按 2.7 應進行試驗的貨艙和液艙。

9 確定測厚的區域和剖面

本部分檢驗計劃應確定並列出按 2.6.1 應測厚的區域和剖面。

10 船體結構最小厚度

本部分檢驗計劃應按 .1 或 .2 詳細規定應進行檢驗的本船船體的最小厚度：

.1 按本船的船體結構圖，按所附的損耗裕度表和原始厚度確定；

.2 在以下表中列出：

區域或位置	建造的原始厚度 (mm)	最小厚度 (mm)	顯著腐蝕厚度 (mm)
甲板			
板			
縱骨			
縱桁			
橫跨甲板板			
橫跨甲板扶強材			
船底			
板			
縱骨			
縱桁			
內底			
板			
縱骨			
縱桁			
肋板			
頂邊艙處的船舷			

區域或位置	建造的原始厚度 (mm)	最小厚度 (mm)	顯著腐蝕厚度 (mm)
板			
縱骨			
底邊艙處的船舷			
板			
縱骨			
雙殼液艙處的船舷 (如適用)			
板			
縱骨或普通橫向肋骨			
縱桁			
縱艙壁內側 (如適用)			
板			
縱骨 (如適用)			
縱骨或普通橫向肋骨			
縱桁 (如適用)			
橫艙壁			
板			
扶強材 (如適用)			
頂凳板			
頂凳扶強材			
底凳板			
底凳扶強材			
頂邊艙內橫向強肋骨			
板			
折板			
扶強材			
底邊艙內橫向強肋骨			
板			
折板			
扶強材			
雙舷側艙內橫向強肋骨			
板			

如損壞與設計有關，姐妹船或類似船舶的船體損壞（如有）

貨艙、液艙或處所編號或區域	可能的原因（如已知）	損壞說明	位置	修理	修理日期

13 以前檢驗中確定的顯著腐蝕區域

本部分檢驗計劃應確定以前檢驗中發現的顯著腐蝕區域並列出清單。

14 臨界結構區域和可疑區域

如有資料，本部分檢驗計劃應確定臨界結構區域和可疑區域並列出清單。

15 其他相關意見和資料

本部分檢驗計劃應提供與檢驗相關的任何其他意見和資料。

附錄

附錄 1 – 圖紙清單

5.1.3.2 要求備有貨艙和壓載艙的主要結構圖（尺寸圖），包括有關使用高強度鋼（HTS）的資料。本檢驗計劃附錄應確定並列出作為本檢驗計劃組成部分的主要結構圖。

附錄 2 – 檢驗計劃調查表

船東已提交的檢驗計劃調查表（附件 4B）應附於本檢驗計劃後。

附錄 3 – 其他文件

本部分檢驗計劃應確定並列出作為本計劃組成部分的任何其他文件。

為符合 5.1.3，由船東配合主管機關制定。

日期：

（經授權的船東代表的姓名和簽字）

日期：

（經授權的主管機關代表的姓名和簽字）

附件 4B**檢驗計劃調查表**

1 下述資料能使船東配合主管機關制定一份符合本規則要求的檢驗計劃。關鍵是船東在填寫本調查表時提供最新的資料。填寫完成的本調查表應提供本規則要求的所有信息和資料。

概況

船名：

IMO 編號：

船旗國：

船籍港：

船東：

被認可組織（RO）：

RO 的船舶標識號：

總噸位：

載重量（公噸）：

船舶建造日期：

為近觀檢驗和測厚檢查而提供通道裝置的資料

2 船東應在下表中說明通往應進行近觀檢驗和測厚的結構的通道。近觀檢驗係指現場驗船師在近距離目視範圍內（即通常伸手可及）對結構件細節進行的檢驗。

貨艙/液艙 號	結構	臨時 腳手架	筏	梯子	直接 通道	其他方式 (請說明)
F.P.	艏尖艙					
A.P.	艉尖艙					
貨艙	艙邊圍板					
	頂邊斜板					
	頂凳板					
	橫跨甲板					
	兩舷邊艙板					
	橫艙壁					
	底邊艙板					
	底凳板					
	艙頂					
頂邊艙	甲板下結構					
	舷側和結構					
	斜邊板和結構					
	腹板和艙壁					
底邊艙	底邊斜板和結構					
	舷側和結構					
	底部結構					
	腹板和艙壁					
雙舷側液艙	舷側和結構					
	內殼和結構					
	腹板和艙壁					
	雙層底結構					
	頂凳內部結構					
	底凳內部結構					
礦砂船邊艙	甲板下結構					
	舷側和結構					
	舷側垂直桁材和結構					
	縱艙壁和結構					
	縱艙壁桁材和結構					
	底板和結構					
	橫撐材/縱桁					

腐蝕性（如高硫含量）散裝貨物歷史記錄

船東的檢查

3 船東應填寫類似以下格式的表（下表僅為示例），根據本規則的要求提供至少最近三年內其對貨物長度區域範圍內所有貨艙、壓載艙和空艙的詳細檢查結果。

液艙/貨艙號	防腐 (1)	塗層範圍 (2)	塗層狀況 (3)	結構蝕耗 (4)	貨艙和液艙歷史記錄 (5)
貨艙					
頂邊艙					
底邊艙					
雙舷側液艙					
雙層底艙					
頂凳					
底凳					
邊艙（礦砂船）					
艏尖艙					
艉尖艙					
其他處所					

註：

指明用於油類/壓載的液艙。

- 1) HC=硬塗層；SC=軟塗層；
SH=半硬塗層；NP=無保護
- 2) U=上部；M=中部
L=下部；C=全部
- 3) G=良好；F=尚好；P=差；

船東代表姓名：

.....

簽字：.....

日期：.....

RC=重新敷設（過去三年中）

4) N =無情況記錄；Y=有情況記錄，

情況說明應附於調查表之後

5) DR=破損和修理；L=滲漏；

CV=改建（說明應附於調查表之後）

港口國監督檢查報告

列出包含船體相關結構缺陷的港口國監督檢查報告，以及關於糾正缺陷的資料：

安全管理系統

列出有關船體維護的不合格項，包括相關的糾正措施：

經認可測厚公司的名稱和地址：

附件 5

認證船體結構測厚公司的程序

1 適用範圍

本指南適用於對有意從事船體結構測厚的公司的認證。

2 認證程序

提交文件

2.1 應提交下列文件給主管機關認可的組織審批：

- .1 公司概況，如組織和管理機構；
- .2 公司在船體結構測厚方面的經歷；
- .3 技術人員履歷、即技術人員作為測厚操作人員的經歷，對船體結構等的技術了解和經驗。操作者應具有符合公認的工業無損檢測（NDT）標準的資質；
- .4 用於測厚的設備，如超聲波檢測設備及其維護和校正程序；
- .5 測厚人員指南；
- .6 測厚技術員的培訓計劃；
- .7 按建議的測厚程序（見附件 8）的測量記錄格式。

公司審核

2.2 在提交的文件經審核合格後，應對公司進行審核，以確認公

司按照所提交的文件進行適當組織和管理，並確認其事實上有能力進行船舶的船體結構測厚工作。

2.3 發證取決於其在船上的測厚操作演示以及出具令人滿意的報告。

3 發證

3.1 在 2.2 所述的公司審核和 2.3 所述的測厚操作演示結果均合格後，主管機關或由主管機關認可的組織應簽發認可證書，同時出具一份關於該公司的測厚操作體系已獲認證的通知。

3.2 對該證書的換新/簽註應不超過三年的間隔期進行一次，以驗證公司保持原認可條件。

4 對業已認證的測厚操作體系作任何變更的報告

如公司對業已認證的測厚操作體系作任何變更，則應立即向主管機關認可的組織提交變更報告。如經主管機關認可的組織認為必要，應進行重新審核。

5 證書撤消

如遇下列情況可撤消證書：

- .1 進行了不正確的測量，或測量報告有誤；
- .2 驗船師發現公司經認可的測厚操作體系中存在任何缺陷；和
- .3 公司未能按要求將上述 4 中所述的任何變更報告經主管機關認可的組織。

附件 6

檢驗報告原則

原則上，對應符合本規則要求的散貨船，驗船師應在其船體結構和管路系統的檢驗報告中包括下列內容。

1 總則

1.1 在下列情形裏，應形成檢驗報告：

- .1 涉及定期船體檢驗，即相關的年度、中間和換證檢驗的開始、繼續和/或完成；
- .2 已發現結構破損/缺陷時；
- .3 已進行修理、換新或改建時；和
- .4 已批註或消除船級條件（遺留項目）時。

1.2 報告應：

- .1 提供證據，表明已按適用的要求進行了規定的檢驗；
- .2 提供文件，表明檢驗中發現的情況、進行的修理以及批註或消除的船級條件（遺留項目）；
- .3 提供檢驗記錄（包括採取的措施），作為可核查文件記錄的組成部分。檢驗報告應置於按要求存放在船上的檢驗報告案卷中；
- .4 提供為以後的檢驗做計劃的信息；和
- .5 提供可用於維護入級規範和須知的素材信息。

1.3 當檢驗在不同的檢驗站分別進行時，應為每一部分檢驗出具報告。其後的現場驗船師在繼續或完成檢驗之前，應可獲得已檢驗項目的清單、相關檢驗結果以及項目是否已做記錄的說明。還應列出已進行的測厚和液艙試驗，供下一位驗船師使用。

2 檢驗範圍

2.1 確定已進行全面檢驗的艙室。

2.2 確定已在每個壓載艙和貨艙內（包括艙蓋和圍板）進行近觀檢驗的位置，以及所使用的通道裝置的資料。

2.3 確定已在每個壓載艙和貨艙內（包括艙蓋和圍板）進行測厚的位置。

註： 確定進行近觀檢驗和測厚的位置應至少包括一份根據定期檢驗的類型和船齡對附件 A 規定的要求範圍的各結構件進行描述的確證書。

如只需進行部分檢驗，即一個橫向強框架、兩個選擇的貨艙橫艙壁時，應使用肋骨號確定每個壓載艙和貨艙內的位置。

2.4 對壓載艙和貨艙內保護塗層處於良好狀況而且已對近觀檢驗和/或測厚範圍作特殊考慮的區域，應確定經特殊考慮的結構。

2.5 確定應經受液艙試驗的液艙。

2.6 確定甲板上以及貨艙、壓載艙、管隧、隔離艙和空艙內的如下管路系統：

.1 已進行的包括管系及其閥和附件的內部檢驗和測厚在內的相關檢查；和

.2 已進行的工作壓力的操作試驗。

3 檢驗結果

3.1 每個液艙內保護塗層的有關類型、範圍和狀況（“良好”、“尚好”或“差”）。

3.2 每個艙室的結構狀況以及以下相關資料：

.1 確定發現的問題，例如：

.1 腐蝕及對位置、類型和範圍的描述；

.2 顯著腐蝕的區域；

.3 裂紋/裂口及對位置和範圍的描述；

.4 屈曲及對位置和範圍的描述；和

.5 凹痕及對位置和範圍的描述；

.2 確定為發現結構破損/缺陷的艙室。報告可附草圖/照片加以補充；和

.3 測厚報告應由在船上監督測量工作的驗船師核實並簽字。

4 對發現的問題所採取的行動

4.1 每當現場驗船師認為需要進行修理時，應在編號的清單中標出應予修理的每一項目。每當進行修理時，應報告實施的修理的細節，具體提及編號的清單中的相關項目。

4.2 應報告已進行的修理並標明：

- .1 艙室；
- .2 結構構件；
- .3 修理方法（即：換新或改動），包括：
 - .1 鋼級和尺度（如與原始材料的區別）；
 - .2 草圖/照片，如適用；
- .4 修理範圍；和
- .5 無損檢測（NDT）/試驗。

4.3 對在檢驗時未完成的修理，船級條件/遺留項目中應規定該修理的具體完成期限。為向參與修理檢驗的驗船師提供正確和適當的資料，船級條件/遺留項目應足夠詳細，並標明應進行修理的每一項目。對大範圍修理的確定，可參考檢驗報告。

附件 7

狀況評估報告

在換證檢驗完成後簽發

船舶概況

船名：船級/主管機關標識號：
前船級/主管機關標識號：
IMO 編號：
船籍港：船旗國：
前船旗國：
載重量：總噸位：
(公噸) 本國法定：
國際噸位丈量公約 (1969)：
建造日期：船級符號：
重大改建日期：
改建類型：船東：
前船東：

- 1 下列檢驗報告和文件已經簽署者審核，並查明合格。
- 2 檢驗狀況評估附於表 2。
- 3 換證檢驗已按本規則在..... (日期) 完成。

狀況評估報告填寫人	姓名 簽字	職務
辦事處	日期	
狀況評估報告填寫人	姓名 簽字	職務
辦事處	日期	

所附的報告和文件：

- 1)
- 2)
- 3)
- 4)
- 5)
- 6)

狀況評估報告目錄

- | | |
|----------------------|----------------------|
| 第 1 部分 - 船舶概況： | - 見首頁 |
| 第 2 部分 - 報告審核： | - 檢驗地點和方法 |
| 第 3 部分 - 近觀檢驗： | - 範圍（液艙/貨艙） |
| 第 4 部分 - 測厚： | - 參見測厚報告 |
| | - 測量點一覽表 |
| | - 單獨表格指明顯著腐蝕的處所及相應的： |
| | - 厚度減小 |
| | - 腐蝕形式 |
| 第 5 部分 - 液艙防腐系統： | - 單獨表格指明： |
| | - 塗層位置 |
| | - 塗層狀況（如適用） |
| 第 6 部分 - 修理： | - 處所/區域標識 |
| 第 7 部分 - 船級條件/船旗國要求： | |
| 第 8 部分 - 備忘錄： | - 可接受的缺陷 |
| | - 未來檢驗時的關注點，如可疑區域 |
| | - 因塗層脫落而擴大的年度/中間檢驗 |
| 第 9 部分 - 結論： | - 檢驗報告的評估/驗證說明 |

測厚摘錄

參見測厚報告：

顯著腐蝕液艙/區域 ¹ 位置或深度鏽點位置 ³	厚度減小(%)	腐蝕形式 ²	備註：(如參考所附草圖)

註：

- 1 顯著腐蝕，即允許損耗範圍的 75% - 100%。
- 2 P = 鏽點
C = 總體腐蝕
- 3 應註明所有鏽點密度達 20%或以上、損耗為顯著腐蝕範圍或鏽點的平均深度為實際板厚度的 1/3 或以上的船底板。

液艙/貨艙防腐系統

液艙/貨艙號 ¹	液艙/貨艙防腐系統 ²	塗層狀況 ³	備註

註：

- 1 應列出所有壓載艙和貨艙。
- 2 C = 塗層 NP = 無保護
- 3 塗層狀況根據以下標準：

“良好”係指僅有少量點狀鏽斑。

“尚好”係指在扶強材的邊緣和焊縫的連接處塗層有局部脫落和/或所檢驗的區域中有超過 20%或更大範圍的輕度鏽蝕，但小於定義“差”的狀況。

“差”係指在檢驗的區域中有超過 20%或更大範圍的塗層普遍剝落，或有 10%或更大範圍的塗層產生硬質鏽皮。

如塗層狀況為“差”，應擴大年度檢驗的範圍，這應在狀況評估報告第 8 部分中予以註明。

附件 8

建議的測厚程序

- 1 本程序應用於記錄附件 A 的 B 部分要求的厚度測量。
- 2 應酌情使用測厚單格式 TM1-DSBC、TM2-DSBC(i)、TM2-DSBC(ii)、TM3-DSBC、TM4-DSBC、TM5-DSBC 和 TM6-DSBC（附錄 2）記錄厚度測量。應說明最大允許減小量。可在附加的文件中說明最大允許減小量。
- 3 附錄 3 是有關報告格式和厚度測量程序的圖解和說明。

附錄 1

測厚報告船舶概況

船名：

IMO 編號：

船級/主管機關標識號：

船籍港：

總噸位：

載重噸：

建造日期：

船級社：

進行測厚的公司名稱：

.....

測厚公司的認證機構：

證書號：

證書有效期自.....至.....

測厚地點：

首次測量日期：

最後測量日期：

換證檢驗/中間檢驗日期：

測厚設備情況：

測量者資質：

報告編號： 頁數 頁

測量者姓名： 驗船師姓名：

測量者簽字： 驗船師簽字：

公司公章： 主管機關：

公章

附錄 2

所有甲板板、所有船底外板和舷側外板厚度測量報告* (TM1-DSBC)

船名： 船級標識號： 報告編號： IMO 編號：

列板位置	編號或符號	原始厚度 mm	舢前讀數				舢後讀數				平均減小量			
			測量		減小量 S		測量		減小量 P		減小量 S		%	
			P	S	mm	%	P	S	mm	%	mm	%	P	S
舢前第 12 塊														
第 11 塊														
第 10 塊														
第 9 塊														
第 8 塊														
第 7 塊														
第 6 塊														
第 5 塊														
第 4 塊														
第 3 塊														
第 2 塊														
第 1 塊														
舢後第 1 塊														
第 2 塊														
第 3 塊														
第 4 塊														
第 5 塊														
第 6 塊														
第 7 塊														
第 8 塊														
第 9 塊														
第 10 塊														
第 11 塊														
第 12 塊														

測量者簽字： 註 - 見下頁

• 不適用者劃去

TM1-DSBC 報告的註釋

- 1 本報告應用於記錄下列厚度測量：
 - .1 貨物長度區域內的所有強力甲板板；
 - .2 貨物長度區域內的所有龍骨板、船底外板和舳列板；
 - .3 貨物長度區域外的舷側外板，包括選擇的乾濕交變列板；和
 - .4 貨物長度區域內的所有乾濕交變列板。
- 2 應清楚示明如下列板位置：
 - .1 對於強力甲板，示明甲板邊板內列板的編號；
 - .2 對於船底板，示明龍骨板外列板的編號；和
 - .3 對於舷側外板，示明舷頂列板以下列板在外板展開圖上的編號和字母。
- 3 僅對開口線外的甲板板列板予以記錄。
- 4 應對舳前和舳後的所有區域的板進行測厚；如有板橫跨壓載艙/貨艙邊界，則應記錄在各類型液艙的板區域分別測得的值。
- 5 所記錄的單點測量應代表多點測量的平均值。
- 6 最大允許減小量可在附加的文件中說明。

TM2-DSBC (i) 報告的註釋

- 1 本報告應用於記錄以下的厚度測量：

 強力甲板板和舷頂列板橫剖面

 貨物長度區域內一個、兩個或三個剖面包括典型橫剖面圖表（附錄3）中的結構項目（1）、（2）和（3）。
- 2 僅對艙口開口線外的甲板板列板予以記錄。
- 3 頂部區域包括甲板板、甲板邊板和舷頂列板（包括圓形舷緣）。
- 4 應註明測量的確切肋骨號。
- 5 所記錄的單點測量應代表多點測量的平均值。
- 6 最大允許減小量可在附加的文件中說明。

橫剖面處舷側外板和甲板板厚度測量報告（一、兩或三個橫剖面）
（TM2-DSBC（ii））

船名：.....

船級標識號：.....

報告編號：.....

IMO 編號：.....

列板位置	第 號肋骨的第一個橫剖面						第 號肋骨的第二個橫剖面						第 號肋骨的第三個橫剖面									
	編號 或符 號	原始 厚度 mm	最大允 許減小 量 mm	測量		減小量 P	減小量 S	編號 或符 號	原始 厚度 mm	最大允 許減小 量 mm	測量		減小量 P	減小量 S	編號 或符 號	原始 厚度 mm	最大允 許減小 量 mm	測量		減小量 P	減小量 S	
				P	S						P	S						P	S			P
舷頂列板下 第1塊列板																						
第2塊																						
第3塊																						
第4塊																						
第5塊																						
第6塊																						
第7塊																						
第8塊																						
第9塊																						
第10塊																						
第11塊																						
第12塊																						
第13塊																						
第14塊																						
第15塊																						
第16塊																						
第17塊																						
第18塊																						
第19塊																						
第20塊																						
龍骨列板																						
船底總數																						

測量者簽字：.....

註 - 見下頁

TM2-DSBC (ii) 報告的註釋

- 1 本報告應用於記錄以下的厚度測量：

 舷側外板橫剖面

 貨物長度區域內一個、兩個或三個剖面包括典型橫剖面圖表附錄 3
 中的結構項目 (3)、(4)、(5) 和 (6)。
- 2 船底區域包括龍骨板、船底板和舳部板。
- 3 應註明測量的確切肋骨號。
- 4 所記錄的單點測量應代表多點測量的平均值。
- 5 最大允許減小量可在附加的文件中說明。

TM3-DSBC 報告的註釋

- 1 本報告應用於記錄以下的厚度測量：

橫剖面處縱向構件

貨物長度區域內兩個或三個剖面包括典型橫剖面圖表附錄 3 中的結構項目（10）至（25）。

- 2 應註明測量的確切肋骨號。
- 3 所記錄的單點測量應代表多點測量的平均值。
- 4 最大允許減小量可在附加的文件中說明。

TM4-DSBC 報告的註釋

1 本報告應用於記錄：

橫向構件的厚度測量，包括附錄 3 所列典型橫剖面圖上的相關結構項目（30）至（34）。

2 測量區域的指導參見附錄 3。

3 所記錄的單點測量應代表多點測量的平均值。

4 最大允許減小量可在附加的文件中說明。

TM5-DSBC 報告的註釋

- 1 本報告應用於記錄：

 貨艙內水密橫艙壁的厚度測量。
- 2 測量區域的指導參見附錄 3。
- 3 所記錄的單點測量應代表多點測量的平均值。
- 4 最大允許減小量可在附加的文件中說明。

TM6-DSBC 報告的註釋

1 本報告應用於記錄：

其他結構件的厚度測量，包括附錄 3 表明的典型橫剖面圖表中的相關結構裂痕（40）、（41）和（42）。

2 測量區域的指導參見附錄 3。

3 所記錄的單點測量應代表多點測量的平均值。

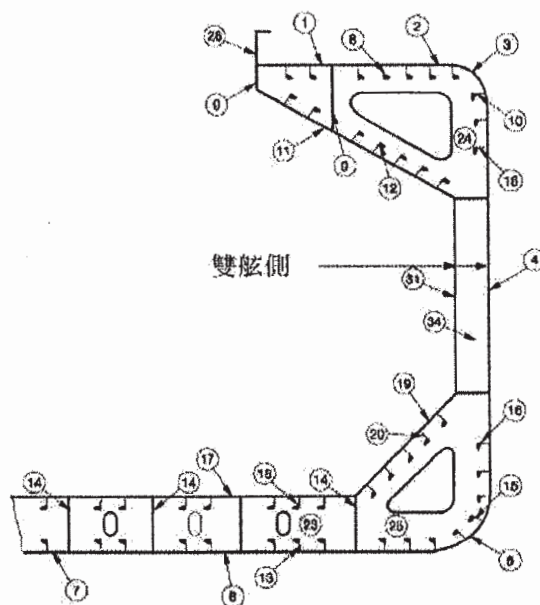
4 最大允許減小量可在附加的文件中說明。

附錄 3

厚度測量-雙舷側結構船舶

厚度測量-雙舷側散貨船

雙舷側散貨船表明縱向和橫向構件的典型橫剖面



TM2-DSBC (i) 和 (ii) 的報告
(1) 強力甲板板
(2) 甲板邊板
(3) 舷頂列板
(4) 舷側板
(5) 舳板
(6) 船底外板
(7) 龍骨板

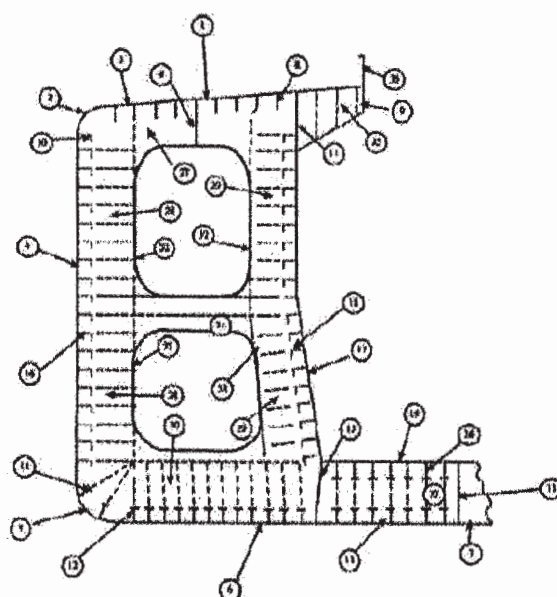
TM3-DSBC 的報告	
(8) 甲板縱骨	(16) 舷側縱骨 (如有)
(9) 甲板縱桁	(17) 內底板
(10) 舷頂列板縱骨	(18) 內底縱骨
(11) 頂邊艙斜板	(19) 底邊艙斜板
(12) 頂邊艙斜板縱骨	(20) 底邊艙斜板縱骨
(13) 船底縱骨	(31) 內側板
(14) 舳縱縱桁	- 內側縱骨 (如有)
(15) 舳縱骨	- 邊壓載艙水平桁

TM4-DSBC 測量報告
(23) 雙層底艙肋板
(25) 底邊艙橫材
(34) 橫向強肋骨
- 頂邊艙橫材

TM6-DSBC 測量報告
(28) 艙口圍板
- 艙口間甲板板
- 艙口蓋

厚度測量 - 礦砂船

礦砂船表明縱向和橫向構件的典型橫剖面



TM2-DSBC(i) 和(ii)的報告
(1) 強力甲板板
(2) 甲板邊板
(3) 舷頂列板
(4) 舷側板
(5) 艙板
(6) 船底外板
(7) 龍骨板

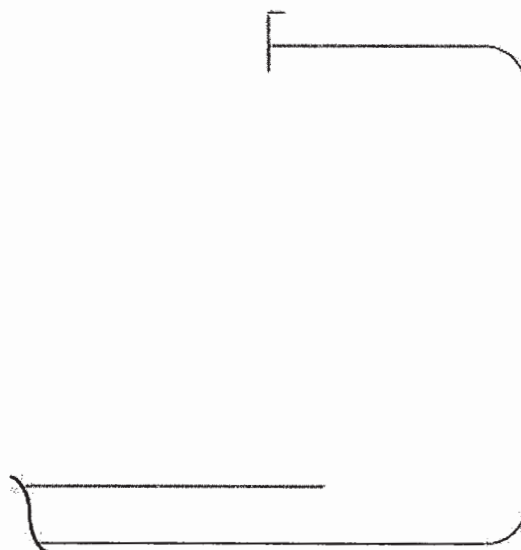
TM6-BC 測量報告
(36) 艙口圍板
(37) 艙口間甲板板
(38) 艙口蓋
(39)
(40)

TM3-DSBC 的報告
(8) 甲板縱骨
(9) 甲板縱桁
(10) 舷頂列板縱骨
(11) 縱向艙壁頂列板
(12) 船底縱骨
(13) 船底縱桁
(14) 艙縱骨
(15) 縱向艙壁底列板
(16) 舷側縱骨
(17) 縱向艙壁板 (剩餘部分)
(18) 縱向艙壁縱骨
(19) 內底板
(20) 內底縱骨
(21)
(22)
(23)
(24)

TM4-BC 測量報告
(25) 甲板橫材中央倉
(26) 肋板中央倉
(27) 甲板橫材邊艙
(28) 舷側垂直桁材
(29) 縱向艙壁垂直桁材
(30) 肋板邊艙
(31) 支撐
(32) 桁材面板
(33) 雙層底肋板
(34)
(35)

厚度測量 – 雙舷側散貨船

橫剖面概要：本表可用於典型橫剖面不適用的船舶。

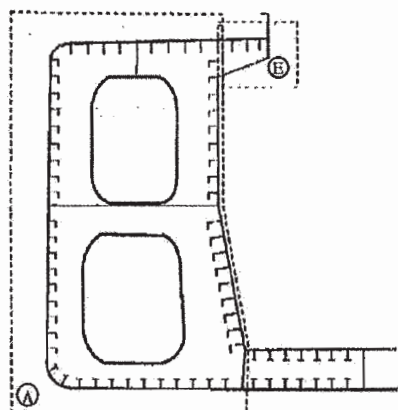


TM2-DSBC(i) 和(ii)報告	TM3-DSBC 報告	
(1) 強力甲板板 (2) 甲板邊板 (3) 舷頂列板 (4) 舷側板 (5) 舳板 (6) 船底外板 (7) 龍骨板	(8) 甲板縱骨 (9) 甲板縱桁 (10) 舷頂列板縱骨 (11) 縱向艙壁頂列板 (12) 船底縱骨 (13) 船底縱桁 (14) 舳縱骨 (15) 縱向艙壁底列板	(16) 舷側縱骨 (17) 縱向艙壁板 (剩餘部分) (18) 縱向艙壁縱骨 (19) 內底板 (20) 內底縱骨 (31) 內側板 - 內側縱骨 (如有) - 邊壓載艙水平桁
TM4-DSBC 測量報告	TM6-DSBC 測量報告	
(23) 雙層底艙肋板 (25) 邊艙橫材 (34) 橫向強肋骨 - 頂邊艙橫材	(28) 艙口圍板 - 艙口間甲板板 - 艙口蓋	

厚度測量 - 礦砂船

應進行近觀檢驗和厚度測量的區域-B 部分附件 1 界定的區域 (A)、(C)、(D) 和 (E) - 應酌情在 TM3-DSBC、TM4-DSBC、TM5-DSBC 和 TM6-DSBC 中報告的厚度

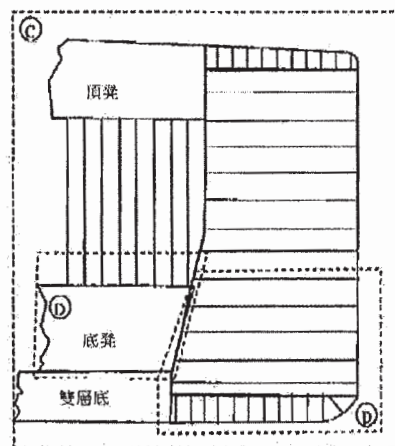
典型橫剖面近觀檢驗



應酌情在 TM3-DSBC 和 TM4-DSBC 中報告的厚度

近觀檢驗區域

典型橫艙壁



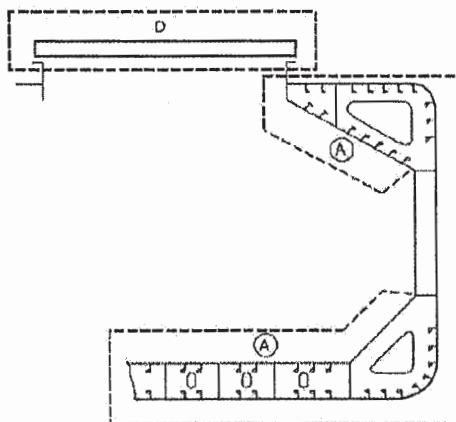
應在 TM5-DSBC 中報告的厚度

厚度測量-雙舷側散貨船

應進行近觀檢驗和厚度測量的區域-B 部分附件 1 界定的區域 (A) 至 (E) - 應酌情在 TM3-DSBC、TM4-DSBC、TM5-DSBC 和 TM6-DSBC 中報告的厚度。

典型橫剖面

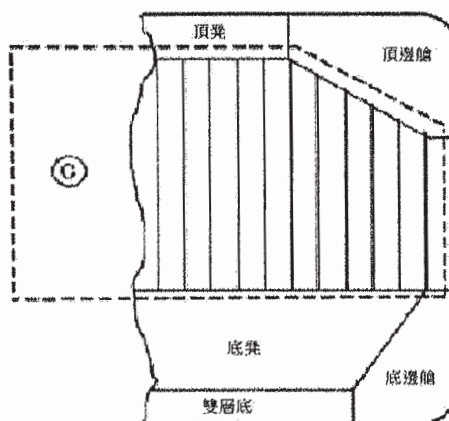
區域(A)和(D)



應酌情在 TM3-DSBC、TM4-DSBC 和 TM6-DSBC 中報告的厚度

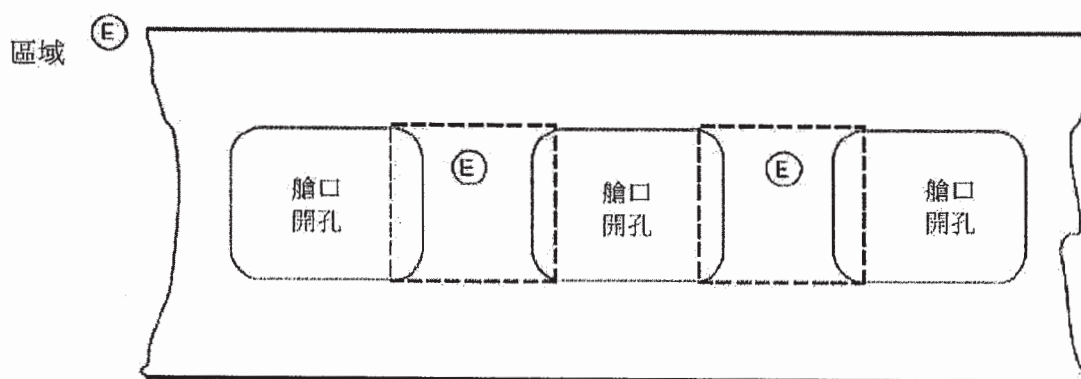
貨艙，橫艙壁

區域(C)



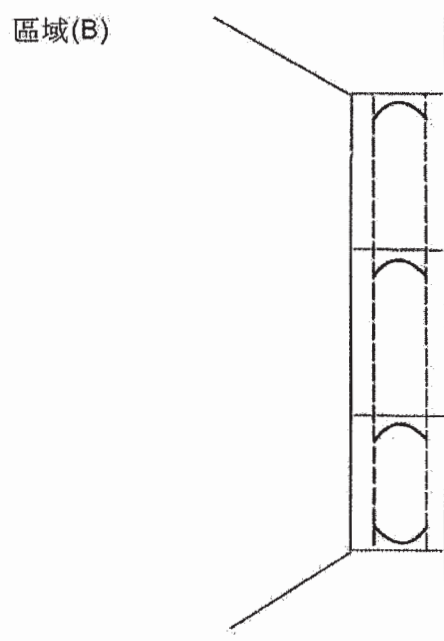
應在 TM5-DSBC 中報告的厚度

貨艙口之間貨艙開口連線以內甲板和甲板下結構典型區域



應在 TM1-DSBC 中報告的厚度

雙舷側艙室的普通橫向肋骨



應在 TM4-DSBC 中報告的厚度

附件 9

結合雙舷側散貨船加強檢驗計劃的 技術評估的導則 – 船體換證檢驗

1 引言

本導則包含與技術評估有關的資料和建議，可結合雙舷側散貨船加強換證檢驗的計劃加以使用。如 5.1.5 所述，本導則是一套建議的方法，在認為必要和適當時，可由主管機關決定，結合制定所要求的檢驗計劃予以施用。

2 目的和原則

2.1 目的

2.1.1 本導則所述的技術評估的宗旨是幫助確定臨界結構區域、指定可疑區域，並把注意力放在那些極易發生損耗或損壞、或表明有損耗或損壞史的結構件或結構件區域。該資料可用於指定要進行測厚、近觀檢驗和液艙試驗的位置、區域、貨艙和液艙。

2.1.2 臨界結構區域係指已從計算中確定需進行檢測的區域或已從該船或類似船舶或姐妹船（如有）的營運史中確定易於出現損壞船舶結構完整性的裂紋、屈曲或腐蝕的區域。

2.2 最低要求

但是，本導則不可用於降低 B 部分附件 1 和 2 以及 2.7 中分別對測厚、近觀檢驗和液艙試驗的要求，這些要求在任何情況下都應作為最低要求予以遵守。

2.3 時限

如同檢驗計劃的其他方面一樣，本導則所述的技術評估應由船東或經營人配合主管機關，在換證檢驗開始之前完成，即在開始檢驗之前且通常在到期檢驗完成日期前至少 12 至 15 個月。

2.4 應予考慮的方面

2.4.1 特定船舶下列方面的技術評估可作為指定檢驗貨艙、液艙和區域的基礎，這些技術評估可包括對相關可能蝕耗的風險進行定量或定性評估：

- .1 設計特徵，如不同結構組件的應力等級、設計細節和高強度鋼的使用範圍；
- .2 與特定船舶及類似船舶（如有）的腐蝕、裂紋、屈曲、凹陷和修理有關的過去史；和
- .3 與所載貨物類型、貨油/壓載的不同貨艙/液艙的使用、貨艙和液艙保護和塗層（如有）狀況有關的資料。

2.4.2 對各種結構件和區域易損壞或易蝕耗的相關風險的技術評估，應根據諸如參考資料 2、3 和 4 所列的經認可原則和慣例進行評判和確定。

3 技術評估

3.1 一般要求

3.1.1 有三種基本形式的可能缺陷，它們可能成為與檢驗計劃有關的技術評估對象，即腐蝕、裂紋和屈曲。碰撞損壞通常不包含在檢驗計劃中，因為凹陷通常在備忘錄中註明且由驗船師作為常規情況進行

處理。

3.1.2 結合檢驗計劃過程開展的技術評估，原則上應按圖 1 的圖解形式表示。

該方法的依據是對基本上與下列有關的知識和經驗的一種風險評估：

.1 設計；和

.2 腐蝕。

3.1.3 應考慮設計中容易因振動、高應力或疲勞造成屈曲或裂紋的有關結構細節。

3.1.4 腐蝕與老化過程有關，並且與新船防腐系統的質量和營運中的後續維護密不可分。腐蝕也可導致裂紋和/或屈曲。

3.2 方法

3.2.1 設計細節

3.2.1.1 本船及姐妹船和/或類似船舶（如有）的損壞經歷，是計劃過程中使用的主要資料來源。此外，還應包括從設計圖紙中選擇的結構細節。

3.2.1.2 應考慮的典型損壞經歷由以下兩方面構成：

.1 裂紋的數量、範圍、位置和發生次數；和

.2 屈曲位置。

3.2.1.3 該資料可在檢驗報告和/或船東檔案中包括船東自查結果中找到。這些缺陷應予以分析、註明並標記在草圖上。

3.2.1.4 此外，還應利用常規經驗。例如，應參照參考資料 2，其中包括單舷側散貨船結構細節的典型損壞和提出的修理方法目錄。還應參照參考資料 3，其中包括雙殼油船結構細節的典型損壞和提出的修理方法目錄，在一定程度上與雙舷側散貨船的結構細節相似。這些圖表應與主要圖紙的查閱一併使用，以比較實際結構並查找有可能易受損壞的類似細節。特別是，參考資料 3 的第 3 章涉及針對雙殼油船的各個方面，如應力集中部位、建造時未對中、腐蝕趨勢、疲勞因素和需特別注意的區域，而參考資料 3 的第 4 章涉及從雙殼（化學品船、OBO 船、礦砂/油船、氣體運輸船）結構缺陷獲得的經驗，這些都應在制定檢驗計劃時予以考慮。

3.2.1.5 除使用上述圖表外，審核主要結構圖紙還應包括核查已出現過裂紋的典型設計細節。造成損壞的因素應予以仔細考慮。

3.2.1.6 高強度鋼（HTS）的使用是一個重要因素。在使用普通低碳鋼時有着良好營運史的構件，在使用高強度鋼及其較高相關應力時，可能更易受損。甲板和船底結構的縱向材料使用高強度鋼的經驗普遍和總體上較好。在其他受到較高動應力的部位，如舷側結構，使用高強度鋼的經驗則不那麼令人鼓舞。

3.2.1.7 在這一方面，根據相關方法對典型和重要的組件及構件的應力計算可能證明有用，並應予以考慮。

3.2.1.8 所選擇的在該過程中確定的結構區域應予以記錄，並標記在將要納入檢驗計劃的結構圖上。

3.2.2 腐蝕

3.2.2.1 為評估相關的腐蝕風險，通常應考慮以下資料：

- .1 液艙、貨艙和處所的使用狀況；
- .2 塗層狀況；
- .3 掃艙程序；
- .4 以前腐蝕損壞；
- .5 貨艙用作壓載艙的時間；
- .6 貨艙和壓載艙的腐蝕風險；和
- .7 鄰近加熱燃油艙的壓載艙位置。

3.2.2.2 參考資料 4 以典型狀況圖給出明確實例，其可用於判定和描述塗層狀況。

3.2.2.3 腐蝕風險的評估應基於參考資料 2 和 4 中一切適用於雙舷側結構的信息，同時基於為制定檢驗計劃而收集的資料得出的船舶狀況和船齡的相關資料。應列出各種貨艙、液艙和處所相應指明的腐蝕風險。

3.2.3 近觀檢驗和測厚的位置

3.2.3.1 根據腐蝕風險表和設計經驗的評估，可指定初次近觀檢驗和測厚（區域和剖面）的位置。

3.2.3.2 通常應指定已判定具備最大腐蝕風險的貨艙、液艙和處所內的測厚剖面。

3.2.3.3 最初應根據最大腐蝕風險指定進行近觀檢驗的液艙、貨艙和處所，並應始終包括壓載艙。選擇的原則應隨船齡的增長或在資料缺乏或不可靠時而增大範圍。

參考資料：

- 1 國際船級社協會（IACS），“統一要求 Z10.5，雙舷側散貨船船體檢驗”。
- 2 國際船級社協會（IACS），“散貨船：船體結構檢驗、評估和修理導則，2007 年 1 月”。
- 3 油船結構合作論壇（TSCF），“雙殼油船結構檢查和維護導則，1995”。
- 4 油船結構合作論壇（TSCF），“油船結構指導手冊，1997”。

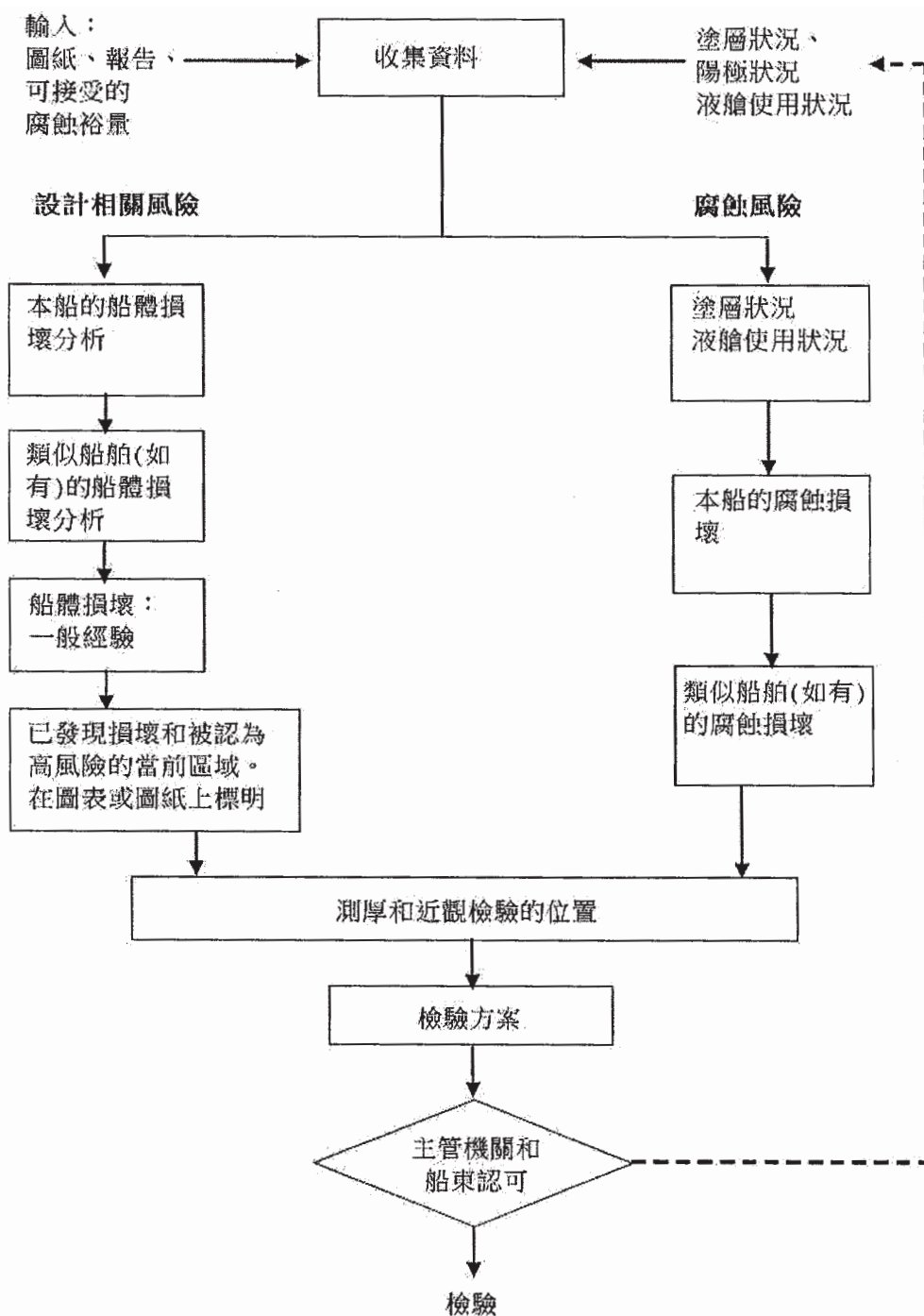


圖1 – 技術評估和檢驗計劃過程

附件 10

雙舷側結構散貨船貨物長度區域內顯著腐蝕區域的測厚範圍要求

表 1 - 船底、內底和底邊艙結構

結構件	測量範圍	測量形式
船底板、內底板和底邊艙斜板	雙層底艙全艙寬，至少三個強肋骨間距，包括後艙壁至強肋板間距 測量所有吸口的周圍和下面	在縱骨和肋板之間的每個板格上作五點形測量
船底板、內底板和底邊艙斜板縱骨	在測量底板的每個強肋骨間距內，至少三根縱骨	在縱骨折板同一橫截線上測量三點，在縱骨腹板垂直方向上測量三點
船底縱桁，包括水密縱桁	在前、後水密肋板處和各艙中心處	桁材板同一垂線上單個測量，在每一個板格扶強材之間測一點；或每一處至少測三點
船底肋板，包括水密肋板	在測量底板的強肋骨間距內，三塊肋板，在肋板兩端和中部測量	在 2m ² 的面積上作五點形測量
底邊艙的橫向環狀強框架	在測量底板的強肋骨間距內，三塊肋板	在 1m ² 的板上作五點形測量 折板上單個測量
底邊艙水密橫艙壁或制蕩艙壁	- 艙壁下部 1/3	1m ² 的板上作五點形測量
	- 艙壁上部 2/3	2m ² 的板上作五點形測量
	- 扶強材（至少三根）	腹板，跨距內作五點形測量（在每端橫截線上測兩點，跨距中點測一點）。對折板，在每端和跨距中點單個測量
板格扶強材	如適用	單個測量

表 2 - 甲板結構，包括橫向甲板條、主貨艙口、艙口蓋、艙口圍板和頂邊艙

結構件	測量範圍	測量形式
橫向甲板條	可疑的橫向甲板條	在 1m 長的甲板下扶強材之間作五點形測量
甲板下扶強材	橫向構件 縱向構件	在跨距兩端和中點作五點形測量 在腹板和折板上各作五點形測量
艙口蓋	每側板和每端板（即裙板）上各三個位置 縱向三條帶：向舷外兩列，中心線處一列	每個位置作五點形測量 每條帶測量五個點
艙口圍板	圍板的每邊和每端：下部 1/3 處一條帶，上部 2/3 處一條帶	每條帶（即邊圍板或端圍板）測量五個點

結構件	測量範圍	測量形式
頂邊壓載水艙	a) 水密橫艙壁： - 艙壁下部 1/3 - 艙壁上部 2/3 - 扶強材	在 1m ² 板面上作五點形測量 在 1m ² 板面上作五點形測量 在 1m 長度上作五點形測量
頂邊壓載水艙	b) 兩個代表性制蕩橫艙壁： - 艙壁下部 1/3 - 艙壁上部 2/3 - 扶強材	在 1m ² 板面上作五點形測量 在 1m ² 板面上作五點形測量 在 1m 長度上作五點形測量
頂邊壓載水艙	c) 三處代表性的強肋骨間距內的斜板： - 艙下部 1/3 - 艙上部 2/3	在 1m ² 板面上作五點形測量 在 1m ² 板面上作五點形測量
頂邊壓載水艙	d) 可疑的縱骨和鄰接縱骨	在 1m 長的腹板和折板上各作五點形測量
主甲板板	可疑的板和鄰接的四塊板	在 1m ² 板面上作五點形測量
主甲板縱骨	可疑的板	在 1m 長的腹板和折板上各作五點形測量
強肋骨/橫向構件	可疑的板	在 1m ² 板面上作五點形測量

表 3 - 雙舷側散貨船的雙舷側處所（包括礦砂船空邊艙）結構

結構件	測量範圍	測量形式
舷側外板和內殼板： - 頂列板和水平桁材處列板 - 所有其他列板	- （沿艙長）至少三個強肋骨間距內每對肋骨/縱骨之間的板 - 在相同三個強肋骨間距內，每第三對縱骨之間的板	- 單個測量 - 單個測量
舷側外板和內殼板在下列位置上的肋骨/縱骨： - 頂列板 - 所有其他列板	- 在相同三個強肋骨間距內的每根肋骨/縱骨 - 在相同三個強肋骨間距內每第三根肋骨/縱骨	- 腹板同一橫截線上測三點，折板上測一點 - 腹板同一橫截線上測三點，折板上測一點
肋骨/縱骨： - 肘板	在相同三個強肋骨間距內艙的頂部、中部和底部至少三處	在肘板上作五點形測量
垂直桁材和橫艙壁： - 水平桁材處列板 - 其他列板	- 至少兩個垂直桁材和兩道橫艙壁 - 至少兩個垂直桁材和兩道橫艙壁	- 約 2m ² 面積上作五點形測量 - 每對垂直扶強材之間測兩點
水平桁材	至少三個強肋骨間距內每根桁材的板	每對縱桁扶強材之間測兩點
板格扶強材	如適用	單個測量

表 4 - 貨艙內橫艙壁

結構件	測量範圍	測量形式
底凳（如設有時）	- 與內底板的連接焊縫處 25mm 以內的橫帶 - 與底凳頂板的連接焊縫處 25mm 以內的橫帶	- 在 1m 長扶強材之間作五點形測量 - 在 1m 長扶強材之間作五點形測量
橫艙壁	- 在約半高處的橫帶 - 在鄰近上甲板或頂凳底板以下（對設有頂凳的船）的部分艙壁的橫帶	- 在 1m² 板面上作五點形測量 - 在 1m² 板面上作五點形測量

附件 11

散貨船貨艙蓋繫固裝置強度

1 繫固裝置

繫固裝置的強度應符合下列要求：

- .1 應通過在圍板和艙蓋結構上適當間隔的裝置（螺栓、楔或類似裝置）對艙蓋板格進行繫固。確定布置和間距時，應根據艙蓋的類型和尺寸以及繫固裝置間的艙蓋邊緣剛度，充分考慮到風雨密的有效性。

- .2 每一繫固裝置的淨橫剖面積不應小於：

$$A = 1.4a/f \text{ (cm}^2\text{)}$$

式中：

$$a = \text{繫固裝置間距，不得小於 2m}$$

$$f = (\sigma_Y/235)^e$$

$$\sigma_Y = \text{規定的用鋼最小上屈服應力，N/mm}^2\text{，不得大於臨界抗拉強度的 70\%}$$

$$e = 0.75, \text{ 對 } \sigma_Y > 235$$

$$= 1.0, \text{ 對 } \sigma_Y \leq 235$$

對於面積超過 5 m² 的艙口，頂桿或螺栓的淨直徑應不小於 19mm。

- .3 在艙蓋、圍板和十字接頭之間，應通過繫固裝置保持足

以達到風雨密性的密封條壓力。對壓力大於 5 N/mm 的密封條，橫剖面積應按直接比例增加。應規定密封條壓力。

- .4 蓋板邊緣的剛度應足以保持繫固裝置間足夠的密封壓力。邊緣構件的慣性力矩 I 不應小於：

$$I = 6 p a^4 \text{ (cm}^4\text{)}$$

式中：

p = 密封條壓力，N/mm，至少 5 N/mm

a = 繫固裝置間距，m

- .5 繫固裝置結構應可靠並緊密地與艙口圍板、甲板或艙蓋連接。每個蓋板上的單點繫固裝置應具有基本相同的剛度特性。
- .6 如安裝了桿子羊角，則應有彈性墊圈或減振器。
- .7 如採用液壓羊角，則應有良好的設備確保在液壓系統失效時羊角仍被機械固定在關閉位置。

2 制動器

2.1 應通過制動器對 1 號和 2 號艙口蓋進行有效繫固，以防止壓力為 175 kN/m² 時產生的橫向力。

2.2 應通過制動器對 2 號艙口蓋進行有效繫固，以防止壓力為 175 kN/m² 時對前端的縱向力。

2.3 應通過制動器對 1 號艙口蓋進行有效繫固，以防止壓力為 230

kN/m²時對前端的縱向力。如安裝了首樓，該壓力可降至 175 kN/m²。

2.4 在制動器及其支撐結構，以及在制動器焊喉處計算的等效應力不應超過許可值 $0.8\sigma_Y$ 。

3 材料和焊接

如安裝符合本附件的制動器或繫固裝置，其包括焊條在內的製造材料應使主管機關滿意。

附件 12

測厚的程序要求

1 總則

船體結構檢驗所要求的測厚，如果不是由船級社自身進行，則應被驗船師見證。驗船師登輪應被記錄。這同樣適用於航行中進行的測厚。

2 檢驗會議

2.1 在換證或中間檢驗開始前，應召開由現場驗船師、現場船東代表和測厚公司代表參加的會議，以確保檢驗和測厚能夠安全且有效地在船上實施。

2.2 在會議上，應就以下事項對與測厚操作人員及船東代表的交流溝通達成一致：

- .1 定期的測厚報告；和
- .2 如果發現如下問題，立即通知驗船師：
 - .1 過度的和/或大面積腐蝕或重要的點蝕/凹槽；和
 - .2 結構缺陷，如屈曲、斷裂和變形的結構；
 - .3 脫開的和/或洞穿的結構；和
 - .4 焊縫的腐蝕。

2.3 檢驗報告應寫明會議召開的時間、地點和參加人員（驗船師、船東代表和測厚公司代表的姓名）。

3 對船上測厚過程的監督

3.1 在全面檢驗船上代表性處所後，驗船師應決定測厚的最終範圍和位置。

3.2 如果船東希望在全面檢驗之前開始測厚，驗船師應建議：在全面檢驗過程中，計劃的測厚範圍和位置要受到確認。根據情況，驗船師可要求進行附加測厚。

3.3 驗船師應選擇所取證讀數可代表該區域的平均結構狀況的位置，以此指導測量操作。

3.4 主要用於評估會影響船體梁強度的腐蝕程度的測厚應以系統的方式進行，以使所有要求的縱向構件得到測量。

3.5 如果測厚表明顯著腐蝕或損耗超過允許的減小量，驗船師應指定進行附加測厚之處，以便描述顯著腐蝕區域的情況，並確認需維修/換新的構件。

3.6 需要進行近觀檢驗的區域的結構測厚，應與近觀檢驗同時進行。

4 審核和驗證

4.1 測厚完成後，驗船師應確認不需要進一步測量或指明需要附加的測量。

4.2 如果經驗船師特殊考慮後，本導則允許縮小測厚範圍，應相應地報告特殊考慮。

4.3 如果已進行部分測厚，應報告剩下的測厚範圍，以供下一位驗船師使用。

附件 B

油船檢驗期間加強檢驗計劃規則

A 部分

雙殼油船檢驗期間加強檢驗計劃規則

1 總則

1.1 適用範圍

1.1.1 本規則應適用於所有 500 總噸及以上的自航式雙殼油船。

1.1.2 本規則應適用於貨物區域內的貨油艙、泵艙、隔離艙、管隧和空艙以及所有壓載艙處的船體結構和管路系統的檢驗。

1.1.3 本規則包含檢查、測厚和液艙試驗的最小範圍。在發現顯著腐蝕和/或結構缺陷時，應擴大檢驗範圍，並包括必要時進行附加近觀檢驗。

1.1.4 應在公約第 I/10 條規定的檢驗期間進行檢驗。

1.2 定義

1.2.1 雙殼油船係指主要用於運輸散裝油類的船舶，其貨油艙受雙層船殼的保護，該雙層船殼覆蓋貨物區域的全長，包括用於裝載壓載水的雙側邊艙和雙層底處所或空艙。

1.2.2 壓載艙係指僅用於海水壓載的液艙。

1.2.3 貨油/壓載兼用艙，如在本規則提及，係指作為船舶運營的常

規部分，用於運載貨油或壓載水並被視作壓載艙的液艙。對於按照《防污公約》第 I/18.3 條規定僅在例外情況下可以裝載壓載水的貨油艙，應視作貨油艙。

1.2.4 全面檢驗係指用於報告船體結構整體狀況和確定附加近觀檢驗範圍的檢驗。

1.2.5 近觀檢驗係指驗船師在近距離目視範圍內（即通常伸手可及處）對結構件細節進行的檢驗。

1.2.6 橫剖面係指垂直於船舶中線的船體橫剖面，包括所有板材等縱向構件，以及在甲板、舷側外板、船底板、內底板和縱艙壁上的縱骨及縱桁。

1.2.7 代表性液艙係指能反映相似類型和用途並具有類似防腐蝕系統的其他液艙。在選擇代表性液艙時，應考慮到其營運和修理史，以及可識別的臨界結構區域和/或可疑區域。

1.2.8 可疑區域係指呈現顯著腐蝕和/或驗船師認為易於快速損耗的區域。

1.2.9 顯著腐蝕係指通過腐蝕狀況評估表明其腐蝕量超過許用裕量的 75%但尚處於可接受範圍內的腐蝕程度。對按國際船級社協會共同結構規範建造的船舶，顯著腐蝕係指通過腐蝕狀況評估表明其測量（或測厚）厚度介於 $t_{net} + 0.5\text{mm}$ 和 t_{net} 之間的腐蝕程度。

1.2.10 防腐系統通常可考慮全硬保護塗層。硬保護塗層通常係指環氧樹脂塗層或同等物。既非軟塗層亦非半硬塗層的其他塗層系統，如按生產廠的技術說明書應用和維護，可考慮作為替代品接受。

1.2.11 塗層狀況定義如下：

“良好”係指僅有少量點狀鏽斑；

“尚好”係指在扶強材的邊緣和焊縫的連接處塗層有局部脫落和/或所檢驗的區域中有超過 20%或更大範圍的輕度鏽蝕，但小於定義“差”的狀況；和

“差”係指在檢驗的區域中有超過 20%或更大範圍的塗層普遍剝落，或有 10%或更大範圍的塗層產生硬質鏽皮。

1.2.12 臨界結構區域係指從計算中或從該船舶或類似船舶或姐妹船的營運歷史中認定並需要進行檢驗的、容易發生影響船舶結構整體性的破裂、屈曲或腐蝕的區域。

1.2.13 貨物區域係指船上包含貨油艙、污油艙和貨油/壓載泵艙、相鄰貨油艙的隔離空艙、壓載艙和空艙處所的部分，以及前述處所上方的船舶這一部分的整個長度和寬度範圍內的甲板區域。

1.2.14 中間檢驗係指在第 2 或第 3 次年度檢驗進行的檢驗。

1.2.15 及時徹底修理係指在檢驗期間完成的並使驗船師滿意的永久性修理，旨在消除需要批註的任何相關船級條件或遺留項目。

1.2.16 特殊考慮（與近觀檢驗和測厚有關）係指進行了足夠的近觀檢查和測厚以確定塗層以下結構的實際平均狀況。

1.3 修理

1.3.1 任何與超過允許極限的結構蝕耗有關的損壞（包括屈曲、凹槽、脫開或斷裂）或大面積區域的蝕耗超過允許極限，若影響或主管

機關認為將影響船舶的結構、水密或風雨密完整性，均應進行及時徹底修理（參見 1.2.15）。應考慮的區域包括：

- .1 船底結構和船底板；
- .2 舷側結構和舷側板；
- .3 甲板結構和甲板板；
- .4 水密或油密艙壁；和
- .5 艙口蓋或艙口圍板，如設有。

在不能提供足夠修理設施的區域，主管機關可允許船舶直接駛往某一修理點。這可能要求船舶為該修理航次卸下貨物和/或進行臨時性修理。

1.3.2 此外，在檢驗發現腐蝕或結構缺陷時，只要主管機關認為其中之一將影響船舶繼續營運，船舶應在繼續營運前採取補救措施。

1.4 驗船師

對 20,000 載重噸及以上的液貨船，應由兩名驗船師聯合執行在其船齡超過 10 年後的第一次計劃的換證檢驗（即第三次換證檢驗），以及其後的所有換證和中間檢驗。如由被認可組織進行檢驗，則這些驗船師應為該被認可組織專職聘用的。

1.5 厚度測量與近觀檢驗

在任何檢驗中，即在換證檢驗、中間檢驗、年度檢驗或與這些檢驗範圍相同的其他檢驗中，對需要實施近觀檢驗的結構區域的測厚應與近觀檢驗同時進行。

2 換證檢驗

2.1 總則

2.1.1 換證檢驗可在第四次年度檢驗時開始，並可在其後一年中繼續進行，以在第五個周年日前完成。

2.1.2 檢驗計劃作為換證檢驗準備的一部分，應在換證檢驗前制定。厚度測量不應放在第四次年度檢驗之前進行。

2.1.3 除年度檢驗的要求外，檢驗還應包括足夠範圍的檢查、試驗和核查，以確保船體以及 2.1.5 所要求的相關管路處於合格狀況，並適合貨船構造安全證書新的有效期內其預定的用途，受到適當的維護和操作及到期接受各種定期檢驗。

2.1.4 所有貨油艙、壓載艙和雙殼處所內的任何其他液艙、泵艙、管隧、隔離艙和鄰接貨油艙的空艙、甲板和外殼板都應進行檢查，這種檢查應輔以 2.5 和 2.6 所要求的厚度測量和試驗，以確保該結構的完整性保持有效。該檢查的目的旨在發現可能存在的顯著腐蝕、嚴重變形、斷裂、破損或其他結構蝕耗。

2.1.5 甲板上的貨油管路，包括原油洗艙（COW）管路，以及上述液艙和處所內的貨油管路和壓載管路應予以檢查，並在現場驗船師認為滿意的工作壓力下進行操作試驗，以確保其密性和狀況保持合格狀態。應特別注意貨油艙內的壓載管路和壓載艙及空艙內的貨物管路情況，在修理期間當該管路（包括閥和附件）處於開啟狀態並可進行內部檢查時，應隨時通知驗船師。

2.2 乾塢檢驗

2.2.1 乾塢檢驗應作為換證檢驗的一部分。在構造安全證書的五年期內應對船底外部至少進行兩次檢查。在所有情況下，船底檢查的最大間隔期不應超過 36 個月。

2.2.2 對船齡為 15 年及以上的船舶，應在乾塢進行船底外部檢查。對船齡小於 15 年的船舶，其未與換證檢驗一起進行的船底外部檢查，作為替代，可在船舶漂浮狀態下進行檢查。船舶在漂浮狀態下的檢查只有在船況令人滿意並具有合適的設備和合格人員時才能進行。

2.2.3 如乾塢檢驗未與換證檢驗一起完成，或如 2.2.1 中所述的 36 個月的最大間隔期未予滿足，則貨船構造安全證書應停止有效，直至乾塢檢驗完成。

2.2.4 如對貨油艙和壓載艙下部的全面檢驗、近觀檢驗和厚度測量（如適用）尚未實施，則應按換證檢驗的適用要求進行。

註：貨油艙和壓載艙下部係指輕壓載水線以下的部分。

2.3 液艙防腐系統

如設有貨油艙防腐系統，應檢查其狀況。如存在下列情況之一，應在隨後每年檢查壓載艙：

- .1 從建造之時就未敷設硬保護塗層；或
- .2 已敷設軟塗層或半硬塗層；或
- .3 在艙內發現顯著腐蝕，或；
- .4 發現硬保護塗層未達到“良好”狀況，且該塗層未進行令驗船師滿意的修補。

如驗船師認為必要，應進行測厚。

2.4 全面和近觀檢驗範圍

2.4.1 在換證檢驗時應對所有液艙和處所進行一次全面檢驗。應檢查以前檢驗中確定的可疑區域。

2.4.2 在換證檢驗時近觀檢驗的最低要求見附件 1。

2.4.3 驗船師在考慮到檢驗時液艙的維護、防腐系統的狀況以及下列情況的同時，可根據需要擴大近觀檢驗的範圍：

- .1 尤其是根據可獲得的資料其結構布置或構件曾在類似液艙中或類似船舶上出現過缺陷的液艙；和
- .2 具有與主管機關認可的防腐系統相關的尺度減小結構的液艙。

2.4.4 對於查明硬保護塗層處於 1.2.11 界定的“良好”狀況的液艙內區域，主管機關可對按附件 1 要求的近觀檢驗範圍予以特殊考慮。

2.5 厚度測量範圍

2.5.1 在換證檢驗時厚度測量的最低要求見附件 2。

2.5.2 顯著腐蝕的區域擴大的厚度測量按附件 4 的規定進行，並可在 5.1 要求的檢驗計劃中作出附加規定。該擴大的測厚應在檢驗完成之前進行。以前檢驗中確定的可疑區域應進行測厚。

2.5.3 驗船師可根據需要進一步擴大厚度測量的範圍。

2.5.4 對於查明硬保護塗層處於 1.2.11 所界定的“良好”狀況的液艙內區域，按附件 2 要求的厚度測量範圍可由主管機關予以特殊考

慮。

2.5.5 測厚的橫剖面應選擇在懷疑發生最大縮減或經甲板板測厚揭示的最大縮減處。

2.5.6 如需要測量兩個或三個橫剖面，則至少應有一個橫剖面位於船中 0.5L 範圍內的壓載艙。對於船長 130m 及以上（船長定義參見現行《國際載重線公約》）且船齡在 10 年以上的油船，如需要按 8.2 要求進行總縱強度的評估，測厚的取樣方式見附件 12 的規定。

2.6 液艙壓力試驗範圍

2.6.1 在換證檢驗時液艙壓力試驗的最低要求見附件 3。

2.6.2 驗船師可根據需要擴大液艙壓力試驗的範圍。

2.6.3 對壓載艙邊界進行試驗的液體壓頭應至空氣管頂部。

2.6.4 對貨油艙邊界進行的試驗應至其各種服務狀態下液體可能上升的最高點。

2.6.5 如對雙層底艙和其他非設計用於裝載液體的處所的內部檢查和內底板檢查認為滿意，則可不進行試驗。

3 年度檢驗

3.1 總則

年度檢驗應由旨在盡實際可行地確保船體和管路處於合格狀態的檢查所構成，還應考慮到營運記錄、壓載艙防腐系統狀況和範圍以及檢驗報告案卷中確定的區域。

3.2 船體檢查

3.2.1 船殼板及其關閉裝置，但凡可見，均應予以檢查。

3.2.2 對水密貫穿件應盡實際可行地進行檢查。

3.3 露天甲板檢查

3.3.1 檢查貨油艙開口，包括墊圈、艙蓋板、艙口圍板和防火網。

3.3.2 檢查貨油艙壓力/真空閥和防火網。

3.3.3 檢查所有燃料艙透氣管上的防火網。

3.3.4 檢查貨油、原油洗艙、燃料艙和透氣管系，包括透氣桅和集管。

3.4 貨泵艙和管隧（如有）檢查

3.4.1 檢查所有泵艙艙壁是否有漏油或裂紋的痕跡，特別是泵艙艙壁的所有貫穿件密封布置。

3.4.2 檢查所有管系和管隧的狀況。

3.5 壓載艙檢查

3.5.1 如由於換證檢驗和中間檢驗的結果而有要求，應對壓載艙進行檢查。在主管機關認為必要或發現大量腐蝕時，應進行測厚。

3.5.2 如發現 1.2.9 界定的顯著腐蝕，則應按附件 4 的要求增加測厚範圍。該擴大的測厚應在檢驗完成之前進行。應檢查以前檢驗中確定的可疑區域。以前檢驗中確定的顯著腐蝕區域應進行測厚。

4 中間檢驗

4.1 總則

4.1.1 對年度檢驗要求以外的附加項目，可在第二次或第三次年度檢驗時或其之間進行檢驗。

4.1.2 貨油艙和壓載艙的檢驗範圍取決於船齡，見 4.2、4.3 和 4.4 的規定。

4.1.3 應儘可能檢查露天甲板上的貨油管系、原油洗艙管系、燃油管系、壓載管系、蒸汽管系和透氣管系統以及透氣桅和集管。如檢查後對管系狀況有懷疑，可要求對該管系進行壓力試驗或（和）測厚。

4.1.4 中間檢驗和換證檢驗所要求的處所的檢驗和測厚不應相互替代。

4.2 船齡 5 至 10 年的油船

4.2.1 4.1.3 的要求適用。

4.2.2 對用於海水壓載的液艙，驗船師應選擇代表性液艙進行全面檢驗。如果該檢驗表明無可見的結構缺陷，則檢查可限於確認保護塗層處於“良好”狀況。

4.2.3 如存在下列情況之一，應在隨後的每年檢查壓載艙：

- .1 從建造之時就未敷設硬保護塗層；或
- .2 已敷設軟塗層或半硬塗層；或
- .3 在艙內發現顯著腐蝕；或
- .4 發現硬保護塗層未達到“良好”狀況，且該塗層未進行令驗船師滿意的修補。

4.3 船齡 10 至 15 年的油船

4.3.1 中間檢驗的要求應與 2 和 5.1 要求的上次換證檢驗的範圍相同。但是，除非主管機關認為必要，可不要求進行貨油艙和壓載艙的壓力試驗和 8.1.2 規定的油船船體樑總縱強度評估。

4.3.2 在應用 4.3.1 時，中間檢驗可在第二次年度檢驗時開始，並可在其後一年中繼續進行，以在第三次年度檢驗時完成，替代應用 2.1.1。

4.3.3 在應用 4.3.1 時，水下檢驗可予以考慮，以替代 2.2 的要求。

4.4 船齡超過 15 年的油船

4.4.1 中間檢驗的要求應與 2 和 5.1 要求的上次換證檢驗的範圍相同。但是，除非主管機關認為必要，可不要求進行貨油艙和壓載艙的壓力試驗和 8.1.2 規定的油船船體樑總縱強度評估。

4.4.2 在應用 4.4.1 時，中間檢驗可在第二次年度檢驗時開始，並可在其後一年中繼續進行，以在第三次年度檢驗時完成，替代應用 2.1.1。

4.4.3 在應用 4.4.1 時，乾塢檢驗應作為中間檢驗的一部分。如對貨油艙和水壓載艙下部的全面檢驗、近觀檢驗和測厚（如適用）尚未實施，則應按中間檢驗的適用要求進行。

註：貨油艙和壓載艙下部係指輕壓載水線以下的部分。

5 檢驗前準備

5.1 檢驗計劃

5.1.1 船東應與主管機關或經主管機關認可的組織合作，在以下檢驗的任何部分開始前制定具體的檢驗計劃：

- .1 換證檢驗；和
- .2 船齡 10 年以上的油船的中間檢驗。

中間檢驗的檢驗計劃可由經上次換證檢驗所作狀況評估報告補充的檢驗計劃以及隨後的相關檢驗報告組成。制定檢驗計劃應考慮自上一次換證檢驗後對檢驗要求的任何修改通報。檢驗計劃應根據附件 6A 中的資料以書面形式制定。只有在制定檢驗計劃後才能開始進行檢驗。

5.1.1.1 在制定檢驗計劃前，船東應根據附件 6B 中的資料填寫檢驗計劃調查表，並送交主管機關。

5.1.2 在制定檢驗計劃時，應搜集和查閱下列文件用以選擇要進行檢查的液艙、區域和結構件：

- .1 檢驗現狀和基本的船舶資料；
- .2 6.2 和 6.3 中所述的船上文件；
- .3 貨油艙和壓載艙主結構圖（尺寸圖），包括有關使用高強度鋼（HTS）的資料；
- .4 按附件 9 要求的狀況評估報告；
- .5 以前相關的破損和修理記錄；
- .6 來自被認可組織和船東兩方面的以前的相關檢驗和檢查報告；
- .7 過去三年的貨物和壓載記錄，包括加熱狀態下的貨物運輸；

- .8 惰性氣體裝置和液艙清潔程序詳細資料；
- .9 自船舶建造以來對貨油艙和壓載艙進行改建或改裝的資料和其他相關數據；
- .10 塗層和防腐系統（如有）的說明和記錄，包括陽極和以前的人級說明；
- .11 過去三年中船東人員對結構總體損耗、液艙邊界和管路滲漏以及塗層防腐系統（如有）的狀況進行的檢查，包括陽極。見附件 5 中的報告指南；
- .12 營運期間有關的維護保養等級的資料，包括涉及船體缺陷的港口國監督檢查報告、與船體維護有關的安全管理系統不合格項（包括相關的糾正措施）；和
- .13 任何有助於確定可疑和臨界結構區域的其他信息。

5.1.3 提交的檢驗計劃應說明並至少符合 2.6 及附件 1、附件 2 和附件 3 分別對近觀檢驗、厚度測量和液艙試驗的要求，並應至少包括下列相關資料：

- .1 基本的船舶資料和概況；
- .2 貨油艙和壓載艙主結構圖（尺寸圖），包括有關使用高強度鋼（HTS）的資料；
- .3 液艙圖；
- .4 附有塗層的使用、防腐蝕系統和狀況資料的液艙明細表；
- .5 檢驗條件（如：有關液艙清潔、除氣、通風、照明等的資

料)；

- .6 結構通道的設置和方法；
- .7 檢驗設備；
- .8 確定進行近觀檢驗的液艙和區域（見 2.4）；
- .9 確定進行測厚的區域和剖面（見 2.5）；
- .10 確定進行液艙試驗的艙（見 2.6）；
- .11 確定測厚公司；
- .12 與該船舶有關的損壞經歷；和
- .13 臨界結構區域和可疑區域，如相關。

5.1.4 主管機關將通知船東適合於該船舶的可接受的最大限度結構蝕耗程度。

5.1.5 也可使用附件 11 中與液貨船加強檢驗計劃有關的技術評估導則。該導則是一套建議的方法，在認為必要和適當時，可由主管機關決定，結合制定所要求的檢驗計劃予以施用。

5.2 檢驗條件

5.2.1 船東應為安全進行檢驗提供必要的設施。

5.2.1.1 為使現場驗船師能進行檢驗，船東和主管機關應商定合適和安全的通道裝置。

5.2.1.2 檢驗計劃調查表中應提供通道細節。

5.2.1.3 如現場驗船師斷定安全的規定和要求的通道不合適時，不應

進行相關處所的檢驗。

5.2.2 應可安全進入液艙和處所。液艙和處所應予除氣和適當通風。進入液艙、空艙或圍蔽處所前，應確認液艙內部空氣中無危險氣體並含足夠的氧氣。

5.2.3 在準備檢驗和測厚時，為徹底檢查，所有處所應進行清掃，包括除去表面所有鬆動的腐蝕積垢。處所應充分清潔，做到無水、無垢、無髒物、無殘油等，以能揭示腐蝕、變形、裂紋、破損或其他結構蝕耗以及塗層狀況。但是，船東已經決定換新的結構區域只需進行清掃和去垢，以確定要換新的區域範圍。

5.2.4 應提供足夠的照明，以能揭示腐蝕、變形、裂紋、破損或其他結構蝕耗以及塗層狀況。

5.2.5 如已敷設軟塗層或半硬塗層，應為驗船師提供安全通道，以使其能驗證塗層的有效性和進行內部結構（可能包括塗層剝落的部分）的狀況評估。如無法提供安全通道，則軟塗層或半硬塗層應予以去除。

5.2.6 船東應指派至少一位對液艙和封閉處所檢查有經驗的人員始終陪伴現場驗船師。此外，由至少兩人組成的有經驗的後備人員應等候在被檢驗的液艙或處所的艙口處。後備組人員應不斷觀察液艙或處所內的工作情況，並應保持救生和撤離設備隨時可用。

5.2.7 在被檢查的液艙或處所內的檢驗人員或甲板上的負責駕駛員和駕駛室（視情況而定）之間應安排通信系統。這些通信設備應在整個檢驗中始終保持工作狀態。

5.3 結構通道

5.3.1 對全面檢驗，應提供裝置使驗船師能用安全和可行的方法檢查船體結構。

5.3.2 對近觀檢驗，應提供驗船師可接受的下列一個或多個通道裝置：

- .1 固定腳手架和穿過結構的通道；
- .2 臨時腳手架和穿過結構的通道；
- .3 升降機和可移動台架；
- .4 艇或筏；
- .5 便攜式梯子；和
- .6 其他等效裝置。

5.4 檢驗設備

5.4.1 通常應使用超聲波檢測設備進行測厚。應按要求向驗船師證明該設備的精度。

5.4.2 如驗船師認為必要，可要求用下列一個或多個裂紋檢測方法：

- .1 射線照相設備；
- .2 超聲波探傷設備；
- .3 磁粉探傷設備；
- .4 着色滲透劑；和
- .5 其他等效手段。

5.4.3 檢驗期間應有可使用的測爆儀、測氧儀、呼吸器、救生索，攀

登帶及其繩索、鉤子和哨笛及其使用說明和指導。應提供安全檢查清單。

5.4.4 應為安全有效地進行檢驗提供足夠和安全的照明。

5.4.5 在檢驗期間，應有足夠的防護服（如：安全頭盔、手套、安全靴等）可供使用。

5.5 海上或錨泊檢驗

5.5.1 如驗船師能得到船上人員的必要協助，可接受在海上或錨泊時進行檢驗。檢驗所需的預防措施和程序應符合 5.1、5.2、5.3 和 5.4 中的要求。

5.5.2 在液艙內的檢驗人員與在甲板上的負責駕駛員之間應安排通信系統。如使用艇或筏，該系統還應包括負責壓載水泵操作的人員。

5.5.3 只有在驗船師考慮到所提供的安全措施，包括氣象預報和船舶對可預見狀況的反應後表示同意，以及在液艙內水位預期的上升不超過 0.25m 的情況下，方可使用艇或筏對液艙進行檢驗。

5.5.4 在使用筏或艇進行近觀檢驗時，應符合下列條件：

- .1 應僅使用即使一個浮箱破裂仍具有合格的剩餘浮力和穩性的耐用型氣脹式筏或艇；
- .2 艇或筏應拴於通道梯上，並另安排一人留守在能清晰看見該艇或筏的通道梯處；
- .3 所有參加人員都應有合適的救生衣；
- .4 液艙內的水面應平靜（在所有可預見的情況下，液艙內

預期的水位上升不應超過 0.25m)，且水位應固定。任何時候當筏或艇在使用時，水位都不得上升；

- .5 液艙或處所必須只存有乾淨的壓載水。水面上不允許有任何油層；
- .6 任何時候都不允許水位與最深甲板下腹板面板的距離在 1m 以內，這樣檢驗人員通往艙口的直接逃生通道才不致被隔絕。只有在被檢查的艙壁間距上設有甲板通道人孔並開啟時才能考慮水位超出甲板橫材，這樣才能保證任何時候檢驗人員都可使用逃生通道。其他有效的通往甲板的逃生通道也可予以考慮；和
- .7 如果液艙（或處所）共用一個透氣系統或惰性氣體系統，使用艇或筏的液艙則應予以隔絕，以防止氣體從其他液艙（或處所）傳入。

5.5.5 如腹板深度為 1.5m 或以下，筏或艇可允許單獨用於在液艙或處所甲板下的區域的檢查。

5.5.6 如腹板深度超過 1.5m，筏或艇可僅允許單獨用於下列之一的情況：

- .1 甲板下結構的塗層處於“良好”狀況，且無鏽蝕的跡象；或
- .2 如果在每一間距上設置一個允許安全出入的永久通道。該通道應：
 - .1 通過每一間距內的垂直梯直接通向甲板，該梯在甲

板下約 2m 處設有一個小平台；或

- .2 通過在液艙每一端都設有通往甲板的梯子的縱向永久平台通向甲板。該平台應在液艙的全長範圍內布置在與甲板下結構的筏運檢查所需要的最高水位的相同平面，或其上。為此，最高水位之上的空餘量應假定在甲板橫框架的跨距中點和液艙長度中點處測量至距甲板板不大於 3m（見圖 1）。

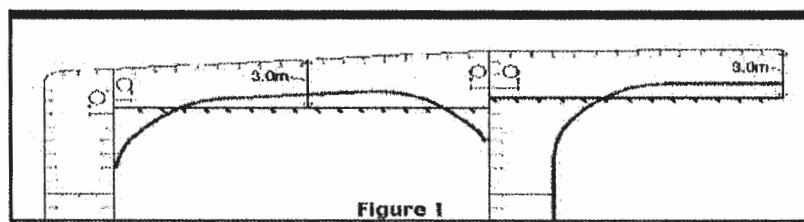


圖 1

如上述條件都不能滿足，則應為甲板下區域的檢驗提供腳手架或其他等效設施。

5.5.7 5.5.5 和 5.5.6 所述的單獨使用筏或艇並不排除在檢驗過程中使用艇或筏在液艙範圍內的移動。

5.6 檢驗計劃會議

5.6.1 在檢驗之前和檢驗期間，現場驗船師和船上船東代表要做好適當準備，進行密切合作，這是執行安全有效檢驗的重要一環。在船上檢驗期間應定期召開安全會議。

5.6.2 為確保檢驗能安全有效地進行，應在換證和中間檢驗的任何部分開始之前，召開由現場驗船師、現場船東代表、測厚公司測量人員（視情況而定）和船長或由船長或公司指派的具有相應資質的代表

參加的檢驗計劃會議，以確定檢驗計劃中預見的所有布置均已到位。

5.6.3 會議中應討論的項目的示意性清單如下：

- .1 船舶計劃（即航線、靠碼頭和離碼頭操縱、靠泊時段、貨物和壓載作業等）；
- .2 測厚的規定和布置（即通道、清潔/除垢、照明、通風、人員安全）；
- .3 測厚範圍；
- .4 認可標準（參見最小厚度表）；
- .5 考慮了塗層狀況和可疑區域/顯著腐蝕區域後確定的近觀檢驗和測厚範圍；
- .6 測厚的實施；
- .7 總體上和發現不均勻腐蝕/點蝕之處的代表性讀數的採集；
- .8 繪製出顯著腐蝕區域；和
- .9 現場驗船師、測厚公司測量人員以及船東代表之間就發現的相關問題進行溝通。

6 船上文件

6.1 總則

6.1.1 船東應獲取、提供並在船上保存 6.2 和 6.3 規定的文件，隨時供驗船師使用。6.2 中所述的狀況評估報告應包括一份英文譯文。

6.1.2 文件應在船舶的整個營運壽命期間保存在船上。

6.2 檢驗報告案卷

6.2.1 檢驗報告案卷應是船上文件的一個組成部分，包括：

- .1 結構檢驗報告（附件 8）；
- .2 狀況評估報告（附件 9）；和
- .3 測厚報告（附件 10）。

6.2.2 船東及主管機關的辦事處，或經主管機關認可的組織的辦事處，也應備有檢驗報告案卷可供使用。

6.3 支持性文件

船上應備有下列附加文件可供使用：

- .1 5.1 要求的檢驗計劃，直至換證檢驗或中間檢驗（如適用）完成；
- .2 貨油艙和壓載艙主結構圖；
- .3 以前修理史；
- .4 貨物和壓載史；
- .5 惰性氣體設備的使用範圍和洗艙程序；
- .6 船上人員對以下方面的檢查：
 - .1 總體的結構損耗狀況；
 - .2 艙壁和管路泄漏；

.3 塗層或防腐系統狀況（如有）；和

.7 任何其他有助於識別臨界結構區域和/或需要檢查的可疑區域的資料。

6.4 船上文件審核

檢驗前，驗船師應檢查船上文件資料的完整性及其內容，並以其為檢驗的基礎。

7 測厚程序

7.1 總則

7.1.1 如要求的測厚不是由代表主管機關的被認可組織進行，則應由被認可組織的驗船師在場見證測厚過程。驗船師在船上的時間應視監督該測厚過程的範圍而定。

7.1.2 測厚公司應參加在檢驗開始前舉行的檢驗計劃會議。

7.1.3 要求實施近觀檢驗的區域內的構件測厚應與近觀檢驗同步進行。

7.1.4 在任何情況下，測厚範圍應足以代表實際的平均狀況。

7.2 測厚公司的認證

測厚應由主管機關認可的組織根據附件 7 規定的原則予以認證的合格公司進行。

7.3 報告

7.3.1 應編製一份測厚報告並提交給主管機關。該報告應給出測量部位、所測得的厚度以及相應的原始厚度。此外，報告還應說明進行

測厚的日期、測量設備的類型、測量人員的姓名及其資質，並由測厚人員簽字。測厚報告應遵循附件 10 建議的測厚程序中規定的原則。

7.3.2 驗船師應審核最終的測厚報告並在封面上會簽。

8 檢驗報告和評估

8.1 檢驗報告的評估

8.1.1 檢驗期間收集的船舶結構狀況的數據和資料應用於評估船舶的可接受性和連續結構完整性。

8.1.2 對（現行《國際載重線公約》中界定的）船長 130m 及以上的油船，在其達到 10 年船齡後所進行的構造安全換新檢驗期間，應按附件 12 中規定的油船船體樑總縱強度衡準，利用測得的、換新的和加強的相應結構件厚度，對船舶的總縱強度作出評估。

8.1.3 應由主管機關或經主管機關授權的被認可組織對資料進行分析並予以簽註，其分析的結論應作為狀況評估報告的一部分。

8.1.4 如根據初始評估的結果對結構件進行了換新或加強，則 8.1.2 中要求的船舶總縱強度的最終評估結果應作為狀況評估報告的一部分。

8.2 報告

8.2.1 檢驗報告原則參見附件 8。

8.2.2 當檢驗在不同的檢驗站分別進行時，檢驗的每一部分均應出具報告。其後的現場驗船師在繼續或完成檢驗之前，應可獲得已經檢查和/或試驗項目的清單（壓力試驗、測厚等）以及項目是否已做記錄的說明。

8.2.3 應向船東簽發附件 9 所示的檢驗狀況評估報告以及結果，並應將其留存船上供以後檢驗時查閱。狀況評估報告應由主管機關或經主管機關授權的被認可組織予以簽註。

附件 1

雙殼油船換證檢驗時的近觀檢驗最低要求

船齡≤5 年	5 年<船齡≤10 年	10 年<船齡≤15 年	船齡> 15 年
第 1 次換證檢驗	第 2 次換證檢驗	第 3 次換證檢驗	第 4 次及以後換證檢驗
一個完整壓載艙內的一根強肋骨（1） （見註 1）	一個完整壓載艙內的所有強肋骨（1）（見註 1） 其餘每個壓載艙內的一根強肋骨的折角區域和其上部（約 5m） （6）	所有壓載艙內的所有強肋骨（1）	同 3 欄中的船舶 主管機關認為必要的附加橫向區域
一個貨油艙內的一根甲板強橫樑（2）	兩個貨油艙內的一根甲板強橫樑（2）	一個貨油艙內的所有強肋骨（7），包括甲板強橫樑和橫撐材（如設置）。 其餘每個貨油艙內的一根強肋骨（7），包括甲板強橫樑和橫撐材（如設置）	
一個完整壓載艙內的一道橫艙壁（4） （見註 1）	每個完整壓載艙內的一道橫艙壁（4）（見註 1）	所有貨油艙（3）和壓載艙（4）內的所有橫艙壁	
一個中央貨油艙內的一道橫艙壁（5） 一個貨油邊艙內的一道橫艙壁（5）（見註 2）	兩個中央貨油艙內的一道橫艙壁（5） 一個貨油邊艙內的一道橫艙壁（5）（見註 2）		

註：

(1)、(2)、(3)、(4)、(5)、(6) 和 (7) 為近觀檢驗和厚度測量的區域（見附件 10 附錄 3）。

- (1) 壓載艙內的強肋骨係指邊艙內的垂直桁材，底邊艙內的桁材、雙層底艙內的肋板和雙甲板艙內（如設置）的甲板強橫樑，包括鄰接構件。艏尖艙和艉尖艙內的強肋骨係指 1 個完整的橫向環形強框架，包括鄰接構件。
- (2) 甲板強橫樑，包括鄰接甲板構件（或在液艙甲板上的外部結構，如適用）。
- (3) 貨油艙內的完整橫艙壁，包括桁材系統、鄰接構件（例如縱艙壁）和上下凳（如設置）的內部構件。
- (4) 壓載艙內的完整橫艙壁，包括桁材系統和鄰接構件，例如縱艙壁、雙層底艙內的桁材、內底板、底邊艙舷側、連接肘板。
- (5) 貨油艙內橫艙壁的下部，包括桁材系統、鄰接構件（例如縱艙壁）和底凳（如設置）的內部構件。
- (6) 船體折角區域及其上部（約 5m），包括鄰接構件。船體折角區域係指底邊艙斜板與內殼艙壁及與內底板連接處 2m 範圍的強肋骨區域。
- (7) 貨油艙內的強肋骨係指甲板強橫樑、縱艙壁的垂直桁材和撐杆（如設置）包括鄰接構件。

註 1：完整壓載艙係指雙層底艙加上雙舷側邊艙加上雙甲板艙（視情況而定），即使它們是分開的，也是如此。

註 2：如不設置縱中油艙（例如設中縱艙壁），邊貨油艙內的橫艙壁應予檢驗。

附件 2

雙殼油船換證檢驗時的測厚最低要求

船齡≤5 年	5 年<船齡≤10 年	10 年<船齡≤15 年	船齡> 15 年
1	2	3	4
貨物區域內全船寬的一個 甲板板剖面	貨物區域內： - 每塊甲板板 - 一個橫剖面	貨物區域內： - 每塊甲板板 - 兩個橫剖面（1） - 所有舷側乾濕交變 列板	貨物區域內： - 每塊甲板板 - 三個橫剖面（1） - 每塊船底板
	貨物區域以外選擇的 舷側乾濕交變列板	貨物區域以外選擇的 舷側乾濕交變列板	全長範圍內所有舷側乾 濕交變列板
按附件 1 應進行近觀 檢驗的結構件的測 量點，供總體評定並 作腐蝕形式記錄	按附件 1 應進行近觀 檢驗的結構件的測量 點，供總體評定並作 腐蝕形式記錄	按附件 1 應進行近觀 檢驗的結構件的測量 點，供總體評定並作 腐蝕形式記錄	按附件 1 應進行近觀檢 驗的結構件的測量點， 供總體評定並作腐蝕形 式記錄
可疑區域	可疑區域	可疑區域	可疑區域
（1）：在船中 0.5L 區域內應至少有一個剖面。			

附件 3

雙殼油船換證檢驗時的液艙試驗最低要求

船齡≤5 年	船齡>5 年	船齡>10 年
1	2	3
所有壓載艙邊界	所有壓載艙邊界	所有壓載艙邊界
面對壓載艙、空艙、管隧、代表性燃油艙、泵艙或隔離艙的貨油艙邊界	面對壓載艙、空艙、管隧、代表性燃油艙、泵艙或隔離艙的貨油艙邊界	面對壓載艙、空艙、管隧、代表性燃油艙、泵艙或隔離艙的貨油艙邊界
	構成分隔貨物邊界的所有貨油艙艙壁	其餘所有的貨油艙艙壁

附件 4/表 1

雙殼油船顯著腐蝕區域的測厚範圍要求

雙殼油船換證檢驗

船底、內底和底邊艙結構		
結構件	測量範圍	測量形式
船底板、內底板和底邊艙的斜板	雙層底艙內全艙寬，至少三個強肋骨間距，包括後艙壁至強肋板間距。 在所有吸口的周圍和下面測量	在縱骨與肋板之間的每個板格內作五點形測量
船底板、內底板和底邊艙斜板上的縱骨	在被測厚船底板範圍的每個強肋骨間距的範圍內，至少三根縱骨	在縱骨折板同一橫截線上測三點，在腹板垂直方向上測三點
船底縱桁，包括水密縱桁	在前、後水密肋板處和各艙中心處	在桁材上的每一個板格扶強材之間測一點，各單點位於同一垂直線上，或至少測三點。
船底肋板，包括水密肋板	在被測厚的船底板的強肋骨間距範圍內，三塊肋板，在其兩端和中部測量	在 2m ² 的面積內作五點形測量
底邊艙的橫向環狀強框架	在被測厚的船底板的強肋骨間距的範圍內，三塊肋板	在 1m ² 的板上作五點形測量，折板上單點測量
底邊艙的水密橫艙壁或制蕩艙壁	- 艙壁下部的 1/3	在 1m ² 的板上作五點形測量
	- 艙壁上部的 2/3	在 2m ² 的板上作五點形測量
	- 扶強材(至少三根)	對腹板，跨長內作五點形測量（在每端橫截線上測各兩點，中央測一點）；對折板，在每一端和跨長中點單點測量
板格扶強材	如適用	單點測量

附件 4/表 2

雙殼油船顯著腐蝕區域的測厚範圍要求

在貨艙長度區域內雙殼油船換證檢驗

甲板結構		
結構件	測量範圍	測量形式
甲板板	橫跨貨油艙的兩條帶	每條帶上的每塊板上至少測三點
甲板縱骨	在至少有一根縱骨的兩條帶中的每一條帶內，每第三根縱骨	腹板垂直方向上測三點和折板（如設置）測兩點
甲板縱桁和肘板（通常僅用於貨油艙）	在前、後橫艙壁肘板趾端處和各艙中心處	在腹板上的每一個板格扶強材之間測一點，各單點位於同一垂直線上，或至少測三點。 在折板的橫截線上測兩點，在縱桁/艙壁肘板上作五點形測量
甲板強橫樑	至少在兩個強橫樑，在其跨距的兩端和中點測量	在 1m ² 的區域內作五點形測量，折板上單個點測量
在邊壓載艙內（自甲板起 2m）垂直桁材和橫艙壁	至少兩個垂直桁材和兩個橫艙壁	在 1m ² 的區域內作五點形測量
板格扶強材	如適用	單點測量

附件 4/表 3

雙殼油船顯著腐蝕區域的測厚範圍要求

在貨艙長度區域內的雙殼油船換證檢驗

邊壓載艙結構		
結構件	測量範圍	測量形式
舷側外板和縱艙壁板： - 頂列板和水平桁材處列板 - 所有其他列板	（沿艙長）至少三個強肋骨間距內，每對縱骨之間的板 在相同的三個強肋骨間距內，每第三對縱骨之間的板	單個測量 單個測量
舷側外板和縱艙壁上的縱骨在： - 頂列板處 - 所有其他列板處	在相同的三個強肋骨間距內，每根縱骨 在相同的三個強肋骨間距內，每第三根縱骨	腹板的同一橫截線上測三點和折板上測一點 腹板的同一橫截線上測三點和折板上測一點
縱骨肘板	在相同三個強肋骨間距內，艙頂部、中部和底部至少三處	在肘板上作五點形測量
垂直桁材和橫艙壁（艙頂區域除外）： - 水平桁材處列板 - 其他列板	至少兩個垂直桁材和兩個橫艙壁 至少兩個垂直桁材和兩個橫艙壁	約 2m ² 面積內作五點形測量 每對垂直扶強材之間測兩點
水平桁材	至少三個強肋骨間距內，每根縱桁的板	每對縱桁扶強材之間測兩點
板格扶強材	如適用	單點測量

附件 4/表 4

雙殼油船顯著腐蝕區域的測厚範圍要求

在貨艙長度區域內的雙殼油船換證檢驗

貨油艙內的縱艙壁		
結構件	測量範圍	測量形式
頂列板和底列板以及橫艙壁上水平縱桁處的列板	至少三個強肋骨間距內每對縱骨之間的板	單個點測量
所有其他列板	在相同的三個強肋骨間距內每第三對縱骨之間的板	單個點測量
頂列板和底列板上的縱骨	在相同的三個強肋骨間距內每根縱骨	在腹板同一橫截線上測三點和折板上測一點
所有其他縱骨	在相同的三個強肋骨間距內每第三根縱骨	在腹板同一橫截線上測三點和折板上測一點
縱骨 肘板	在相同的三個強肋骨間距內， 艙頂部、中部和底部至少三處	在肘板區域範圍內作五點形測量
強肋骨和橫撐材	三塊腹板，每塊腹板上至少測三個部位，包括與橫撐材連接處	約 2m ² 面積內強肋骨作五點形測量，和強肋骨和橫撐材折板上單點測量
下端肘板（在強肋骨相對的一側）	至少三塊肘板	約 2m ² 面積內肘板作五點形測量，和肘板折板上單點測量

附件 4/表 5

雙殼油船顯著腐蝕區域的測厚範圍要求

在貨艙長度區域內的雙殼油船換證檢驗

貨油艙內橫向水密艙壁和制蕩艙壁		
結構件	測量範圍	測量形式
頂凳和底凳（如設置）	與內底板/甲板板焊接處 25mm 範圍內的橫帶 與頂凳底板和底凳頂板焊接處 25mm 範圍內的橫帶	在 1m 長度內扶強材之間作五點形測量
頂列板和底列板以及水平縱桁處的列板	在艙寬約 1/4、1/2 和 3/4 的三個位置處，一對扶強材之間的板	在 1m 長度內扶強材之間作五點形測量
所有其他列板	在中間部位，一對扶強材之間的板	單點測量
槽形艙壁列板	在平面板板格中心處和斜面板（折板）裝配連接處，用於每一結構尺寸改變處的板	在約 1m ² 板上作五點形測量
扶強材	至少三根典型的扶強材	對腹板，與肘板連接之間的跨長內作五點形測量（每個肘板連接處的腹板同一橫截線上測兩點，跨長中點測一點） 對折板，每個肘板趾端和跨長中點單點測量
肘板	艙頂部、中部和底部至少三處	在肘板區域範圍內作五點形測量
水平桁材	所有桁材在其兩端和中部測量	在 1m ² 面積範圍內作五點形測量，和肘板趾端附近和折板上單點測量

附件 5
船東檢查報告
結構狀況

船名：.....							
液艙號：.....							
鋼級： 甲板：..... 舷側：.....							
船底：..... 縱艙壁：.....							
構件	裂紋	屈曲	腐蝕	塗層狀況	凹蝕	改動/修理	其他
甲板：							
船底：							
舷側：							
縱艙壁：							
橫艙壁：							
進行修理的原因：							
進行的測厚（日期）：							
總體結果：							
過期檢驗：							
船級遺留項目：							
意見：							
檢查日期：.....							
檢查員：.....							
簽字：.....							

附件 6A**檢驗計劃****基本資料和概況**

船名：
IMO編號：
船旗國：
船籍港：
總噸位：
載重量（公噸）：
垂線間長（m）：
造船廠：
船體號：
被認可組織（RO）：
RO的船舶標識號：
交船日期：
船東：
測厚公司：

1 序言**1.1 範圍**

1.1.1 本檢驗計劃包括在本規則中要求的貨物區域、壓載艙（包括艏艙尖艙）內進行全面檢驗、近觀檢驗、測厚和壓力試驗的最小範圍。

1.1.2 檢驗布置和安全方面應經現場驗船師認可。

1.2 文件

按第 6 節的要求，制定檢驗計劃所用的全部文件應在檢驗期間在船上可供使用。

2 液艙和處所的布置

本部分檢驗計劃應以圖紙或文字形式提供檢驗適用範圍內的液艙和

處所布置的資料。

3 液艙和處所的一覽表及其使用情況、塗層範圍和防腐保護系統的資料

本部分檢驗計劃應說明與檢驗計劃調查表中提供的船舶液艙使用情況、塗層範圍和防腐保護系統資料有關的任何變化（並應予更新）。

4 檢驗條件

本部分檢驗計劃應提供有關的檢驗條件的資料，如：貨艙和液艙清洗、除氣、通風和照明等。

5 結構通道的設置和方法

本部分檢驗計劃應說明與檢驗計劃調查表中提供的結構通道的設置和方法資料有關的任何變化（並應予更新）。

6 檢驗設備清單

本部分檢驗計劃應確定並列出可用於檢驗和所要求測厚的設備。

7 檢驗要求

7.1 全面檢驗

本部分檢驗計劃應確定並列出本船按 2.4.1 應進行全面檢驗的處所。

7.2 近觀檢驗

本部分檢驗計劃應確定並列出本船按 2.4.2 應進行近觀檢驗的船體結構。

8 確定進行試驗的液艙

本部分檢驗計劃應確定並列出本船按 2.6 應進行液艙試驗的液艙。

9 確定測厚的區域和剖面

本部分檢驗計劃應確定並列出按 2.5.1 應進行測厚的區域和剖面。

10 船體結構最小厚度

本部分檢驗計劃應規定受本規則約束的本船船體最小厚度（說明按（a）或最好是（b），如有此類信息）：

（a）根據該船的船體結構圖所附的損耗裕度表和原始厚度確定；

（b）在以下表中給出：

區域或位置	建造時的原始厚度 (mm)	最小厚度 (mm)	顯著腐蝕厚度 (mm)
甲板			
板			
縱骨			
縱桁			
船底			
板			
縱骨			
縱桁			
船側			
板			
縱骨			
縱桁			
縱艙壁			
板			
縱骨			
縱桁			
內底			
板			
縱骨			
縱桁			

如損壞與設計有關，姐妹船或類似船舶的船體損壞（如有）

液艙或處所編號 或區域	可能的原因 （如已知）	損壞描述	位置	修理	修理日期

13 以前檢驗中確定的顯著腐蝕區域

本部分檢驗計劃應確定並列出以前檢驗中發現的顯著腐蝕區域。

14 臨界結構區域和可疑區域

本部分檢驗計劃應確定並列出臨界結構區域和可疑區域（如有此類信息）。

15 其他相關意見和信息

本部分檢驗計劃應提供與檢驗相關的任何其他意見和信息。

附錄

附錄 1 - 圖紙清單

5.1.3.2 要求備有貨油艙和壓載艙的主要結構圖（尺寸圖），包括有關使用高強度鋼（HTS）的資料。本檢驗計劃附錄應確定並列出作為檢驗計劃組成部分的主要結構圖。

附錄 2 - 檢驗計劃調查表

船東已提交的檢驗計劃調查表（附件 6B）應附於本檢驗計劃後。

附錄 3 - 其他文件

本部分檢驗計劃應確定並列出作為本計劃組成部分的任何其他文件。

為符合 5.1.3 要求，船東配合主管機關制定。

日期：

（經授權的船東代表的姓名和簽字）

日期：

（經授權的主管機關代表的姓名和簽字）

附件 6B

檢驗計劃調查表

下述資料將使船東能配合主管機關制定一份符合本規則要求的檢驗計劃。關鍵是船東在填寫本調查表時提供最新的資料。填寫完成後的本調查表應能提供本決議要求的所有資料和材料。

概況

船名：

IMO 編號：

船旗國：

船籍港：

船東：

被認可組織（RO）：

總噸位：

載重量（公噸）：

交船日期：

關於為近觀檢驗和測厚提供通道的資料

船東應在下表中說明通往應進行近觀檢驗和測厚的結構的通道。近觀檢驗係指現場驗船師在近距離目視範圍內（即通常伸手可及）對結構件細節進行的檢驗。

液艙號	結構	C (貨物) / B (壓載)	臨時 腳手架	筏	梯子	直接 通道	其他方法 (請說明)
F.P.	艏尖艙						
A.P.	艉尖艙						
邊艙	甲板下						
	舷側						
	底部橫材						
	縱骨						
	橫材						
中艙	甲板下						
	底部橫材						
	橫材						

過去三年中含 H₂S 貨物或加熱貨物的記錄，連同貨物是否經加熱的說明，以及物質安全數據單（MSDS）（如有）

船東的檢查

船東應填寫類似以下格式的表（下表僅為示例），提供至少最近三年內其對貨物區域範圍內所有貨油艙、壓載艙和空艙的詳細檢查結果，包括尖艙。

液艙號	防腐 (1)	塗層範圍 (2)	塗層狀況 (3)	結構蝕耗 (4)	液艙破損 歷史記錄 (5)
中央貨油艙					
邊貨油艙					
污油艙					
壓載艙					
艏尖艙					
艉尖艙					
其他處所					

註：

指明用於油類/壓載的液艙。

- 1) HC=硬塗層；SC=軟塗層；
A=陽極；NP=無保護
- 2) U=上部；M=中部；
L=下部；C=全部
- 3) G=良好；F=尚好；P=差；
RC=重新敷設（過去三年中）
- 4) N=無情況記錄；Y=情況記錄，

船東代表姓名：

.....

簽字：.....

日期：.....

5) DR=破損和修理；L=滲漏
CV=改建（說明應附於調查表之後）

[illegible][illegible][illegible]

附件 7

認證船體結構測厚公司的程序

1 適用範圍

本指南適用於對有意從事船體結構測厚的公司的認證。

2 認證程序

提交文件

2.1 應提交下列文件給主管機關認可的組織審批：

- .1 公司概況，如組織和管理機構；
- .2 公司在船體結構測厚方面的經歷；
- .3 技術人員履歷、即技術人員作為測厚操作人員的經歷，對船體結構等等的技術知識和經驗。操作人員應具有符合公認的行業無損檢測（NDT）標準的資質；
- .4 用於測厚的設備，如超聲波試驗機及其維護/校正程序；
- .5 測厚人員指導手冊；
- .6 測厚技術員的培訓計劃；和
- .7 按建議的測厚程序（參見附件 10）的測量記錄格式。建議的雙殼油船厚度測量程序列於附件 2。

公司審核

2.2 在提交的文件經審查合格後，應對公司進行審核，以確認公司按所提交的文件適當組織和管理，並確認其事實上有能力進行船體

結構的測厚工作。

2.3 認證取決於其在船上的測厚操作演示以及出具令人滿意的報告。

3 發證

3.1 在 2.2 所述的公司審核和 2.3 所述的測厚操作演示結果均合格後，主管機關或由主管機關認可的組織應簽發認可證書，同時出具一份關於該公司的測厚操作體系已獲認證的通知。

3.2 對證書的換新/簽註應以不超過三年的間隔期進行一次，以驗證公司保持原認可條件。

4 對已認證的測厚操作體系作任何變更的報告

如公司對業已認證的測厚操作體系作任何變更，應立即向主管機關認可的組織提交變更報告。如經主管機關認可的組織認為必要，應重新審核。

5 撤銷證書

如遇下列情況可撤銷證書：

- .1 進行了不正確的測量，或報告結果錯誤；
- .2 驗船師發現公司認可的測厚操作體系存在任何缺陷；和
- .3 公司未能按要求將上述 4 中所述的任何變更報告經主管機關認可的組織。

附件 8

檢驗報告原則

原則上，對應符合本規則要求的油船，驗船師應在其船體結構和管路系統的檢驗報告中包括下列與檢驗有關的內容。

1 總則

1.1 在下列情形裏，應形成檢驗報告：

- .1 涉及定期船體檢驗，即相關的年度、中間和換證檢驗的開始、繼續和/或完成；
- .2 已發現結構破損/缺陷時；
- .3 已進行修理、換新或改裝時；和
- .4 已批註或消除船級條件（遺留項目）時。

1.2 報告應：

- .1 提供證據，表明已按適用的要求進行了規定的檢驗；
- .2 提供文件，表明檢驗中發現的情況、進行的修理以及批註或消除的船級條件（遺留項目）；
- .3 提供檢驗記錄（包括採取的措施），作為可核查文件記錄的組成部分。檢驗報告應置於需存放在船上的檢驗報告案卷中；
- .4 提供為未來檢驗作計劃的信息；和
- .5 提供可用於維護入級規範和須知的素材信息。

1.3 當檢驗在不同的檢驗站分別進行時，應為每一部分檢驗出具報告。其後的現場驗船師在繼續或完成檢驗之前，應可獲得已檢驗項目的清單、相關的檢驗結果以及項目是否已做記錄的說明。還應列出已進行的測厚和液艙試驗，供下一位驗船師使用。

2 檢驗範圍

2.1 確定已進行全面檢驗的艙室。

2.2 確定已在每個液艙內進行近觀檢驗的位置，以及所使用的通道裝置的資料。

2.3 確定已在每個液艙內進行測厚的位置。

註：確定進行近觀檢驗和測厚的位置應至少包括一份根據定期檢驗的類型和船齡對附件 B 規定的要求範圍相應的各結構構件進行描述的確證書。

如僅要求進行部分檢驗，即一個橫向環形強框架/一根甲板強橫樑，應使用肋骨號確定每個壓載艙和貨艙內的位置。

2.4 對液艙內保護塗層處於良好狀況而且已對近觀檢驗和（或）測厚的範圍作特殊考慮的區域，應確定經特殊考慮的結構。

2.5 確定應經受液艙試驗的液艙。

2.6 確定甲板上的如下管路系統，包括原油洗艙（COW）管路以及貨油艙和壓載艙、管隧、隔離艙和空艙內的壓載管系：

.1 已進行包括管系及其閥和附件的內部檢查和測厚在內的相關檢查；和

.2 已進行工作壓力的操作試驗。

3 檢驗結果

3.1 每個相關液艙內保護塗層的類型、範圍和狀況（分為“良好”、“尚好”或“差”），包括確定安裝了陽極的液艙。

3.2 每個相關艙室的結構狀況及以下方面的資料：

.1 確定發現的問題，例如：

.1 腐蝕及對位置、類型和範圍的描述；

.2 顯著腐蝕的區域；

.3 裂紋/裂口及對位置和範圍的描述；

.4 屈曲及對位置和範圍的描述；和

.5 凹痕及對位置和範圍的描述。

.2 確定未發現結構破損/缺陷的艙室。報告可附草圖/照片加以補充。

.3 測厚報告應由在船上監督測量過程的驗船師驗證並簽字。

.4 船長為 130m 及以上且船齡 10 年以上的油船的船體樑總縱強度評估結果。應包括下列相關內容：

.1 測得的甲板和底部折板的橫剖面面積及其建造面積；

.2 甲板和底部折板的橫剖面面積減小量；和

.3 已進行的換新或加強的相關詳細情況（見 4.2）。

4 對發現的問題所採取的行動

4.1 每當現場驗船師認為需要進行修理時，應在編號的清單中標出應予修理的每一項目。每當進行修理時，應報告實施的修理的細節，具體提及編號的清單中的相關項目。

4.2 應報告已進行的修理並標明：

- .1 艙室；
- .2 結構構件；
- .3 修理方法（即：換新或改動），包括：
 - .1 鋼級和尺度（如與原始材料的區別）；
 - .2 草圖/照片，如適用；
- .4 修理範圍；和
- .5 無損檢測（NDT）。

4.3 對在檢驗時未完成的修理，船級條件/遺留項目中應規定該修理的具體完成期限。為向參與修理檢驗的驗船師提供正確和適當的資料，船級條件/遺留項目應足夠詳細，並標明應進行修理的每一項目。對大範圍修理的確定，可參考檢驗報告。

附件 9

狀況評估報告

在換證檢驗完成後簽發

船舶概況

船名：船級/主管機關標識號：
 前船級/主管機關標識號：
 IMO 編號：
 船籍港：船旗國：
 前船旗國：
 載重量：總噸位：
 （公噸）本國法定：
 國際噸位丈量公約（1969）：
 建造日期：船級符號：
 重大改建日期：
 改建類型：船東：
 前船東：

- 1 下列檢驗報告和文件已經簽署者審核，並查明合格。
- 2 檢驗狀況評估附於表 2。
- 3 換證檢驗已按本規則在.....（日期）完成。

狀況評估報告填寫人	姓名 簽字	職務
辦事處	日期	
狀況評估報告填寫人	姓名 簽字	職務
辦事處	日期	

所附的報告和文件：

- 1)
- 2)
- 3)
- 4)
- 5)
- 6)

狀況評估報告目錄

- | | |
|------------------|----------------------|
| 第 1 部分 - 船舶概況 | - 見首頁 |
| 第 2 部分 - 報告審核 | - 檢驗地點和方法 |
| 第 3 部分 - 近觀檢驗 | - 範圍（液艙） |
| 第 4 部分 - 貨物和壓載管系 | - 已檢查 |
| | - 已試驗操作 |
| 第 5 部分 - 測厚 | - 參見測厚報告 |
| | - 測量點一覽表 |
| | - 單獨表格指明顯著腐蝕的處所及相應的： |
| | - 厚度減小 |
| | - 腐蝕形式 |
| 第 6 部分 - 液艙防腐系統 | - 單獨表格指明： |
| | - 塗層位置/陽極 |
| | - 塗層狀況（如適用） |

- 第 7 部分 - 修理 - 液艙/區域標識
- 第 8 部分 - 船級條件/船旗國要求
- 第 9 部分 - 備忘錄 - 可接受的缺陷
- 未來檢驗時的關注點，如可疑區域
- 因塗層脫落而擴大的年度/中間檢驗
- 第 10 部分 - 船舶總縱強度評估結果
- (對船長 130 m 及以上且
- 10 年以上船齡的油船)
- 第 11 部分 - 結論 - 檢驗報告的評估/驗證說明

測厚摘錄

參見測厚報告：

顯著腐蝕液艙/區域 ¹ 位置或深度鏽點位置 ³	厚度減小 (%)	腐蝕形式 ²	備註： (如：參考所附草圖)

註：

- 1 顯著腐蝕，即允許損耗範圍的 75% - 100%。
- 2 P = 鏽點
C = 總體腐蝕
- 3 應註明所有鏽點密度達 20%或以上、損耗為顯著腐蝕範圍或鏽點的平均深度為實際板厚度的 1/3 或以上的船底板。

液艙防腐系統

液艙號 ¹	液艙防腐蝕系統 ²	塗層狀況 ³	備註

註：

1 應列出所有分隔的壓載艙和貨油/壓載兼用艙。

2 C = 塗層

NP = 無保護

3 塗層狀況根據以下標準：

“良好”係指僅有少量點狀鏽斑；

“尚好”係指在扶強材的邊緣和焊縫的連接處塗層有局部脫落和/或所檢驗的區域中有超過 20%或更大範圍的輕度鏽蝕，但小於定義“差”的狀況；

“差”係指在檢驗的區域中有超過 20%或更大範圍的塗層普遍剝落，或有 10%或更大範圍的塗層產生硬質鏽皮。

如塗層狀況未達到“良好”，應擴大年度檢驗的範圍，這應在狀況評估報告目錄第 9 部分中予以註明。

船長 130m 及以上且 10 年以上船齡的油船船體樑總縱強度的評估結果

(在下列 1、2、3 節中，只需填寫其中適用的一節)

1 本節適用於無論何時建造的船舶：在對已達到 10 年船齡的船舶進行最近一次“貨船構造安全證書”或“貨船安全證書”的換證檢驗(SC 換證檢驗)期間，酌情通過測量、換新或加強的結構件厚度，已對船體樑甲板處(甲板板和甲板縱骨)和船底處(船底板和船底縱骨)的橫剖面面積進行了計算，

發現橫剖面面積減少未超出原建造面積的 10%，如下表所列：

表 1 – 船體樑折板的橫剖面面積

		測量值	建造值	減小量
橫剖面 1	甲板折板	cm ²	cm ²	cm ² (%)
	底部折板	cm ²	cm ²	cm ² (%)
橫剖面 2	甲板折板	cm ²	cm ²	cm ² (%)
	底部折板	cm ²	cm ²	cm ² (%)
橫剖面 3	甲板折板	cm ²	cm ²	cm ² (%)
	底部折板	cm ²	cm ²	cm ² (%)

2 本節適用於 2002 年 7 月 1 日或以後建造的船舶：按附件 12 中 2.2.1.1 的規定，在對已達到 10 年船齡的船舶進行最近一次 SC 換證檢驗期間，酌情通過測量、換新或加強的結構件厚度，已對船體樑橫剖面模數進行了計算，並考慮到本組織通過的建議案，發現其在主管機關確定的極限折減值範圍之內，如下表所列：

表 2 – 船體樑的橫剖面模數

		Z _{act} (cm ³) ¹	Z _{req} (cm ³) ²	備註
橫剖面 1	上甲板			
	船底			
橫剖面 2	上甲板			
	船底			
橫剖面 3	上甲板			
	船底			

註：

- 1 Z_{act} 係指按附件 12 中 2.2.1.1 的規定，在 SC 換證檢驗期間，通過測量、換新或加強的結構件厚度所計算出的船體樑實際橫剖面模數。
- 2 Z_{req} 係指按附件 12 中 2.2.1.1 的規定所計算出的船舶總縱彎曲強度的極限折減值。

Z_{act} 的計算表應附於本報告之後。

3 本節適用於 2002 年 7 月 1 日以前建造的船舶：按附件 12 中 2.2.1.2 的規定，在對已達到 10 年船齡的船舶進行最近一次 SC 換證檢驗期間，酌情通過測量、換新或加強的結構件厚度，已對船體樑橫剖面模數進行了計算，發現其符合主管機關或經認可的船級社要求的衡準，且 Z_{act} 不小於附件 12 附錄 2 中規定的 Z_{mc} （見下列註 2 定義），如下表所列。

闡述主管機關或經認可的船級社要求的營運船舶船體樑最小剖面模數的認可衡準。

表 3 - 船體樑的橫剖面模數

		$Z_{act}(cm^3)^1$	$Z_{mc}(cm^3)^2$	備註
橫剖面 1	上甲板			
	船底			
橫剖面 2	上甲板			
	船底			
橫剖面 3	上甲板			
	船底			

註：

1 如表 2 註 1 的定義。

2 Z_{mc} 係指按附件 12 中 2.2.1.2 規定計算出的最小剖面模數的極限值。

附件 10

建議的雙殼油船測厚程序

總則

- 1 本程序應用於記錄附件 2 和 4 所要求的厚度測量。
- 2 附錄 2 規定的報告格式 TM1-DHT、TM2-DHT(i)、TM2-DHT(ii)、TM3-DHT、TM4-DHT、TM5-DHT 和 TM6-DHT 應用於記錄厚度測量，並應說明最大允許減小量。可在附加的文件中說明最大允許減小量。
- 3 附錄 3 包含有關報告格式和厚度測量要求的圖解和說明。
- 4 報告格式（如適用）應以結構草圖上所示的數據加以補充。

附錄 1

船舶概況

船名：.....

IMO 編號：.....

船級主管機關標識號：.....

船籍港：.....

總噸位：.....

載重噸：.....

建造日期：.....

船級社：.....

進行測厚的公司名稱：.....

.....

測厚公司的認證機構：.....

證書號：.....

證書有效期自：.....至.....

測厚地點：.....

首次測量日期：.....

最後測量日期：.....

換證檢驗/中間檢驗日期：.....

測厚設備情況：.....

測量者資質：.....

報告編號：..... 頁數：..... 頁

測量者姓名：..... 驗船師姓名：.....

測量者簽字：..... 驗船師簽字：.....

公司公章：..... 主管機關：.....

公章

附錄 2

所有甲板板、所有船底板或舷側外板厚度測量報告* (TM1-DHT)

船名：船級標識號：報告編號：IMO 編號：

列板位置	編號或符號	原始厚度 (mm)	舢前讀數				舢後讀數				平均減小量		
			測量		減小量 S		測量		減小量 P		減小量 S		mm
			P	S	%	mm	P	%	mm	S	%	mm	
舢前第 12 塊													
第 11 塊													
第 10 塊													
第 9 塊													
第 8 塊													
第 7 塊													
第 6 塊													
第 5 塊													
第 4 塊													
第 3 塊													
第 2 塊													
第 1 塊													
船中													
舢後第 1 塊													
第 2 塊													
第 3 塊													
第 4 塊													
第 5 塊													
第 6 塊													
第 7 塊													
第 8 塊													
第 9 塊													
第 10 塊													
第 11 塊													
第 12 塊													

測量者簽字：註 - 見下頁

不適用者劃去。

TM1-DHT 報告的註釋：

- 1 本報告應用於記錄下列厚度測量：
 - .1 貨物區域內的所有強力甲板板；
 - .2 貨物區域內的所有龍骨板、船底外板和舳列板；
 - .3 貨物區域外包括選擇的乾濕交變列板的舷側外板；
 - .4 貨物區域內的所有乾濕交變列板。
- 2 應清楚示明如下列板位置：
 - .1 對於強力甲板，示明甲板邊板內列板的編號；
 - .2 對於船底板，示明龍骨板外列板的編號；和
 - .3 對於舷側外板，示明舷頂列板以下列板在外板展開圖上的編號和字母。
- 3 應對舳前和舳後的所有區域的板進行測厚，如有板橫跨壓載艙/貨油艙邊界，則應記錄在各類型液艙的板區域分別測得的值。
- 4 所記錄的單點測量應代表多點測量的平均值。
- 5 最大允許減小量可在附加的文件中說明。

TM2-DHT (i) 報告的註釋：

- 1 本報告應用於記錄強力甲板板和舷頂列板橫剖面的厚度測量：
貨物區域內一個、兩個或三個剖面，包括附錄 3 中典型橫剖面圖表表明的結構項目 (0)、(1) 和 (2)。
- 2 頂部區域包括甲板板、甲板邊板和舷頂列板（包括圓形舷緣）。
- 3 應註明測量的確切肋骨號。
- 4 所記錄的單點測量應代表多點測量的平均值。
- 5 最大允許減小量可在附加的文件中說明。

舷側外板和甲板板厚度測量報告（一、兩或三個橫剖面）（TM2-DHT（ii））

船名：船級標識號：報告編號：IMO 編號：

列板位置	第.....號肋骨的第一個橫剖面						第.....號肋骨的第二個橫剖面						第.....號肋骨的第三個橫剖面					
	編號 或 符號	原始 厚度 (mm)	最大允 許減小 量(mm)		測量		編號 或 符號	原始 厚度 (mm)	最大允 許減小 量(mm)		測量		編號 或 符號	原始 厚度 (mm)	最大允 許減小 量(mm)		測量	
			P	S	P	S			P	S	P	S			P	S	P	S
舷頂列板下 第1塊列板																		
第2塊																		
第3塊																		
第4塊																		
第5塊																		
第6塊																		
第7塊																		
第8塊																		
第9塊																		
第10塊																		
第11塊																		
第12塊																		
第13塊																		
第14塊																		
第15塊																		
第16塊																		
第17塊																		
第18塊																		
第19塊																		
第20塊																		
龍骨列板																		
艙底總數																		

測量者簽字：註 - 見下頁

TM2-DHT (ii) 報告的註釋：

- 1 本報告應用於記錄橫剖面處舷側外板的厚度測量：

貨物區域內一個、兩個或三個剖面，包括附錄 3 中典型橫剖面圖表表明的結構項目 (3)、(4)、(5) 和 (6)。
- 2 船底區域包括龍骨板、船底板和舳部板。
- 3 應註明測量的確切肋骨號。
- 4 所記錄的單點測量應代表多點測量的平均值。
- 5 最大允許減小量可在附加的文件中說明。

TM3-DHT 報告的註釋：

- 1 本報告應用於記錄橫剖面處縱向構件的厚度測量：

貨物區域內一個、兩個或三個剖面，包括附錄 3 中典型橫剖面圖表表明的相應結構項目（10）至（29）。
- 2 應註明測量的確切肋骨號。
- 3 所記錄的單點測量應代表多點測量的平均值。
- 4 最大允許減小量可所加附文件中說明。

TM4-DHT 報告的註釋：

- 1 本報告應用於記錄橫向構件的厚度測量，包括附錄 3 中典型橫剖面圖表表明的相應結構項目（30）至（36）。
- 2 測量區域的指導參見附錄 3。所記錄的單點測量應代表多點測量的平均值。
- 3 最大允許減小量可在附加的文件中說明。

***TMS-DHT* 報告的註釋：**

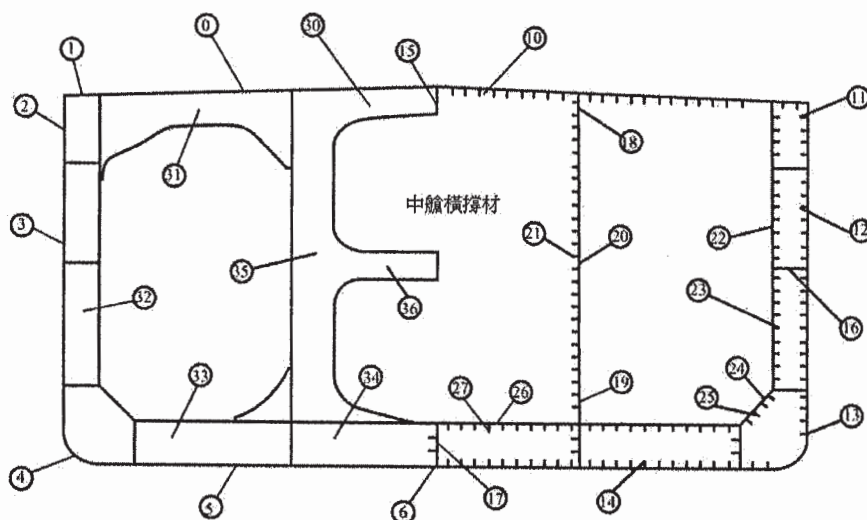
- 1 本報告應用於記錄水密/油密橫艙壁的厚度測量。
- 2 測量區域的指導參見附錄 3。
- 3 所記錄的單點測量應代表多點測量的平均值。
- 4 最大允許減小量可在附加的文件中說明。

TM6-DHT 報告的註釋

- 1 本報告應用於記錄其他結構件的厚度測量。
- 2 所記錄的單點測量應代表多點測量的平均值。
- 3 最大允許減小量可在附加的文件中說明。

附錄 3

厚度測量 - 雙殼油船



TM2-DHT (i) 和 (ii) 測量報告
⑨ 強力甲板板
① 甲板邊板
② 舷頂列板
③ 舷側板
④ 舳板
⑤ 船底外板
⑥ 龍骨板

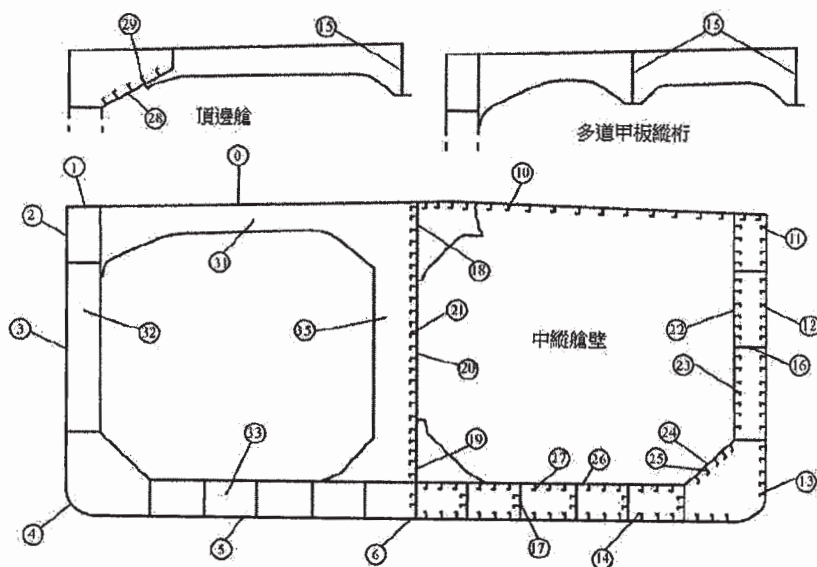
TM4-DHT 測量報告
⑩ 甲板橫材 - 中央艙
⑪ 甲板橫材 - 邊艙
⑫ 邊壓載艙垂直桁材
⑬ 雙層底板 - 邊艙
⑭ 雙層底板 - 中央艙
⑮ 縱向艙壁垂直桁材
⑯ 橫撐材

TM3-DHT 測量報告	
⑩ 甲板縱骨	⑳ 縱向艙壁板 (剩餘部分)
⑪ 舷頂列板縱骨	㉑ 縱向艙壁縱骨
⑫ 舷側縱骨	㉒ 內側板
⑬ 舳縱骨	㉓ 內側縱骨
⑭ 船底縱骨	㉔ 底邊艙板
⑮ 甲板縱桁	㉕ 底邊艙縱骨
⑯ 邊壓載艙水平桁材	㉖ 內底板
⑰ 船底縱桁	㉗ 內底縱骨
⑱ 縱向艙壁頂列板	㉘ 頂邊艙板
⑲ 縱向艙壁底列板	㉙ 頂邊艙縱骨

150,000載重噸以上的雙殼油船表明縱向和橫向構件的典型橫剖面

厚度測量 - 雙殼油船

150,000 載重噸及以下的雙殼油船表明縱向和橫向構件的典型橫剖面



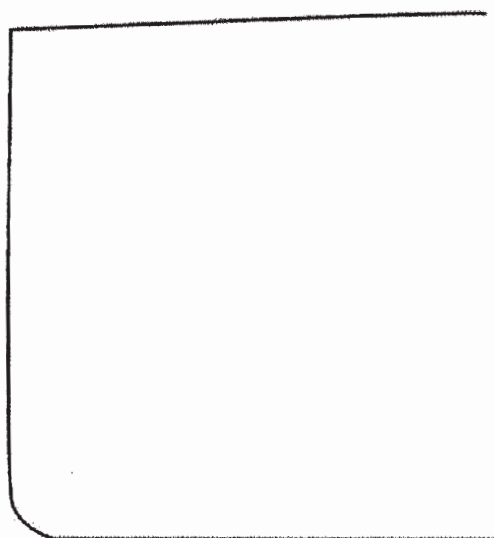
TM2-DHT (i) 和 (ii) 報告
① 強力甲板板
① 甲板邊板
② 舷頂列板
③ 舷側板
④ 舳板
⑤ 船底外板
⑥ 龍骨板

TM4-DHT 報告
⑩ 甲板橫材 - 中央艙
⑪ 甲板橫材 - 邊艙
⑫ 邊壓載艙垂直桁材
⑬ 雙層底板 - 邊艙
⑭ 雙層底板 - 中央艙
⑮ 縱向艙壁垂直桁材
⑯ 橫撐材

TM3-DHT 報告	
⑩ 甲板縱骨	⑳ 縱向艙壁板 (剩餘部分)
⑪ 舷頂列板縱骨	㉑ 縱向艙壁縱骨
⑫ 舷側縱骨	㉒ 內側板
⑬ 舳縱骨	㉓ 內側縱骨
⑭ 船底縱骨	㉔ 底邊艙板
⑮ 甲板縱桁	㉕ 底邊艙縱骨
⑯ 邊壓載艙水平桁材	㉖ 內底板
⑰ 船底縱桁	㉗ 內底縱骨
⑱ 縱向艙壁頂列板	㉘ 頂邊艙板
⑲ 縱向艙壁底列板	㉙ 頂邊艙縱骨

厚度測量 - 雙殼油船

橫剖面輪廓。對不適用典型橫剖面的船舶，可使用本表。



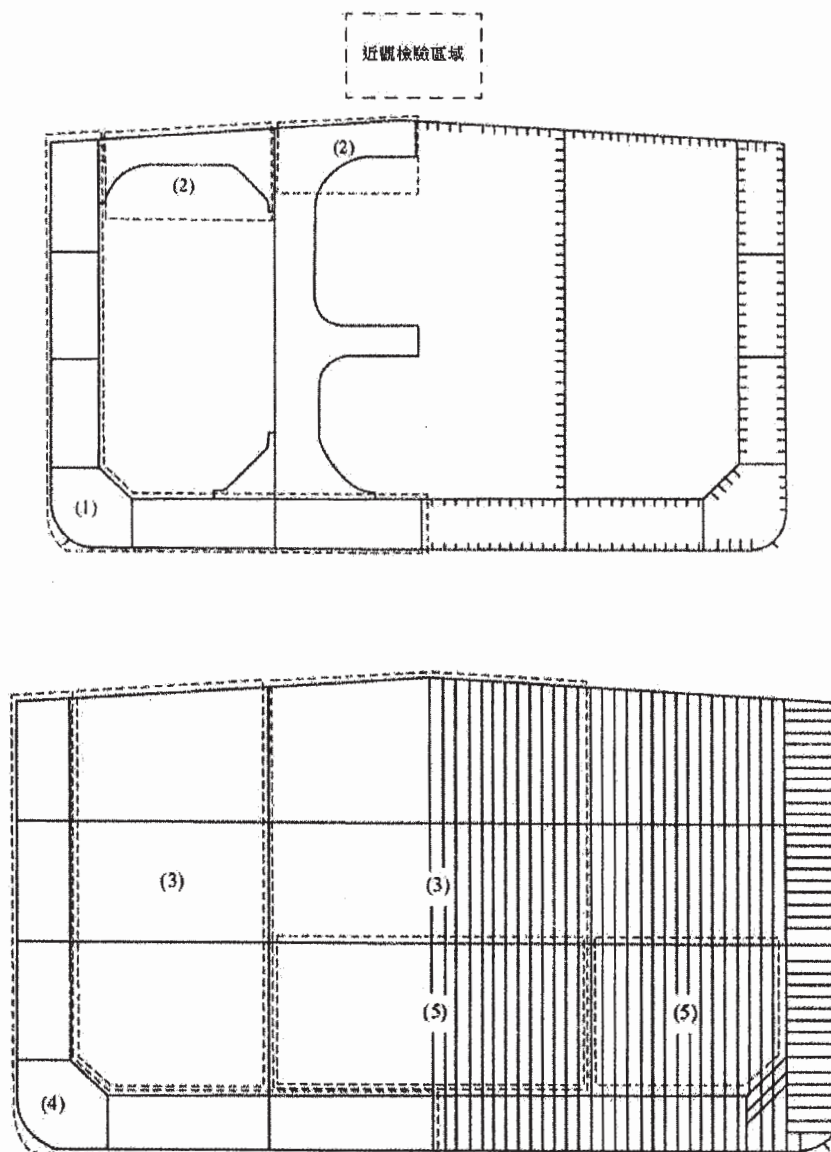
TM2-DHT (i) 和 (ii) 報告
① 強力甲板板
① 甲板邊板
② 舷頂列板
③ 舷側板
④ 艀板
⑤ 船底外板
⑥ 龍骨板

TM3-DHT 報告	
⑩ 甲板縱骨	⑳ 縱向艀壁板 (剩餘部分)
⑪ 舷頂列板縱骨	㉑ 縱向艀壁縱骨
⑫ 舷側縱骨	㉒ 內側板
⑬ 艀縱骨	㉓ 內側縱骨
⑭ 船底縱骨	㉔ 底邊艀板
⑮ 甲板縱桁	㉕ 底邊艀縱骨
⑯ 邊壓載艀水平桁材	㉖ 內底板
⑰ 船底縱桁	㉗ 內底縱骨
⑱ 縱向艀壁頂列板	㉘ 頂邊艀板
⑲ 縱向艀壁底列板	㉙ 頂邊艀縱骨

TM4-DHT 報告
㉚ 甲板橫材 — 中央艀
㉛ 甲板橫材 — 邊艀
㉜ 邊壓載艀垂直桁材
㉝ 雙層底板 — 邊艀
㉞ 雙層底板 — 中央艀
㉟ 縱向艀壁垂直桁材
㊱ 橫撐材

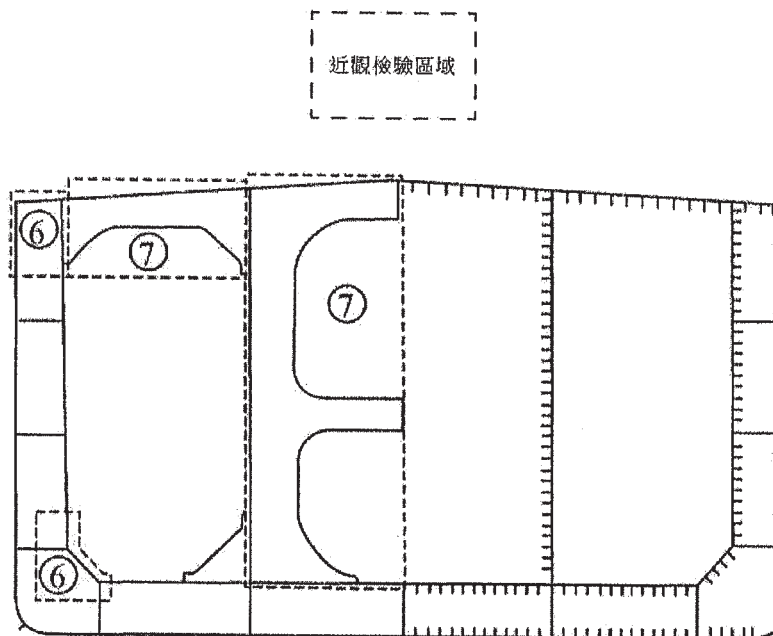
厚度測量 - 雙殼油船

應進行近觀檢驗和測厚的區域 - 附則 1 中界定的 (1) 至 (5) 區域 - 應在相應的 TM3-DHT、TM4-DHT 和 TM5-DHT 中報告的厚度。



厚度測量 - 雙殼油船

應進行近觀檢驗和測厚的區域 - 附則 1 中界定的 (6) 至 (7) 區域 - 應在相應的 TM3-DHT 和 TM4-DHT 中報告的厚度。



附件 11

與油船加強檢驗計劃有關的技術評估導則

換證檢驗

1 引言

本導則包含與技術評估有關的資料和建議，可結合油船換證檢驗的計劃加以使用。如 5.1.5 所示，本導則是一套建議的方法，在認為必要和適當時，可由主管機關決定，結合制定所要求的檢驗計劃予以施用。

2 目的和原則

2.1 目的

本導則所述的技術評估應有助於確定臨界結構區域、指定可疑區域，並把注意力放在那些極易發生損耗或損壞、或表明有損耗或損壞史的結構件或結構件區域。該資料可能有助於指定要進行測厚、近觀檢驗和液艙試驗的位置、區域和液艙。

2.2 最低要求

本導則不可用於降低附件 1、2 和 3 中分別對近觀檢驗、測厚和液艙試驗的要求，這些要求在任何情況下都應作為最低要求予以遵守。

2.3 時限

如同檢驗計劃的其他方面一樣，本導則所述的技術評估應由船東或經營人配合主管機關，在換證檢驗開始之前完成，即在開始檢

驗之前且通常在到期檢驗完成之日前至少 12 至 15 個月。

2.4 應予考慮的方面

特定船舶下列方面的技術評估可作為指定檢驗液艙和區域的基礎，這些技術評估可包括對相關可能蝕耗的風險進行定量或定性評估：

- .1 設計特徵，如不同結構組件的應力等級、設計細節和高強度鋼（HTS）的使用範圍；
- .2 與特定船舶及類似船舶（如有）的腐蝕、裂紋、屈曲、凹陷和修理有關的過去史；和
- .3 與所載貨物類型、貨油/壓載的不同液艙的使用、液艙保護以及塗層（如有）狀況有關的資料。

對各種結構件和區域易損壞或易蝕耗的相關風險的技術評估，應根據諸如參考資料 1 和 2 所列的經認可原則和慣例進行評判和確定。

3 技術評估

3.1 總則

3.1.1 有三種基本類型的可能缺陷，它們可能成為與檢驗計劃有關的技術評估對象，即腐蝕、裂紋和屈曲。碰撞損壞通常不包含在檢驗計劃中，因為凹陷通常在備忘錄中註明且由驗船師作為常規情況進行處理。

3.1.2 結合檢驗計劃過程開展的技術評估，原則上應按圖 1 的圖解形式表示，該圖表示如何結合檢驗計劃程序進行技術評估。該方法的

依據是對基本上與設計和腐蝕有關的知識和經驗的一種風險評估。

3.1.3 應考慮到設計中有關容易因振動、高應力或疲勞造成屈曲或裂紋的結構細節。

3.1.4 腐蝕與老化過程有關，並且與新船防腐系統的質量和營運中的後續維護密不可分。腐蝕也可導致裂紋和/或屈曲。

3.2 方法

3.2.1 設計細節

3.2.1.1 本船及姐妹船和/或類似船舶（如有）的損壞經歷，是計劃過程中使用的主要資料來源。此外，還應包括從設計圖紙中選擇的結構細節。應考慮的典型損壞經歷包括：

- .1 裂紋的數量、範圍、位置和發生次數；和
- .2 屈曲位置。

3.2.1.2 該資料可在檢驗報告和/或船東檔案中包括船東自查結果中找到。這些缺陷應予以分析、註明並標記在草圖上。

3.2.1.3 此外，還應利用一般經驗。例如，應參照參考資料 1，其中包括各種油船結構細節的典型損壞和所建議的修理方法目錄。

3.2.1.4 在使用此種圖表時，應一道審核主要結構圖紙，以比對實際結構，並查找易受損壞的相似細節。圖 2 所示是一個實例。特別是，參考資料 1 的第 3 章涉及針對雙殼油船的各個方面，如應力集中部位、建造時未對中、腐蝕趨勢、疲勞因素和需特別關注的區域，這些都應在制定檢驗計劃時予以考慮。

3.2.1.5 除使用上述圖表外，審核主要結構圖紙還應包括校核已出現過裂紋的典型設計細節。應仔細考慮造成損壞的因素。

3.2.1.6 高強度鋼（HTS）的使用是一個重要因素。在使用普通低碳鋼時有着良好營運史的構件，在使用高強度鋼及其較高相關應力時，可能更易受損。甲板和船底結構的縱向材料使用高強度鋼的經驗普遍和總體上較好。在其他受到較高動應力的部位如舷側結構，使用高強度鋼的經驗則不那麼令人鼓舞。

3.2.1.7 在這一方面，根據相關方法對典型和重要的組件及構件的應力計算可能證明有用，並應予以考慮。

3.2.1.8 所選擇的在該過程中確定的結構區域應予以記錄，並標記在將要納入檢驗計劃的結構圖上。

3.2.2 腐蝕

3.2.2.1 為評估相關的腐蝕風險，通常應考慮以下資料：

- .1 液艙和處所的使用狀況；
- .2 塗層狀況；
- .3 陽極狀況；
- .4 掃艙程序；
- .5 以前腐蝕損壞；
- .6 貨油艙用作壓載艙的時間；
- .7 腐蝕風險方案（見參考資料 2，表 2.1）；和
- .8 加熱液艙的位置。

3.2.2.2 參考資料 2 以典型狀況圖給出明確實例，其可用於判定和描述塗層狀況。

3.2.2.3 腐蝕風險的評估應基於參考資料 2，以及船齡和為制定檢驗計劃而收集的資料推測出的船舶狀況的相關資料。

3.2.2.4 應列出各種液艙和處所相應指明的腐蝕風險。應特別注意雙殼油船極易受腐蝕的區域。為此，應考慮參考資料 1 的 3.4（腐蝕趨勢）中專門針對雙殼油船腐蝕方面的表述。

3.2.3 近觀檢驗和測厚的位置

3.2.3.1 根據腐蝕風險表和設計經驗的評估，可指定初次近觀檢驗和測厚（剖面）的位置。

3.2.3.2 通常應指定已判定具備最大腐蝕風險的液艙和處所內的測厚剖面。

3.2.3.3 最初應根據最大腐蝕風險指定進行近觀檢驗的液艙和處所，並應始終包括壓載艙。選擇的原則是隨船齡的增長或在資料缺乏或不可靠時增大範圍。

參考資料

1 油船結構合作論壇（TSCF），“雙殼油船結構檢查和維護導則，1995”。

2 油船結構合作論壇（TSCF），“油船結構指導手冊，1997”。

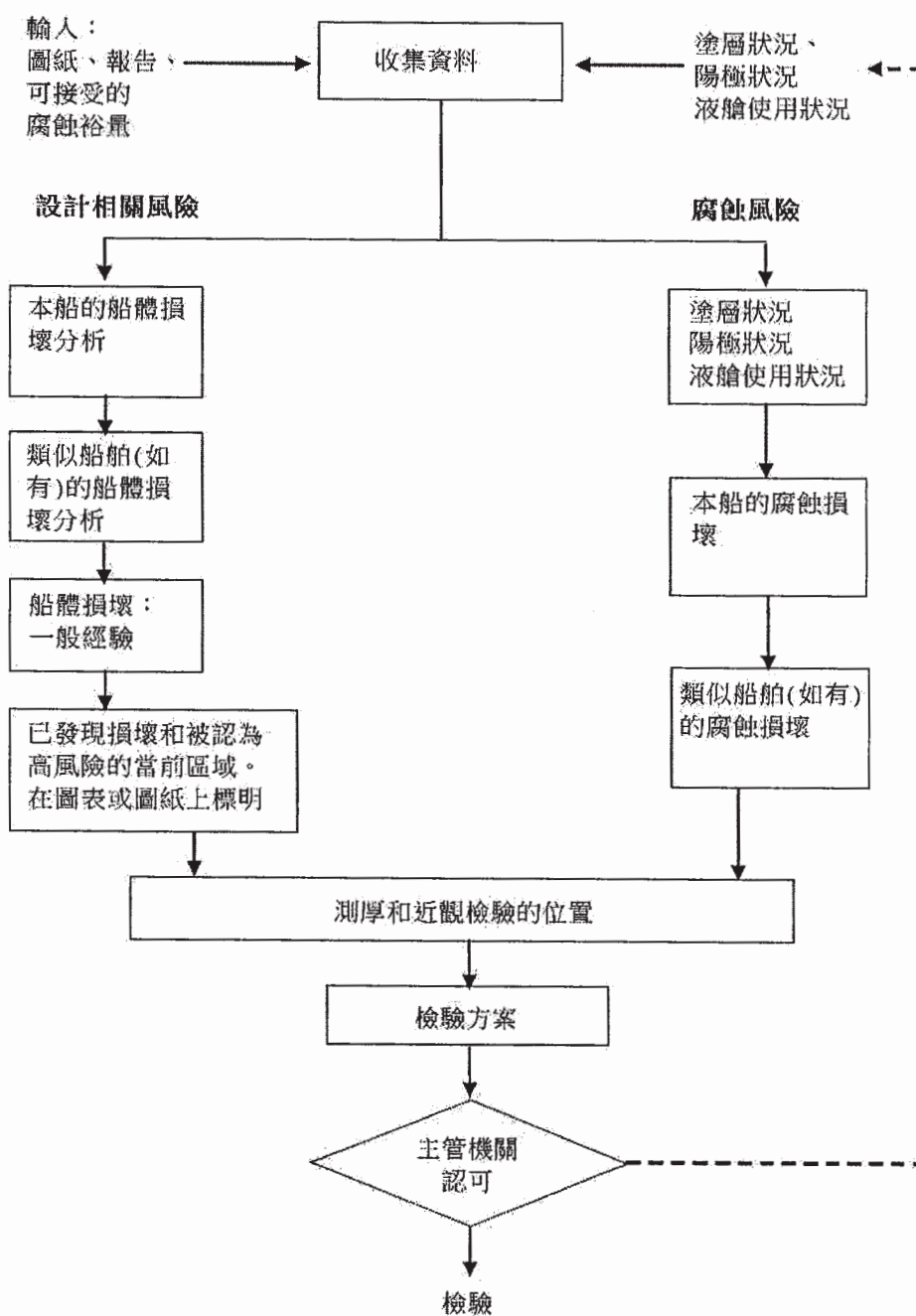


圖1 – 技術評估和檢驗計劃過程

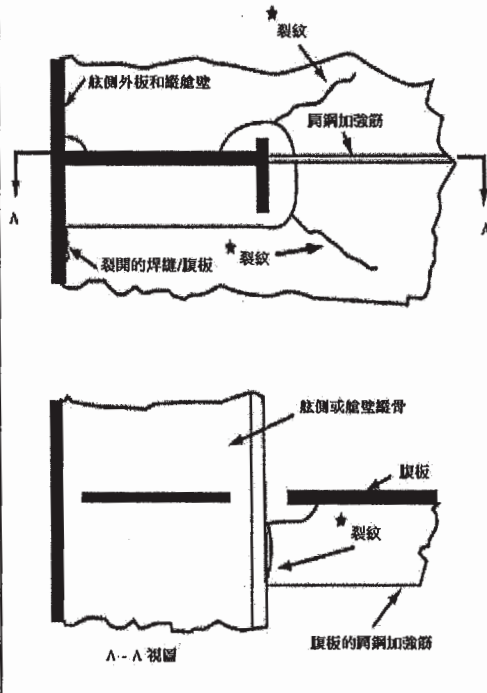
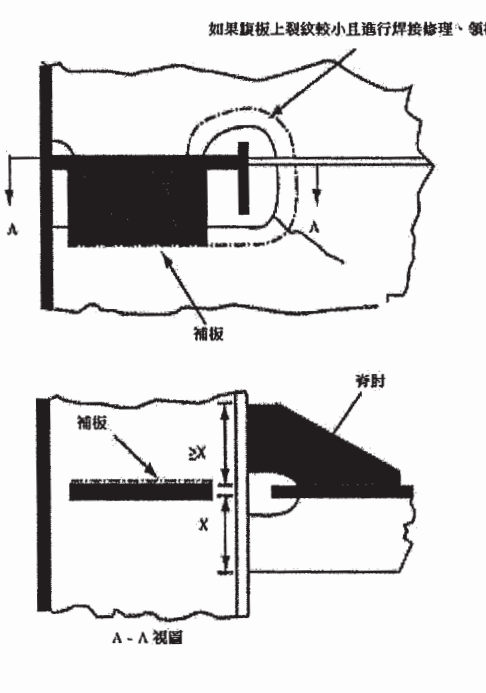
位置：縱骨與橫框架的連接		
例1：縱向扶強材連接切口處腹板和扁鋼裂紋		
典型損壞		建議修理
 註：可能出現一處或多處裂紋		如果腹板上裂紋較小且進行焊接修理、領板  腹板扁鋼割換並部分換新或予以焊補
造成損壞的因素： 1. 扁鋼扶強材的不對稱連接導致疲勞載荷下扶強材根部處產生高應力。 2. 縱骨與腹板的連接面積不足。 3. 板厚周邊包焊處的焊縫有缺陷。 4. 應力集中區域有高度局部腐蝕，如扁鋼扶強材連接處、縱骨切口處角隅，以及腹板與船體連接切口處。 5. 橫向腹板處應力集中。 6. 動力波浪載荷/船舶運動。		
圖1	油船結構合作論壇 主題：結構細節的目錄	圖1

圖2 - 典型損壞和修理示例（根據參考資料2複製）

附件 12

油船船體樑總縱強度衡準

1 總則

1.1 本衡準應按 8.1.2 要求，用於船體樑總縱強度的評估。

1.2 為使所評估的船舶總縱強度能被承認為有效，縱向內部構件和船體外板之間的角焊縫應處於良好狀況，以保持船體外板與縱向內部構件的完整性。

2 總縱強度的評估

對船長 130m 及以上且船齡在 10 年以上的油船，應在“貨船構造安全證書”或“貨船安全證書”的換證檢驗（SC 換證檢驗）期間，酌情以測得、換新或加強的結構件厚度為基礎，按本附件的要求對船體樑總縱強度進行評估。船體樑總縱強度的狀況評估應根據附錄 3 中規定的方法確定。

2.1 甲板和底部折板船體樑橫剖面面積的計算

2.1.1 應在 SC 換證檢驗期間，酌情利用測得、換新或加強的結構件厚度，對甲板折板（甲板板和甲板縱骨）以及底部折板（船底板和船底縱骨）船體樑的橫剖面面積進行計算。

2.1.2 如甲板或底部折板的橫剖面面積減小量超過其各自的建造面積（即船舶建造時的原始剖面面積）的 10%，則應採取下列任一措施：

- .1 對甲板或底部折板進行換新或加強，以使實際剖面面積不小於建造面積的 90%；或

- .2 在 SC 換證檢驗期間，酌情利用測得、換新或加強的結構件厚度，應用附錄 1 中規定的計算方法計算船體樑的橫剖面的實際剖面模數 (Z_{act})。

2.2 船體樑橫剖面模數的要求

2.2.1 根據 2.1.2.2 計算的船體樑橫剖面實際剖面模數應根據適用情況符合下列任一要求：

- .1 對於 2002 年 7 月 1 日或以後建造的船舶，根據 2.1.2.2 計算的船體樑橫剖面實際剖面模數 Z_{act} 應不小於主管機關確定的減小極限值，同時考慮到本組織通過的建議案；
或
- .2 對於 2002 年 7 月 1 日以前建造的船舶，只要 Z_{act} 在任何情況下不小於附錄 2 中規定的最小剖面模數的減小極限值，則根據 2.1.2.2 要求計算的船體樑橫剖面實際剖面模數 Z_{act} 應符合主管機關或認可的船級社要求的營運船舶最小剖面模數衡準。

附錄 1

船體樑船中剖面的剖面模數計算標準

- 1 在計算船體樑橫剖面模數時，應考慮到所有縱向連續強力構件的剖面面積。
- 2 對較大開口，即長度超過 2.5m 或寬度超過 1.2m 以及採用扇形焊接的扇形孔，應始終在剖面模數計算中扣除其剖面面積。
- 3 對較小開口（人孔、減輕孔、焊縫處的單個扇形孔等），只要其寬度或陰影區寬度在一個橫剖面上的總和所減小的甲板或船底剖面模數不超過 3%，且縱骨和縱向桁材上減輕孔、流水孔和焊縫處單個扇形孔的高度不超過腹板高度的 25%（但對扇形孔深度最大不超過 75mm），則不必扣除其剖面面積。
- 4 較小開口寬度總和在一個橫剖面上小於船底或甲板區域的 $0.06(B-\Sigma b)$ （ B =船寬， Σb =較大開口的總寬度），可視作等同於上述剖面模數的減小。
- 5 投影區域將通過畫兩條為 30°角的切線獲得。
- 6 甲板剖面模數與舷側型甲板線有關。
- 7 船底剖面模數與基線有關。
- 8 如得到縱艙壁或高腹板桁材的有效支持，連續凸形甲板和連續縱向艙口圍板應包含在縱向構件剖面面積中。甲板剖面模數應通過慣性力矩除以下列距離求得，但此距離應大於到舷側甲板邊線的距離：

$$y_i = y \left(0.9 + 0.2 \frac{x}{B} \right)$$

式中：

y = 中和軸至連續強力構件頂點的距離；

x = 連續強力構件頂點至船體中心線的距離；

x 和 y 應在 y_t 最大值處測量。

- 9 多艙口間的縱桁將通過特殊計算予以考慮。

附錄 2

營運船舶最小總縱強度的減小極限值

- 1 營運油船的最小剖面模數 (Z_{mc}) 的減小極限值由下列公式得到：

$$Z_{mc} = cL^2 B (C_b + 0.7)k \text{ (cm}^3\text{)}$$

式中：

L = 船長。 L 係指在夏季載重線上首柱前緣至舵柱後緣，或如無承舵柱時至舵桿中心的距離，m。 L 應不小於夏季載重線總長的 96%，且不必大於 97%。對於特殊船艙和船艙布置的船舶， L 可予以特殊考慮。

B = 最大型寬，m。

C_b = 基於 L 和 B 及相應於夏季載重線吃水 d 的型方形係數。 C_b 應取不小於 0.6。

$$C_b = \frac{d \text{ 吃水的型排水量(m}^3\text{)}}{LBd}$$

$$c = 0.9c_n$$

$$c_n = 10.75 - \left(\frac{300-L}{100}\right)^{1.5}, \text{ 對 } 130 \text{ m} \leq L \leq 300 \text{ m}$$

$$c_n = 10.75, \text{ 對 } 300 \text{ m} \leq L \leq 350 \text{ m}$$

$$c_n = 10.75 - \left(\frac{L-350}{150}\right)^{1.5}, \text{ 對 } 350 \text{ m} \leq L \leq 500 \text{ m}$$

k = 材料係數，如：

k = 1.0，對屈服應力為 235 N/mm² 及以上的低碳鋼；

k = 0.78，對屈服應力為 315 N/mm² 及以上的高強度鋼；

k = 0.72，對屈服應力為 355 N/mm² 及以上的高強度鋼。

2 上述 1 中基於剖面模數要求的船體樑所有縱向連續構件尺寸應保持在船中 $0.4L$ 範圍內。但在特殊情況下，考慮到船舶種類、船型和裝載條件，該尺寸可向船中 $0.4L$ 區域的兩端逐漸減小，但不應影響船舶的裝載適應性。

3 但是，上述標準可能不適用於特殊船型或特殊設計的船舶，如特殊主要比例和/或重量分布的船舶。

附錄 3

總縱強度評估和修理方法的測厚取樣方法

1 總縱強度評估範圍

如果船體樑長度包含了壓載艙和貨油艙，總縱強度評估應在船中 $0.4L$ 範圍內；如果鄰近的壓載艙和貨油艙延伸至船中 $0.4L$ 之外，總縱強度評估應在船中 $0.5L$ 範圍內。

2 厚度測量的取樣方法

2.1 按照第 2.5 節的要求，應選擇橫剖面以對儘可能多的腐蝕環境中的不同液艙進行厚度測量，例如與裝有加熱盤管的貨油艙同處一個共同界面的壓載艙、其他壓載艙、允許注入海水的貨油艙和其他貨油艙。如有，應選擇與裝有加熱盤管的貨油艙同處一個共同界面的壓載艙和允許注入海水的油艙。

2.2 應按照附件 2 對橫剖面的最低數量進行取樣。橫剖面應位於懷疑會產生，或從 2.3 規定的甲板板和船底板測量中已發現的，最大厚度縮減的區域，並應在已進行局部換新或加強的區域之外。

2.3 在貨物區域內應按照附件 2 的要求測量的每塊甲板板和（或）船底板上，應至少測量兩個點。

2.4 在按照附件 2 的要求測量的每個橫剖面的甲板和船底的 $0.1D$ （ D 為船舶型深）範圍內，應在腹板和面板上測量每根縱骨和縱桁，並應在縱骨之間測量每塊板的一個點。

2.5 對於除 2.4 規定的按照附件 2 的要求在每個橫剖面處進行測量者外

的縱向構件，應在腹板和面板上測量每根縱骨和縱桁，並在每塊列板的每塊板上至少測量一個點。

2.6 每一構件的厚度應通過每一構件上橫剖面處所有測量值的平均值來確定。

3 總縱強度不足時的附加測量

3.1 如果按照本附件中的總縱強度要求，發現一個或一個以上的橫剖面有缺陷，應增加進行厚度測量的橫剖面數量以使船中 $0.5L$ 區域內的每個液艙均已取樣。對部分在 $0.5L$ 區域內但延伸至 $0.5L$ 區域外的液艙處所也應進行取樣。

3.2 在每個修理區域前部的一個橫剖面 and 每個修理區域後部的一個橫剖面上也應進行附加的厚度測量，該厚度測量的範圍應足以確保鄰近修理剖面的區域也符合本規則的要求。

4 有效的修理方法

4.1 為滿足本附件要求而進行的換新或加強應符合 4.2。

4.2 經換新或加強的結構件的最小連續長度應不小於該處主要構件間距的兩倍。此外，更換的構件（板、扶強材、樑腹板和折板等）前部和後部的每個連接件對接處的厚度減小應不在顯著腐蝕範圍（相關的每一特定構件允許縮減量的 75%）以內。如果對接處的厚度差超過較小厚度的 15%，應採取厚度平穩過渡。

4.3 涉及設置覆板或改變結構件的替代修理方法應經特殊考慮。在考慮設置覆板時，應限於下列情況：

- .1 恢復和/或增加總縱強度；

- .2 應加強的甲板或船底板的厚度減小應不在顯著腐蝕範圍（相關甲板板的允許縮減量的 75%）以內；
 - .3 定位和布置，包括覆板的終止應按照主管機關認可的標準進行；
 - .4 覆板連續至船中整個 $0.5L$ 的長度範圍；和
 - .5 對接焊中採用連續填角焊和全焊透焊縫，並根據覆板的長度採用塞焊。採用的焊接工藝應令主管機關滿意。
- 4.4 考慮到抗皺折力和縱向構件和外板之間的焊接狀況，鄰近更換區域且與安裝的覆板相連的現有結構應能承受施加的載荷。

B 部分

除雙殼油船外的油船檢驗期間加強檢驗計劃規則

1 總則

1.1 適用範圍

1.1.1 本規則應適用於附件 B 的 A 部分中 1.2.1 所界定的、所有除雙殼油船外的 500 總噸及以上的自航式油船。

1.1.2 本規則應適用於貨物區域內的貨油艙、泵艙、隔離艙、管隧和空艙以及所有壓載艙處的船體結構和管路系統的檢驗。

1.1.3 本規則包含檢查、測厚和液艙壓力試驗的最小範圍。在發現顯著腐蝕和/或結構缺陷時，應擴大檢驗範圍，並包括必要時進行附加近觀檢驗。

1.1.4 應在公約第 I/10 條規定的檢驗期間進行檢驗。

1.2 定義

1.2.1 壓載艙係指僅用於海水壓載的液艙。

1.2.2 貨油/壓載兼用艙：如在本規則提及，係指作為船舶運營的常規部分，用於運載貨油或壓載水並被視作壓載艙的液艙。對於按照《防污公約》第 I/18.3 條規定僅在例外情況下可以裝載壓載水的貨油艙，應視作貨油艙。

1.2.3 全面檢驗係指用於報告船體結構整體狀況和確定附加近觀檢驗範圍的檢驗。

1.2.4 近觀檢驗係指驗船師在近距離目視範圍內（即通常伸手可及）對結構件細節進行的檢驗。

1.2.5 橫剖面係指垂直於船舶中線的船體橫剖面，包括所有板材等縱向構件，以及在甲板、舷側外板、船底板、內底板以及縱艙壁上的縱骨和縱桁。

1.2.6 代表性液艙係指能反映相似類型和用途並具有類似防腐蝕系統的其他液艙。當選擇代表性液艙時，應考慮到其營運和修理史，以及可識別的臨界結構區域和/或可疑區域。

1.2.7 可疑區域係指呈現顯著腐蝕和/或驗船師認為易於快速損耗的區域。

1.2.8 顯著腐蝕係指通過腐蝕狀況評估表明其腐蝕量超過許用裕量的 75%但尚處於可接受範圍內的腐蝕程度。

1.2.9 防腐系統通常可考慮全硬保護塗層。硬保護塗層通常係指環氧樹脂塗層或同等物。既非軟塗層亦非半硬塗層的其他塗層系統，如按生產廠的技術說明書進行敷設和維護，可考慮作為替代品接受。

1.2.10 塗層狀況定義如下：

“良好” 係指僅有少量點狀鏽斑；

“尚好” 係指在扶強材的邊緣和焊縫的連接處塗層有局部脫落和/或所檢驗的區域中有超過 20%或更大範圍的輕度鏽蝕，但小於定義“差”的狀況；

“差” 係指在檢驗的區域中有超過 20%或更大範圍的塗層普遍剝落，或有 10%或更大範圍的塗層產生硬質鏽

皮。

1.2.11 臨界結構區域係指從計算中或從該船舶或類似船舶或姐妹船的營運歷史中認定並需要進行檢測的、容易發生影響船舶結構整體性的破裂、屈曲或腐蝕的區域。

1.2.12 貨物區域係指船上包含貨油艙、污油艙和貨油/壓載泵艙、相鄰貨油艙的隔離空艙、壓載艙和空艙處所的部分，以及前述處所上方的船舶這一部分的整個長度和寬度範圍內的甲板區域。

1.2.13 中間檢驗係指在第二或第三次年度檢驗進行的檢驗。

1.2.14 及時徹底修理係指在檢驗期間完成的並使驗船師滿意的永久性修理，旨在消除需要批註的任何相關船級條件或遺留項目。

1.2.15 特殊考慮（與近觀檢驗和測厚有關）係指進行足夠的近觀檢查和測厚以確定塗層以下結構的實際平均狀況。

1.3 修理

1.3.1 任何與超過允許極限的結構蝕耗有關的損壞（包括屈曲、凹槽、脫開或斷裂）或大面積區域的蝕耗超過允許極限，若影響或主管機關認為將影響船舶的結構、水密或風雨密完整性，均應進行及時徹底修理。應考慮的區域包括：

- .1 舷側肋骨，其端部附件或鄰接的舷側外板；
- .2 甲板結構和甲板板；
- .3 船底結構和船底板；
- .4 水密或油密艙壁；和

.5 艙蓋和艙口圍板，如安裝在兼裝船上。

在不能提供足夠修理設施的區域，主管機關可允許船舶直接駛往某一修理點。這可能要求船舶為該修理航次卸下貨物和/或進行臨時性修理。

1.3.2 此外，在檢驗發現腐蝕或結構缺陷時，只要主管機關認為其中之一將影響船舶繼續營運，船舶應在繼續營運前採取補救措施。

1.4 驗船師

對 20,000 載重噸及以上的油船，應由兩名驗船師聯合執行在其船齡超過 10 年後的第一次計劃的換證檢驗（即第三次換證檢驗），以及其後的所有換證和中間檢驗。如由被認可組織進行檢驗，則這些驗船師應為該被認可組織專職聘用的。

1.5 厚度測量與近觀檢驗

在任何檢驗中，即在換證檢驗、中間檢驗、年度檢驗或與這些檢驗範圍相同的其他檢驗中，對需要實施近觀檢驗的結構區域的測厚應與近觀檢驗同時進行。

2 換證檢驗

2.1 總則

2.1.1 換證檢驗可在第四次年度檢驗時開始，並可在其後一年中繼續進行，以在第五個周年日前完成。

2.1.2 檢驗計劃作為換證檢驗準備的一部分，應在換證檢驗前制定。厚度測量不應放在第四次年度檢驗之前進行。

2.1.3 除年度檢驗的要求外，檢驗還應包括足夠範圍的檢查、試驗和核查，以確保船體以及 2.1.5 所要求的相關管路處於合格狀況，並適合貨船構造安全證書新的有效期內其預定的用途，同時應進行適當的維護作業及到期接受各種定期檢驗。

2.1.4 所有貨油艙、壓載艙和貨物區域內構成船體結構的任何其他液艙、泵艙、管隧、隔離艙和鄰接貨油艙的空艙、甲板和外板都應進行檢查，這種檢查應輔以 2.5 和 2.6 所要求的厚度測量和試驗，以確保該結構的完整性保持有效。該檢查的目的旨在發現可能存在的顯著腐蝕、嚴重變形、斷裂、破損或其他結構蝕耗。

2.1.5 甲板上的貨油管路，包括原油洗艙（COW）管路，以及上述液艙和處所內的貨油管路和壓載管路應予以檢查，並在現場驗船師認為滿意的工作壓力下進行操作試驗，以確保其密性和狀況保持合格狀態。應特別注意貨油艙內的壓載管路和壓載艙及空艙內的貨物管路情況，在修理期間當該管路（包括閥和附件）處於開啟狀態並可進行內部檢查時，應隨時通知驗船師。

2.1.6 對兼裝壓載/貨油艙的檢驗範圍，應根據以前的壓載記錄和提供的防腐系統予以評估。

2.2 乾塢檢驗

2.2.1 乾塢檢驗應作為換證檢驗的一部分。在貨船構造安全證書的五年期內應對船底外部至少進行兩次檢查。在所有情況下，船底檢查的最大間隔期不應超過 36 個月。

2.2.2 對船齡為 15 年及以上的船舶，應在乾塢進行船底外部檢查。對船齡小於 15 年的船舶，其未與換證檢驗一起進行的船底外部檢查，

作為替代，可在船舶漂浮狀態下進行檢查。船舶在漂浮狀態下的檢查只有在船況令人滿意並具有合適的設備和合格人員時才能進行。

2.2.3 如乾塢檢驗未與換證檢驗一起完成，或如 2.2.1 中所述的 36 個月的最大間隔期未予滿足，則貨船構造安全證書應停止有效，直至乾塢檢驗完成。

2.2.4 如對貨油艙和壓載艙下部的全面檢驗、近觀檢驗和厚度測量（如適用）尚未實施，則應按換證檢驗的適用要求進行。

註：貨油艙和壓載艙下部係指輕壓載水線以下的部分。

2.3 液艙防腐系統

如設有貨油艙防腐系統，應檢查其狀況。如存在下列情況之一，應在隨後每年檢查壓載艙：

- .1 從建造之時就未敷設硬保護塗層；或
- .2 已敷設軟塗層或半硬塗層；或
- .3 在艙內發現顯著腐蝕，或；
- .4 發現硬保護塗層未達到“良好”狀況，且該塗層未進行令驗船師滿意的修補。如驗船師認為必要，應進行測厚。

2.4 全面和近觀檢驗範圍

2.4.1 在換證檢驗時應對所有液艙和處所進行一次全面檢驗。應檢查以前檢驗中確定的可疑區域。

2.4.2 在換證檢驗時近觀檢驗的最低要求見附件 1。

2.4.3 驗船師在考慮到檢驗時液艙的維護、防腐系統的狀況以及下

列情況的同時，可根據需要擴大近觀檢驗的範圍：

- .1 尤其是根據可獲得的資料其結構布置或構件曾在類似液艙中或類似船舶上出現過缺陷的液艙；和
- .2 具有與主管機關認可的防腐系統相關的尺度減小結構的液艙。

2.4.4 對於查明硬保護塗層處於 1.2.10 界定的“良好”狀況的液艙內區域，主管機關可對按附件 1 要求的近觀檢驗範圍予以特殊考慮。

2.5 厚度測量範圍

2.5.1 在換證檢驗時厚度測量的最低要求見附件 2。

2.5.2 顯著腐蝕的區域擴大的厚度測量按附件 4 的規定進行，並可在 5.1 要求的檢驗計劃中作出附加規定。該擴大的測厚應在檢驗完成之前進行。以前檢驗中確定的可疑區域應進行測厚。

2.5.3 驗船師可根據需要進一步擴大厚度測量的範圍。

2.5.4 對於查明硬保護塗層處於 1.2.10 所界定的“良好”狀況的液艙內區域，按附件 2 要求的厚度測量範圍可由主管機關予以特殊考慮。

2.5.5 測厚的橫剖面應選擇在懷疑發生最大縮減或經甲板板測厚揭示的最大縮減處。

2.5.6 如需要測量兩個或三個橫剖面，則至少應有一個橫剖面位於船中 $0.5L$ 範圍內的壓載艙。對於船長 130m 及以上（船長定義參見現行《國際載重線公約》）且船齡在 10 年以上的油船，如需要按 8.1.2 進行總縱強度的評估，測厚的取樣方式見附件 12 的規定。

2.6 液艙壓力試驗範圍

- 2.6.1 在換證檢驗期時液艙壓力試驗的最低要求見附件 3。
- 2.6.2 驗船師可根據需要擴大液艙壓力試驗的範圍。
- 2.6.3 對壓載艙邊界進行試驗的液體壓頭應至空氣管頂部。
- 2.6.4 對貨油艙邊界進行的試驗應至其各種服務狀態下液體可能上升的最高點。

3 年度檢驗

3.1 總則

年度檢驗應由旨在盡實際可行確保船體和管路處於合格狀態的檢查所構成，還應考慮到營運記錄、壓載艙防腐系統狀況和範圍以及檢驗報告案卷中確定的區域。

3.2 船體檢查

- 3.2.1 凡可見的船殼板及其關閉裝置均應進行檢查。
- 3.2.2 對水密貫穿件應盡實際可行地進行檢查。

3.3 露天甲板檢查

- 3.3.1 檢查貨油艙開口，包括墊圈、艙蓋板、艙口圍板和防火網。
- 3.3.2 檢查貨油艙壓力/真空閥和防火網。
- 3.3.3 檢查所有燃料艙透氣管上的防火網。
- 3.3.4 檢查貨油、原油洗艙、燃料艙和透氣管系，包括透氣桅和集管。

3.4 貨泵艙和管隧（如設有）檢查

3.4.1 檢查所有泵艙艙壁是否有漏油或裂紋的痕跡，特別是泵艙艙壁的所有貫穿件密封布置。

3.4.2 檢查所有管系和管隧的狀況。

3.5 壓載艙檢查

3.5.1 如由於換證檢驗和中間檢驗的結果而有要求，應對壓載艙進行檢查。在主管機關認為必要或發現大量腐蝕時，應進行測厚。

3.5.2 如發現 1.2.8 界定的顯著腐蝕，則應按附件 4 的要求增加測厚範圍。該擴大的測厚應在檢驗完成之前進行。應檢查以前檢驗中確定的可疑區域。以前檢驗中確定的顯著腐蝕區域應進行測厚。

4 中間檢驗

4.1 總則

4.1.1 對年度檢驗要求以外的附加項目，可在第二次或第三次年度檢驗時或其之間進行檢驗。

4.1.2 貨油艙和壓載艙的檢驗範圍取決於船齡，見 4.2、4.3 和 4.4 的規定。

4.1.3 應儘可能檢查露天甲板上的貨油管系、原油洗艙管系、燃油管系、壓載管系、蒸汽管系和透氣管系統以及透氣桅和集管。如檢查後對管系狀況有懷疑，可要求對該管系進行壓力試驗或（和）測厚。

4.1.4 中間檢驗和換證檢驗所要求的處所的檢驗和測厚不應相互替代。

4.2 船齡 5 至 10 年的油船

4.2.1 4.1.3 的要求適用。

4.2.2 應檢查所有壓載艙。在主管機關認為必要時，應進行測厚和試驗，以確保該結構的完整性保持有效。

4.2.3 如存在下列情況之一，應在隨後的每年檢查壓載艙：

- .1 從建造之時就未敷設硬保護塗層；或
- .2 已敷設軟塗層或半硬塗層；或
- .3 在艙內發現顯著腐蝕，或；
- .4 發現硬保護塗層未達到“良好”的狀況，且該塗層未進行令驗船師滿意的修補。

4.2.4 除上述要求之外，還應對上次檢驗中確定的可疑區域進行檢查。

4.3 船齡 10 至 15 年的油船

4.3.1 中間檢驗的要求應與 2 和 5.1 要求的上次換證檢驗的範圍相同。但是，除非主管機關認為必要，可不要求進行貨油艙和壓載艙的壓力試驗和 8.1.2 規定油船船體樑總縱強度評估。

4.3.2 在應用 4.3.1 時，中間檢驗可在第二次年度檢驗時開始，並可在其後一年中繼續進行，以在第三次年度檢驗時完成，替代應用 2.1.1。

4.3.3 在應用 4.3.1 時，水下檢驗可予以考慮，以替代 2.2 的要求。

4.4 船齡超過 15 年的油船

4.4.1 中間檢驗的要求應與 2 和 5.1 要求的上次換證檢驗的範圍相同。但是，除非主管機關認為必要，可不要求進行貨油艙和壓載艙的壓力試驗和 8.1.2 規定的油船船體樑總縱強度評估。

4.4.2 在應用 4.4.1 時，中間檢驗可在第二次年度檢驗時開始，並可在其後一年中繼續進行，以在第三次年度檢驗時完成，替代應用 2.1.1。

4.4.3 在應用 4.4.1 時，乾塢檢驗應作為中間檢驗的一部分。如對貨油艙和水壓載艙下部的全面檢驗、近觀檢驗和測厚（如適用）尚未實施，則應按中間檢驗的適用要求進行。

註：貨油艙和壓載艙下部係指輕壓載水線以下的部分。

5 檢驗前準備

5.1 檢驗計劃

5.1.1 船東應與主管機關或經主管機關認可的組織合作，在以下檢驗的任何部分開始前制定具體的檢驗計劃：

- .1 換證檢驗；和
- .2 船齡 10 年以上的油船的中間檢驗。

中間檢驗的檢驗計劃可由經上次換證檢驗所作狀況評估報告補充的檢驗計劃以及隨後的相關檢驗報告組成。制定檢驗計劃應考慮自上一次換證檢驗後對檢驗要求的任何修正。檢驗計劃應根據附件 6A 中的資料以書面形式制定。只有在制定檢驗計劃後才能開始進行檢驗。

5.1.1.1 在制定檢驗計劃前，船東應根據附件 6B 中的資料填寫檢驗

計劃調查表，並送交主管機關。

5.1.2 在制定檢驗計劃時，應搜集和查閱下列文件用以選擇要進行檢查的液艙、區域和結構件：

- .1 檢驗現狀和基本的船舶資料；
- .2 6.2 和 6.3 中所述的船上文件；
- .3 貨油艙和壓載艙主結構圖（尺寸圖），包括有關使用高強度鋼（HTS）的資料；
- .4 按附件 9 要求的狀況評估報告；
- .5 以前相關的破損和修理記錄；
- .6 來自被認可組織和船東兩方面的以前相關的檢驗和檢查報告；
- .7 過去三年的貨物和壓載記錄，包括加熱狀態下的貨物運輸；
- .8 惰性氣體裝置和液艙清潔程序詳細資料；
- .9 自船舶建造以來對貨油艙和壓載艙進行改建或改裝的資料和其他相關數據；
- .10 塗層和防腐系統（如有）的說明和記錄，包括陽極和以前的人級說明；
- .11 過去三年中船東對結構總體損耗、液艙邊界和管路滲漏以及塗層和包括陽極在內的防腐系統（如有）狀況進行的檢查。見附件 5 中的報告指南；

- .12 營運期間有關的維護保養等級的資料，包括含船體相關缺陷的港口國監督檢查報告、安全管理系統與船體保養有關的不合格項，包括相關的糾正措施；和
- .13 任何有助於確定可疑和臨界結構區域的其他信息。

5.1.3 提交的檢驗計劃應說明並至少符合 2.6 及附件 1、附件 2 和附件 3 分別對近觀檢驗、厚度測量和液艙試驗的要求，並應至少包括下列相關資料：

- .1 基本的船舶資料和概況；
- .2 貨油艙和壓載艙主結構圖（尺寸圖），包括有關使用高強度鋼（HTS）的資料；
- .3 液艙圖；
- .4 附有塗層的使用、防腐蝕系統和狀況資料的液艙明細表；
- .5 檢驗條件（如：有關液艙清潔、除氣、通風、照明等的資料）；
- .6 結構通道的設置和方法；
- .7 檢驗設備；
- .8 確定進行近觀檢驗的液艙和區域（見 2.4）；
- .9 確定進行測厚的區域和剖面（見 2.5）；
- .10 確定進行液艙試驗的艙（見 2.6）；
- .11 確定測厚公司；

.12 與該船舶有關的損壞經歷。

.13 臨界結構區域和可疑區域，如相關。

5.1.4 主管機關將通知船東適合於該船舶的可接受的最大限度結構蝕耗。

5.1.5 也可使用附件 11 中與液貨船加強檢驗計劃有關的技術評估導則。該導則是一套建議的方法，在認為必要和適當時，可由主管機關決定，結合制定所要求的檢驗計劃予以施用。

5.2 檢驗條件

5.2.1 船東應為安全進行檢驗提供必要的設施。

5.2.1.1 為使現場驗船師能進行檢驗，船東和主管機關應商定合適和安全的通道裝置。

5.2.1.2 檢驗計劃調查表中應提供通道細節。

5.2.1.3 如現場驗船師斷定安全的設置和要求的通道不合適，不應進行相關處所的檢驗。

5.2.2 應可安全進入液艙和處所。液艙和處所應予除氣和適當通風。進入液艙、空艙或圍蔽處所前，應確認液艙內部空氣中無危險氣體並含足夠的氧氣。

5.2.3 在準備檢驗和測厚時，為徹底檢查，所有處所應進行清掃，包括除去表面所有鬆動的腐蝕積垢。處所應充分清潔，做到無水、無垢、無髒物、無殘油等，以能揭示腐蝕、變形、裂紋、破損或其他結構蝕耗以及塗層狀況。但是，船東已經決定換新的結構區域只需進行清掃和去垢，以確定要換新的區域範圍。

5.2.4 應提供足夠的照明，以能揭示腐蝕、變形、裂紋、破損或其他結構蝕耗以及塗層狀況。

5.2.5 如已敷設軟塗層或半硬塗層，應為驗船師提供安全通道，以使其能驗證塗層的有效性和進行內部結構（可能包括塗層剝落的部分）的狀況評估。如無法提供安全通道，則軟塗層或半硬塗層應予以去除。

5.2.6 船東應指派至少一位對液艙和封閉處所檢查有經驗的人員始終陪伴現場驗船師。此外，由至少兩人組成的有經驗的後備人員應等候在被檢驗的液艙或處所的艙口處。後備組人員應不斷觀察液艙或處所內的工作情況，並應保持救生和撤離設備隨時可用。

5.2.7 在被檢查的液艙或處所內的檢驗人員、甲板上的負責駕駛員和駕駛室（視情況而定）之間應安排通信系統。這些通信設備應在整個檢驗中始終保持工作狀態。

5.3 結構通道

5.3.1 對全面檢驗，應提供設施使驗船師能用安全和可行的方法檢查船體結構。

5.3.2 對近觀檢驗，應提供驗船師可接受的下列一個或多個通道裝置：

- .1 固定腳手架和穿過結構的通道；
- .2 臨時腳手架和穿過結構的通道；
- .3 升降機和可移動台架；
- .4 艇或筏；

.5 便攜式梯子；和/或

.6 其他等效設施。

5.4 檢驗設備

5.4.1 通常應使用超聲波檢測設備進行測厚。應按要求向驗船師證明該設備的精度。

5.4.2 如驗船師認為必要，可要求用下列一個或多個裂紋檢測方法：

.1 射線照相設備；

.2 超聲波探傷設備；

.3 磁粉探傷設備；

.4 着色滲透劑；和/或

.5 其他等效手段。

5.4.3 檢驗期間應有可使用的測爆儀、測氧儀、呼吸器、救生索，攀登帶及其繩索、鉤子和哨笛及其使用說明和指導。應提供安全檢查清單。

5.4.4 應為安全有效地進行檢驗提供足夠和安全的照明。

5.4.5 在檢驗期間，應有足夠的防護服（如：安全頭盔、手套、安全靴等）可供使用。

5.5 海上或錨泊檢驗

5.5.1 如驗船師能得到船上人員的必要協助，可接受在海上或錨泊時進行檢驗。檢驗所需的預防措施和程序應符合 5.1、5.2、5.3 和 5.4

中的要求。

5.5.2 在液艙內的檢驗人員與在甲板上的負責駕駛員之間應布置通信系統。如使用艇或筏，該系統還應包括負責壓載水泵操作的人員。

5.5.3 只有在驗船師考慮到所提供的安全措施，包括氣象預報和船舶對可預見狀況的反應並表示同意，以及在液艙內水位預期的上升不超過 0.25m 的情況下，方可使用艇或筏對液艙進行檢驗。

5.5.4 在使用筏或艇進行近觀檢驗時，應符合下列條件：

- .1 應僅使用即使一個浮箱破裂仍具有合格的剩餘浮力和穩性的耐用型氣脹式筏或艇；
- .2 艇或筏應拴於通道梯上，並另安排一人留守在能清晰看見該艇或筏的通道梯處；
- .3 所有參加人員都應有合適的救生衣；
- .4 液艙內的水面應平靜（在所有可預見的情況下，液艙內預期的水位上升不應超過 0.25m），且水位應固定。任何時候當筏或艇在使用時，水位都不得上升；
- .5 液艙或處所必須只含有乾淨的壓載水。水面上不允許有任何油層；
- .6 任何時候都不允許水位與最深甲板下腹板面板的距離在 1m 以內，這樣檢驗人員通往艙口的直接逃生通道才不致被隔絕。只有在被檢查的艙壁間距上設有甲板通道人孔並開啟時才能考慮水位超出甲板橫材，這樣才能保證任何時候檢驗人員都可使用逃生通道。其他有效的通往甲

板的逃生通道也可予以考慮；和

- .7 如果液艙（或處所）共用一個透氣系統或惰性氣體系統，使用艇或筏的液艙應予以隔絕，以防止氣體從其他液艙（或處所）傳入。

5.5.5 如腹板深度為 1.5m 或以下，筏或艇可允許單獨用於在液艙或處所甲板下的區域的檢查。

5.5.6 如腹板深度超過 1.5m，筏或艇可僅允許單獨用於下列之一的情況：

- .1 甲板下結構的塗層處於“良好”狀況，且無鏽蝕的跡象；或
- .2 如果在每一間距上設置一個允許安全進出的永久通道。該通道應：
 - .1 通過垂直梯直接通向甲板，該梯在甲板下約 2m 處設有一個小平台；和
 - .2 通過在液艙每一端都設有通往甲板的梯子的縱向永久平台通向甲板。該平台應在液艙的全長範圍內布置在與甲板下結構的筏運檢查所需要的最高水位的相同平面，或其上。為此，最高水位之上的空餘量應假定在甲板橫框架的跨距中點和液艙長度中點處測量至距甲板板不大於 3m（參見圖 1）。

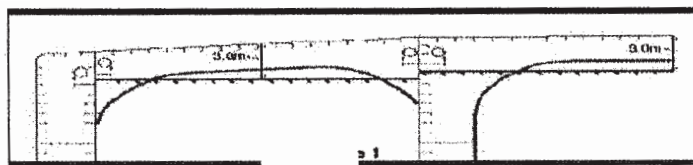


圖 1

如上述條件都不能滿足，則應為甲板下區域的檢驗提供腳手架或其他等效設施。

5.5.7 5.5.5 和 5.5.6 所述的單獨使用筏或艇並不排除在檢驗過程中使用艇或筏在液艙範圍內的移動。

5.6 檢驗計劃會議

5.6.1 在檢驗之前和檢驗期間，現場驗船師和船上船東代表要做好適當準備，進行密切合作，這是執行安全有效檢驗的重要一環。在船上檢驗期間應定期召開安全會議。

5.6.2 為確保檢驗能安全有效地進行，應在換證和中間檢驗的任何部分開始之前，召開由現場驗船師、現場船東代表、測厚公司測量人員（視情況而定）和船長或由船長或公司指派的具有相應資質的代表參加的檢驗計劃會議，以確定檢驗計劃中預見的所有布置均已到位。

5.6.3 會議中應討論的項目的示意性清單如下：

- .1 船舶計劃（即航線、靠碼頭和離碼頭操縱、靠泊時段、貨物和壓載作業等）；
- .2 測厚的規定和布置（即通道、清潔/除垢、照明、通風、人員安全）；
- .3 測厚範圍；

- .4 認可標準（參見最小厚度表）；
- .5 考慮了塗層狀況和可疑區域/顯著腐蝕區域後確定的近觀檢驗和測厚範圍；
- .6 測厚的實施；
- .7 總體上和發現不均勻腐蝕/點蝕之處的代表性讀數的採集；
- .8 繪製出顯著腐蝕區域；和
- .9 現場驗船師、測厚公司測量人員以及船東代表之間就發現的相關問題進行溝通。

6 船上文件

6.1 總則

6.1.1 船東應獲取、提供並在船上保存 6.2 和 6.3 規定的文件，隨時供驗船師使用。6.2 中所述的狀況評估報告應包括一份英文譯文。

6.1.2 文件應在船舶的整個營運壽命期間保存在船上。

6.2 檢驗報告案卷

6.2.1 檢驗報告案卷應是船上文件的一個組成部分，包括：

- .1 結構檢驗報告（附件 8）；
- .2 狀況評估報告（附件 9）；和
- .3 測厚報告（附件 10）。

6.2.2 船東及主管機關的辦事處，或經主管機關認可的組織的辦事

處，也應備有檢驗報告案卷可供使用。

6.3 支持性文件

船上應備有下列附加文件可供使用：

- .1 貨油艙和壓載艙主結構圖；
- .2 以前修理史；
- .3 貨物和壓載史；
- .4 惰性氣體設備的使用範圍和洗艙程序；
- .5 船上人員對以下方面檢查：
 - .1 總體的結構損耗狀況；
 - .2 艙壁和管路泄漏；和
 - .3 塗層或防腐系統狀況（如有）。報告製作格式如附件5所示；和
- .6 5.1 要求的檢驗計劃，直至換證檢驗（如適用）完成；和
- .7 任何其他有助於識別臨界結構區域和/或需要檢查的可疑區域的資料。

6.4 船上文件審核

檢驗前，驗船師應檢查船上文件資料的完整性及其內容，並以其為檢驗的基礎。

7 測厚程序

7.1 總則

7.1.1 如要求的測厚不是由代表主管機關的被認可組織進行，則應由被認可組織的驗船師在場見證測厚過程。驗船師在船上的時間應視需要監督該測厚過程的範圍而定。

7.1.2 測厚公司應參加在檢驗開始前舉行的檢驗計劃會議。

7.1.3 要求實施近觀檢驗的區域內的構件測厚應與近觀檢驗同步進行。

7.1.4 在任何情況下，測厚範圍應足以代表實際的平均狀況。

7.2 測厚公司的認證

測厚應由主管機關認可的組織根據附件 7 規定的原則予以認證的合格公司進行。

7.3 報告

7.3.1 應編製一份測厚報告並提交給主管機關。該報告應給出測量部位、所測得的厚度以及相應的原始厚度。此外，報告還應說明進行測厚的日期、測量設備的類型、測量人員的姓名及其資質，並由測厚人員簽字。測厚報告應遵循附件 10 建議的測厚程序中規定的原則。

7.3.2 驗船師應審核最終的測厚報告並在封面上會簽。

8 檢驗報告和評估

8.1 檢驗報告的評估

8.1.1 檢驗期間收集的船舶結構狀況的數據和資料應用於評估船舶的可接受性和連續結構完整性。

8.1.2 對（現行《國際載重線公約》中界定的）船長 130m 及以上的

油船，在其達到 10 年船齡後所進行的構造安全換新檢驗期間，應按附件 12 中規定的油船船體樑總縱強度衡準，利用測得的、換新的和加強的相應結構件厚度，對船舶的總縱強度作出評估。

8.1.3 應由主管機關或經主管機關授權的被認可組織對資料進行分析並予以簽註，其分析的結論應作為狀況評估報告的一部分。

8.1.4 如根據初始評估的結果對結構件進行了換新或加強，則 8.1.2 中要求的船舶總縱強度的最終評估結果應作為狀況評估報告的一部分。

8.2 報告

8.2.1 檢驗報告原則參見附件 8。

8.2.2 當檢驗在不同的檢驗站分別進行時，檢驗的每一部分均應出具報告。其後的現場驗船師在繼續或完成檢驗之前，應可獲得已經檢查和/或試驗項目的清單（壓力試驗、測厚等）以及項目是否已做記錄的說明。

8.2.3 應向船東簽發附件 9 所示的檢驗狀況評估報告以及結果，並應將其留存在船上供以後檢驗時查閱。狀況評估報告應由主管機關或經主管機關授權的被認可組織予以簽註。

附件 1

換證檢驗時的近觀檢驗要求

船齡≤5 年	5 年<船齡≤10 年	10 年<船齡≤15 年	船齡> 15 年
第 1 次換證檢驗	第 2 次換證檢驗	第 3 次換證檢驗	第 4 次及以後換證檢驗
(A) 一個完整的橫向環狀框架-在一個壓載邊艙內(如設置)或者一個主要用於水壓載的貨油邊艙內 (B) 一根甲板強橫樑-在一個貨油艙內 (D) 一道橫艙壁-在一個壓載艙內 (D) 一道橫艙壁-在一個貨油邊艙內 (D) 一道橫艙壁-在一個中央貨油艙內	(A) 所有完整的橫向環狀框架-在一個壓載邊艙內(如設置)或者一個主要用於水壓載的貨油邊艙內 (B) 一根甲板強橫樑-在每一個餘下的壓載艙內(如設置) (B) 一根甲板強橫樑-在一個貨油邊艙內 (B) 一根甲板強橫樑-在兩個中央貨油艙內 (C) 兩個橫向艙壁-在一個壓載邊艙內(如設置)或者一個主要用於水壓載的貨油邊艙內 (D) 一道橫艙壁-在每一個餘下的壓載艙內 (D) 一道橫艙壁-在一個貨油邊艙內 (D) 一道橫艙壁-在兩個中央貨油艙內	(A) 所有完整橫向環狀框架-在所有壓載艙內 (A) 所有完整橫向環狀框架-在一個貨油邊艙內 (A) 所有環狀框架中至少 30%-在餘下的每個貨油邊艙內(見註 1) (C) 所有橫艙壁-在所有貨油艙和壓載艙內 (E) 甲板和底部橫材至少 30%,包括鄰接的結構件-在每一個中央貨油艙內(見註 1) (F) 主管機關認為必要之處	與第 3 欄中的船舶相同;如主管機關認為必要,包括附加的橫向構件

註 1：

30%應圓整到下一位完整的整數。

- (A) 完整的橫向環狀框架，包括相鄰的結構構件。
- (B) 甲板強橫樑，包括相鄰的結構構件。
- (C) 完整的橫向艙壁，包括縱桁系統及相鄰構件。
- (D) 橫艙壁下部，包括縱桁系統及相鄰結構構件。
- (E) 甲板及船底橫框架，包括相鄰的結構構件。
- (F) 附加的完整橫向環狀框架。

附件 2

換證檢驗時的測厚要求

船齡≤5 年	5 年<船齡≤10 年	10 年<船齡≤15 年	船齡> 15 年
1	2	3	4
1 貨物區域內全船寬的一個甲板板剖面(在一個壓載艙處,如設置;或一個主要用於水壓載的貨油艙內) 2 按附件 1 應進行近觀檢驗的結構件的測量點,供總體評定並作腐蝕形式記錄 3 可疑區域	1 貨物區域內: .1 每塊甲板板 .2 一個橫剖面 2 按附件 1 應進行近觀檢驗的結構件的測量點,供總體評定並作腐蝕形式記錄 3 可疑區域 4 貨物區域以外選擇的舷側乾濕交變列板	1 貨物區域內: .1 每塊甲板板 .2 兩個橫剖面 .3 所有舷側乾濕交變列板 2 按附件 1 應進行近觀檢驗的結構件的測量點,供總體評定並作腐蝕形式記錄 3 可疑區域 4 貨物區域以外選擇的舷側乾濕交變列板	1 貨物區域內: .1 每塊甲板板 .2 三個橫剖面 .3 每塊船底板 2 按附件 1 應進行近觀檢驗的結構件的測量點,供總體評定並作腐蝕形式記錄 3 可疑區域 4 全長範圍內所有舷側乾濕交變列板

附件 3

換證檢驗時的液艙壓力試驗要求

船齡≤5 年	船齡> 5 年		
1	2		
1 面對壓載艙、空艙、管隧、燃油艙、泵艙或隔離艙的貨油艙邊界	1 所有壓載艙邊界 2 所有貨油艙艙壁		
2 所有壓載艙邊界			

附件 4

顯著腐蝕區域的測厚範圍要求

貨物區域內的換證檢驗

船底結構

結構件	測量範圍	測量形式
1 船底板	至少為三個強肋骨間距（包括後艙壁至強肋板間距）長的全艙寬底板； 測量所有吸口的周圍和下面的底板	在縱骨和橫桁之間的每一板格上作五點形測量
2 船底縱骨	在被測厚的船底板每一個強肋骨間距內，至少取三根縱骨	在縱骨折板同一橫截線上測量三個點，在腹板垂直方向上測三個點
3 底部縱桁和肘板	在前、後橫艙壁肘板趾端處和各艙中點處	在腹板上的每一個板格扶強材之間測量一個點，各單點位於同一垂直線上，或腹板上至少測量三個點。在面板的同一橫截線上測量兩個點，在縱桁/艙壁肘板上作五點形測量
4 底部強框架（腹板）	在測量的船底板格範圍內的各強肋骨間距中，三個底強橫框架腹板的兩端和中點	在 2m ² 面積上作五點形測量，在面板上作單個測量
5 板格扶強材	如設有	單個測量

甲板結構

結構件	測量範圍	測量形式
1 甲板板	全艙寬的兩條帶	每條帶上的每塊板至少測量三個點
2 甲板縱骨	在每兩個強肋骨間距中，至少各取三根縱骨	腹板上沿其垂線上測量三個點，在折板上（如設有）測量兩個點
3 甲板縱桁和肘板	在前、後橫艙壁肘板趾端處和各艙中點處	在腹板上的每一個板格扶強材之間測量一個點，各單點位於同一垂直線上，或腹板上至少測量三個點。 在面板的同一橫截線上測量兩個點，在縱桁/艙壁肘板上作五點形測量
4 甲板強橫樑	至少在兩個強橫樑，在其跨距的兩端和中點測量	在約 2m ² 面積上作五點形測量，在面板上作單個測量
5 板格扶強材	如適用	單個測量

外板和縱艙壁

結構件	測量範圍	測量形式
1 頂列板和底列板及桁材平台處的列板	至少三個強肋骨間距的範圍內，每對縱骨之間的板	單點測量
2 所有其他列板	在相同的三個強肋骨間距的範圍內，每第三對縱骨間的板	單點測量
3 頂列板和底列板上的縱骨	在相同的三個強肋骨間距的範圍內，每根縱骨	在腹板的橫截線上，腹板上測量三個點，折板上測量一個點
4 所有其他板列上的縱骨	在相同的三個強肋骨間距的範圍內，每第三根縱骨	在腹板的橫截線上，腹板上測量三個點，折板上測量一個點
5 縱骨—肘板	在相同的三個強肋骨間距的範圍內，在艙的上部、中部和底部至少取三根縱骨—肘板	在肘板上作五點形測量
6 強肋骨和橫撐材	三塊腹板，每塊腹板上至少測量三個部位，包括橫撐材連接處	在約 2m ² 面積內作五點形測量，在強肋骨和橫撐材面板上作單點測量

橫艙壁和止蕩艙壁

結構件	測量範圍	測量形式
1 頂列板和底列板及桁材平台處的列板	在約 1/4、1/2 和 3/4 艙寬處，一對扶強材之間的板	在 1m 長的扶強材間作五點形測量
2 所有其他列板	在中間部位，一對扶強材之間的板	單點測量
3 槽形艙壁列板	在平板板格的中心處和在斜折板或裝配連接處，用於每個結構尺寸改變處的板	在約 1m ² 面積上作五點形測量
4 扶強材	至少取三根典型扶強材	腹板：肘板連接之間的全跨長內作五點形測量（在每個肘板連接處腹板同一橫截線上測兩點，跨中點測一點）。折板：每塊肘板趾端和跨長的中點作單點測量
5 肘板	在艙的頂部、中部和底部	至少取三塊在肘板上作五點形測量
6 高腹板和桁材	在肘板趾端和跨長中點測量	腹板：在約 1m ² 面積上作五點形測量，在面板的橫截線上測量三個點
7 桁材平台	所有桁材在其兩端和中部測量	在 1m ² 面積上作五點形測量再在肘板趾端附近和面板上作單個測量

附件 5

船東檢查報告

結構狀況							
船名：							
船東檢查報告 — 結構狀況							
液艙/貨艙號：							
鋼級： 甲板： 舷側：							
船底： 縱艙壁：							
構件	裂紋	屈曲	腐蝕	塗層狀況	凹蝕	改動/修理	其他
甲板：							
船底：							
舷側：							
縱艙壁：							
橫艙壁：							
進行修理的原因：							
進行的測厚（日期）：							
總體結果：							
過期檢驗：							
船級遺留項目：							
意見：							
檢查日期：							
檢查員：							
簽字：							

附件 6A

檢驗計劃

基本資料和概況

船名：
IMO編號：
船旗國：
船籍港：
總噸位：
載重量（公噸）：
垂線間長（m）：
造船廠：
船號：
被認可組織（RO）：
RO的船舶標識號：
交船日期：
船東：
測厚公司：

1 序言

1.1 範圍

1.1.1 本檢驗計劃包括在本規則中要求的貨物區域、壓載艙（包括艏艉尖艙）內進行全面檢驗、近觀檢驗、測厚和壓力試驗的最小範圍。

1.1.2 檢驗布置和安全方面應經現場驗船師認可。

1.2 文件

按第 6 節的要求，制定檢驗計劃所用的全部文件應在檢驗期間在船上可供使用。

2 貨艙、液艙和處所的布置

本部分檢驗計劃應以圖紙或文字形式提供檢驗適用範圍內的液艙和

處所布置的資料。

3 液艙和處所的一覽表及其使用情況、塗層範圍和防腐系統的資料

本部分檢驗計劃應說明與檢驗計劃調查表中提供的船舶液艙使用情況、塗層範圍和防腐系統資料有關的任何變化（並應作更新）。

4 檢驗條件

本部分檢驗計劃應提供有關的檢驗條件的資料，如：貨艙和液艙清洗、除氣、通風和照明等。

5 結構通道的設置和方法

本部分檢驗計劃應說明與檢驗計劃調查表中提供的結構通道的設置和方法資料有關的任何變化（並應作更新）。

6 檢驗設備清單

本部分檢驗計劃應確定並列出可用於檢驗和所要求測厚的設備。

7 檢驗要求

7.1 全面檢驗

本部分檢驗計劃應確定並列出本船按 2.4.1 應進行全面檢驗的處所。

7.2 近觀檢驗

本部分檢驗計劃應確定並列出本船按 2.4.2 應進行近觀檢驗的船體結構。

8 確定進行液艙試驗的液艙

本部分檢驗計劃應確定並列出本船按 2.6 應進行液艙試驗的液艙。

9 確定測厚的區域和剖面

本部分檢驗計劃應確定並列出按 2.5.1 應測厚的區域和剖面。

10 船體結構最小厚度

本部分檢驗計劃應規定受本規則約束的該船船體最小厚度（說明按（a）或最好是（b），如有此類信息）：

（a）根據本船的船體結構圖所附的損耗裕度表和原始厚度確定；

（b）在以下表中給出：

區域或位置	建造時的原始厚度 (mm)	最小厚度 (mm)	顯著腐蝕厚度 (mm)
甲板			
板			
縱骨			
縱桁			
船底			
板			
縱骨			
縱桁			
船側			
板			
縱骨			
縱桁			
縱艙壁			
板			
縱骨			
縱桁			
內底			
板			
縱骨			
縱桁			

如損壞與設計有關，姐妹船或類似船舶的船體損壞（如可得到）

液艙或處所 編號或區域	可能的原因 （如已知）	損壞說明	位置	修理	修理日期

13 以前檢驗中確定的顯著腐蝕區域

本部分檢驗計劃應確定並列出以前檢驗中發現的顯著腐蝕區域。

14 臨界結構區域和可疑區域

本部分檢驗計劃應確定並列出臨界結構區域和可疑區域（如有此類信息）。

15 其他相關意見和信息

本部分檢驗計劃應提供與檢驗相關的任何其他意見和信息。

附錄

附錄 1 – 圖紙清單

5.1.3.2 要求備有貨油艙和壓載艙的主要結構圖（尺寸圖），包括有關使用高強度鋼（HTS）的資料。本檢驗計劃附錄應確定並列出作為本檢驗計劃組成部分的主要結構圖。

附錄 2 – 檢驗計劃調查表

船東已提交的檢驗計劃調查表（附件 6B）應附於本檢驗計劃後。

附錄 3 – 其他文件

本部分檢驗計劃應確定並列出作為本計劃組成部分的任何其他文件。

為符合 5.1.3，船東配合主管機關制定。

日期：

（經授權的船東代表的姓名和簽字）

日期：

（經授權的主管機關代表的姓名和簽字）

附件 6B

檢驗計劃調查表

下述資料將使船東能配合主管機關制定一份符合本規則要求的檢驗計劃。關鍵是船東在填寫本調查表時提供最新的資料。填寫完成後的本調查表應能提供本決議要求的所有資料和材料。

概況

船名：

IMO 編號：

船旗國：

船籍港：

船東：

被認可組織（RO）：

總噸位：

載重量（公噸）：

交船日期：

關於為近觀檢驗和測厚提供通道的資料

船東應在下表中說明通往應進行近觀檢驗和測厚的結構的通道。近觀檢驗係指現場驗船師在近距離目視範圍內（即通常伸手可及）對結構件細節進行的檢驗。

液艙號	結構	C (貨物) / B (壓載)	臨時腳 手架	筏	梯子	直接 通道	其他方法 (請說明)
F.P.	艏尖艙						
A.P.	艉尖艙						
邊艙	甲板下						
	舷側						
	底部橫材						
	縱骨						
	橫材						
中艙	甲板下						
	底部橫材						
	橫材						

過去三年中含 H₂S 貨物或加熱貨物的記錄，連同貨物是否經加熱的說明，以及物質安全數據單（MSDS）（如有）

船東的檢查

船東應填寫類似以下格式的表（下表僅為示例），提供至少最近三年內其對貨物區域範圍內所有貨油艙、壓載艙和空艙的詳細檢查結果，包括尖艙。

液艙號	防腐 (1)	塗層範圍 (2)	塗層狀況 (3)	結構蝕耗 (4)	液艙破損歷史記錄 (5)
中央貨油艙					
邊貨油艙					
污水水艙					
壓載艙					
艏尖艙					
艉尖艙					
其他處所					

註：

指明用於油類/壓載的液艙。

- 1) HC = 硬塗層；SC = 軟塗層；
A = 陽極；NP = 無保護
- 2) U = 上部；M = 中部
L = 下部；C = 全部
- 3) G = 良好；F = 尚好；P = 差；
RC = 重新敷設（過去三年中）
- 4) N = 無情況記錄；Y = 有情況記錄，
情況的說明應附於調查表之後

船東代表簽名：

.....

簽字：.....

日期：.....

- 5) DR = 破損和修理；L = 滲漏；
CV = 改建（說明應附於調查表之後）

港口國監管檢查報告

列出港口國監督檢查報告，包括船體相關結構缺陷以及相應的糾正措施的信息：

安全管理系統

列出有關船體維護的不符合項，包括相關的糾正措施：

認可的測厚公司名稱和地址：

[illegible]

附件 7

認證船體結構測厚公司的程序

1 適用範圍

本指南適用於對有意從事船體結構測厚的公司的認證。

2 認證程序

提交文件

2.1 應提交下列文件給主管機關認可的組織審批：

- .1 公司概況，如組織和管理機構；
- .2 公司在船體結構測厚方面的經歷；
- .3 技術人員履歷、即技術人員作為測厚操作人員的經歷，對船體結構等等的技術知識和經驗。操作者應具有符合公認的工業無損檢測（NDT）標準的資質；
- .4 用於測厚的設備，如超聲波檢測設備及其維護和校正程序；
- .5 測厚人員操作指南；
- .6 測厚技術員的培訓計劃；和
- .7 按建議的厚度測量程序（見附件 10）的測量記錄格式。

公司審核

2.2 在提交的文件經審核合格後，應對公司進行審核，以確認公司按所提交的文件適當組織和管理，並確認其事實上有能力進行船體

結構測厚工作。

2.3 發證取決於其在船上的測厚操作演示以及出具令人滿意的報告。

3 發證

3.1 在 2.2 所述的公司審核和 2.3 所述的測厚操作演示結果均合格後，主管機關或由主管機關認可的組織應簽發認可證書，同時出具一份關於該公司的測厚操作體系已獲認證的通知。

3.2 對證書的換新/簽註應以不超過三年的間隔期進行一次，以驗證公司保持原認可條件。

4 對業已認證的測厚操作體系作任何變更的報告

如公司對業已認證的測厚操作體系作任何變更，則應立即向主管機關認可的組織提交變更報告。如經主管機關認可的組織認為必要，應重新審核。

5 撤消證書

如遇下列情況可撤消證書：

- .1 進行了不正確的測量，或測量報告有誤；
- .2 驗船師發現公司經認可的測厚操作體系中存在任何缺陷；和
- .3 公司未能按要求將上述 4 中所述的任何變更報告經主管機關認可的組織。

附件 8

檢驗報告原則

原則上，對應符合本規則要求的油船，驗船師應在其船體結構和管路系統的檢驗報告中包括下列內容。

1 總則

1.1 在下列情形裏，應形成檢驗報告：

- .1 涉及定期船體檢驗，即相關的年度、中間和換證檢驗的開始、繼續和/或完成；
- .2 已發現結構破損/缺陷時；
- .3 已進行修理、換新或改建時；和
- .4 已批註或消除船級條件（遺留項目）時。

1.2 報告應：

- .1 提供證據，表明已按適用的要求進行了規定的檢驗；
- .2 提供文件，表明檢驗中發現的情況、進行的修理以及批註或消除的船級條件（遺留項目）；
- .3 提供檢驗記錄（包括採取的措施），作為可核查文件記錄的組成部分。檢驗報告應置於需存放在船上的檢驗報告案卷中；
- .4 提供為以後的檢驗做計劃的信息；和
- .5 提供可用於維護入級規範和須知的素材信息。

1.3 當檢驗分為在不同的檢驗站進行時，應為每一部分檢驗出具報告。其後的現場驗船師在繼續或完成檢驗之前，應可獲得已檢驗項目的清單、相關的檢驗結果以及項目是否已做記錄的說明。還應列出已進行的測厚和液艙試驗，供下一位驗船師使用。

2 檢驗範圍

2.1 確定已進行全面檢驗的艙室。

2.2 確定已在每個液艙進行近觀檢驗的位置，以及所使用的通道裝置的資料。

2.3 確定已在每個液艙進行測厚的位置。

註： 確定進行近觀檢驗和測厚的位置應至少包括一份根據定期檢驗的類型和船齡，對附件 B 規定的要求範圍相應的各結構構件進行描述的確證書。

如僅要求進行部分檢驗，即一個橫向環形強框架/一根甲板強橫樑，應使用肋骨號確定每個壓載艙和貨艙內的位置。

2.4 對液艙內保護塗層處於良好狀況而且已對近觀檢驗和/或測厚範圍作特殊考慮的區域，應確定經特殊考慮的結構。

2.5 確定應經受液艙試驗的液艙。

2.6 確定甲板上的如下管路系統，包括原油洗艙（COW）管路以及貨油艙和壓載艙、管隧、隔離艙和空艙內的壓載管系：

.1 已進行包括管系及其閥和附件的內部檢查和測厚在內的相關檢查；和

.2 已進行工作壓力的操作試驗。

3 檢驗結果

3.1 每個液艙內保護塗層的類型、範圍和狀況（“良好”、“尚好”或“差”），包括確定安裝了陽極的液艙。

3.2 每個艙室的結構狀況及以下方面的資料：

.1 確定發現的問題，例如：

.1 腐蝕及對位置、類型和範圍的描述；

.2 顯著腐蝕的區域；

.3 裂紋/裂口及對位置和範圍的描述；

.4 屈曲及對位置和範圍的描述；和

.5 凹痕及對位置和範圍的描述。

.2 確定無結構破損/缺陷的艙室。報告後可附草圖/照片加以補充；

.3 測厚應由在船上監督測量過程的驗船師驗證並簽字。

.4 船長為 130m 及以上且船齡 10 年以上的油船的船體樑總縱強度評估結果。應包括下列相關內容：

.1 測得的甲板和底部折板的橫剖面面積及其建造面積；

.2 甲板和底部折板的橫剖面面積減小量；和

.3 已進行的換新或加強的相關詳細情況（見 4.2）。

4 對發現的問題所採取的行動

4.1 每當現場驗船師認為需要進行修理時，應在編號的清單中標出應予修理的每一項目。每當進行修理時，應報告實施的修理的細節，具體提及編號的清單中的相關項目。

4.2 應報告已進行的修理並標明：

- .1 艙室；
- .2 結構件；
- .3 修理方法（即：換新或改動），包括：
 - .3.1 鋼級和尺度（如與原始材料的區別）；
 - .3.2 草圖/照片，如適用；
- .4 修理範圍；和
- .5 無損檢測（NDT）。

4.3 對在檢驗時未完成的修理，船級條件/遺留項目中應規定該修理的具體完成期限。為向參與修理檢驗的驗船師提供正確和適當的資料，船級條件/遺留項目應足夠詳細，並標出應進行修理的每一項目。為確定大範圍的修理，可參閱檢驗報告。

附件 9

狀況評估報告

在換證檢驗完成後簽發

船舶概況

船名： 船級/主管機關標識號：
 前船級/主管機關標識號：
 IMO 編號：
 船籍港： 船旗國：
 前船旗國：
 載重量： 總噸位：
 （公噸） 本國法定：
 國際噸位丈量公約（1969）：
 建造日期： 船級符號：
 重大改建日期：
 改建類型： 船東：
 前船東：

- 1 下列檢驗報告和文件已經簽署者審核，並查明合格。
- 2 檢驗狀況評估附於表 2。
- 3 換證檢驗已按本規則在.....（日期）完成。

狀況評估報告填寫人	姓名 簽字	職務
辦事處	日期	
狀況評估報告填寫人	姓名 簽字	職務
辦事處	日期	

所附的報告和文件：

1)

2)

3)

4)

5)

6)

狀況評估報告目錄

第 1 部分 - 船舶概況

- 見首頁

第 2 部分 - 報告審核

- 檢驗地點和方法

第 3 部分 - 近觀檢驗

- 範圍（液艙）

第 4 部分 - 貨物和壓載管系

- 已檢查

- 試驗操作

第 5 部分 - 測厚

- 參見測厚報告

- 測量點一覽表

- 單獨表格指明顯著腐蝕的處所及相應的：

- 厚度減小

- 腐蝕形式

第 6 部分 - 液艙防腐系統

- 單獨表格指明：

- 塗層位置/陽極

- 塗層狀況（如適用）

- 第7部分 - 修理 - 液艙/區域標識
- 第8部分 - 船級條件/船旗國要求
- 第9部分 - 備忘錄 - 可接受的缺陷
- 未來檢驗時的關注點，如可疑區域
- 因塗層脫落而擴大的年度/中間檢驗
- 第10部分 - 船舶總縱強度評估結果
- (對船長130m及以上且
- 10年以上船齡的油船)
- 第11部分 - 結論 - 檢驗報告的評估/驗證說明

測厚摘錄

參見測厚報告：

顯著腐蝕液艙/區域 ¹ 位置或深度鏽點位置 ³	厚度減小(%)	腐蝕形式 ²	備註 (如：參考所附草圖)

註：

- 1 顯著腐蝕，即允許損耗範圍的75% - 100%。
- 2 P = 鏽點
C = 總體腐蝕
- 3 應註明所有鏽點密度達20%或以上、損耗為顯著腐蝕範圍或鏽點的平均深度為實際板厚度的1/3或以上的船底板。

液艙防腐系統

液艙號 ¹	液艙防腐蝕系統 ²	塗層狀況 ³	備註

註：

1 應列出所有分隔的壓載艙和貨油/壓載兼用艙。

2 C = 塗層

NP = 無保護

3 塗層狀況根據以下標準：

“良好” 係指僅有少量點狀鏽斑；

“尚好” 係指在扶強材的邊緣和焊縫的連接處塗層有局部脫落和/或所檢驗的區域中有超過 20%或更大範圍的輕度鏽蝕，但小於定義“差”的狀況；

“差” 係指在檢驗的區域中有超過 20%或更大範圍的塗層普遍剝落，或有 10%或更大範圍的塗層產生硬質鏽皮。

如塗層狀況未達到“良好”，應擴大年度檢驗的範圍，這應在狀況評估報告目錄第 9 部分中予以註明。

船長 130m 及以上且 10 年以上船齡的油船船體樑總縱強度的評估結果

(在下列 1、2、3 節中，只需填寫其中適用的一節)

1 本節適用於無論何時建造的船舶：在對已達到 10 年船齡的船舶進行最近一次“貨船構造安全證書”或“貨船安全證書”的換證檢驗(SC 換證檢驗)期間，酌情通過測量、換新或加強的結構件厚度，已對船體樑甲板處(甲板板和甲板縱骨)和船底處(船底板和船底縱骨)的橫剖面面積進行了計算，

發現橫剖面面積減小未超出原建造面積的 10%，如下表所列：

表 1 - 船體樑折板的橫剖面面積

		測量值	建造值	減小量
橫剖面 1	甲板折板	cm ²	cm ²	cm ² (%)
	底部折板	cm ²	cm ²	cm ² (%)
橫剖面 2	甲板折板	cm ²	cm ²	cm ² (%)
	底部折板	cm ²	cm ²	cm ² (%)
橫剖面 3	甲板折板	cm ²	cm ²	cm ² (%)
	底部折板	cm ²	cm ²	cm ² (%)

2 本節適用於 2002 年 7 月 1 日或以後建造的船舶：按附件 12 中 2.2.1.1 的規定，在對已達到 10 年船齡的船舶進行最近一次 SC 換證檢驗期間，酌情通過測量、換新或加強的結構件厚度，已對船體樑橫剖面模數進行了計算，並考慮到本組織通過的建議案，發現其在主管機關確定的極限折減值範圍之內，如下表所列：

表 2 - 船體樑的橫剖面模數

		Z _{act} (cm ³) ¹	Z _{req} (cm ³) ²	備註
橫剖面 1	上甲板			
	船底			
橫剖面 2	上甲板			
	船底			
橫剖面 3	上甲板			
	船底			

註：

1 Z_{act} 係指按附件 12 中 2.2.1.1 的規定，在 SC 換證檢驗期間，通過測量、換新或加強的結構件厚度所計算出的船體樑實際橫剖面模數。

2 Z_{req} 係指按附件 12 中 2.2.1.1 的規定所計算出的船舶總縱彎曲強度的極限折減值。

Z_{act} 的計算表應附於本報告之後。

3 本節適用於 2002 年 7 月 1 日以前建造的船舶：按附件 12 中 2.2.1.2

的規定，在對已達到 10 年船齡的船舶進行最近一次 SC 換證檢驗期間，酌情通過測量、換新或加強的結構件厚度，已對船體樑橫剖面模數進行了計算，發現其符合主管機關或認可的船級社要求的衡準，且 Z_{act} 不小於附件 12 附錄 2 中規定的 Z_{mc} （見下列 2 定義），如下表所列。

闡述主管機關或經認可的船級社要求的營運船舶船體樑最小剖面模數的認可衡準。

表 3 – 船體樑的橫剖面模數

		$Z_{act}(cm^3)^1$	$Z_{mc}(cm^3)^2$	備註
橫剖面 1	上甲板			
	船底			
橫剖面 2	上甲板			
	船底			
橫剖面 3	上甲板			
	船底			

註：

1 見表 2 註 1 定義。

2 Z_{mc} 係指按附件 12 中 2.2.1.2 規定計算出的最小剖面模數的極限值。

附件 10

建議的測厚程序

總則

- 1 本程序應用於記錄附件 2 和 4 所要求的厚度測量。
- 2 附錄 2 規定的報告格式 TM1-T、TM2-T(i)、TM2-T(ii)、TM3-T、TM4-T、TM5-T 和 TM6-T 應用於記錄厚度測量，並應說明最大允許減小量。可在附加的文件中說明最大允許減小量。
- 3 附錄 3 包含有關報告格式和厚度測量要求的圖解和說明。
- 4 報告格式（如適用）應以結構草圖上所示的數據加以補充。

附錄 1

船舶概況

船名：
IMO 編號：
船級主管/機關標識號：
船籍港：
總噸位：
載重噸：
建造日期：
船級社：

進行測厚的公司名稱：
.....
測厚公司的認證機構：
證書號：
證書有效期自：至.....
測厚地點：
首次測量日期：
最後測量日期：
換證檢驗/中間檢驗日期：
測厚設備情況：
測量者資質：
報告編號： 頁數：頁
測量者姓名： 驗船師姓名：
測量者簽字： 驗船師簽字：
公司公章： 主管機關：

公章

附錄 2

所有甲板板、所有船底外板或舷側外板厚度測量報告 (TM1-T)

船名： 船級標識號： 報告編號： IMO 編號：

列板位置	編號或符號	原始厚度 (mm)	舢舨前讀數				舢舨後讀數				平均減小量							
			測量		減小量 S		測量		減小量 P		減小量 S		%					
			P	S	mm	%	P	S	mm	%	mm	%	P	S	mm	%		
舢舨前第 12 塊																		
第 11 塊																		
第 10 塊																		
第 9 塊																		
第 8 塊																		
第 7 塊																		
第 6 塊																		
第 5 塊																		
第 4 塊																		
第 3 塊																		
第 2 塊																		
第 1 塊																		
船中																		
舢舨後第 1 塊																		
第 2 塊																		
第 3 塊																		
第 4 塊																		
第 5 塊																		
第 6 塊																		
第 7 塊																		
第 8 塊																		
第 9 塊																		
第 10 塊																		
第 11 塊																		
第 12 塊																		

測量者簽字： 註 - 見下頁

TM1-T 報告的註釋：

- 1 本報告應用於記錄下列厚度測量：
 - .1 貨物區域內的所有強力甲板板；
 - .2 貨物區域內的所有龍骨板、船底外板和舳列板；
 - .3 貨物區域外包括選擇的乾濕交變列板的舷側外板；
 - .4 貨物區域內的所有乾濕交變列板。
- 2 應清楚示明如下列板位置：
 - .1 對於強力甲板，示明甲板邊板內列板的編號；
 - .2 對於船底板，示明龍骨板外列板的編號；和
 - .3 對於舷側外板，示明舷頂列板以下列板在外板展開圖上的編號和字母。
- 3 對於油船，所有甲板板列板均應記錄，對於礦油/油船，僅對開口線外的甲板板列板予以記錄。
- 4 應對舳前和舳後的所有區域的板進行測厚，如有板橫跨壓載艙/貨油艙邊界，則應記錄在各類型液艙的板區域分別測得的值。
- 5 所記錄的單點測量應代表多點測量的平均值。
- 6 最大允許減小量可在附加的文件中說明。

外板和甲板板厚度測量報告（一、兩或三個橫剖面）（TM2-T(i)）

船名：船級標識號：報告編號：IMO 編號：

強力甲板和舷頂列板															
第.....號肋骨的第一個橫剖面				第.....號肋骨的第二個橫剖面				第.....號肋骨的第三個橫剖面							
列板位置	編號 或 符號	原始 厚度 (mm)	最大允 許減小 量(mm)	測量		減小量 P	減小量 S	編號 或 符號	原始 厚度 (mm)	最大允 許減小 量(mm)	測量		減小量 P	減小量 S	
				P	S						P	S			
甲板邊板															
舷內第 1 塊列板															
第 2 塊															
第 3 塊															
第 4 塊															
第 5 塊															
第 6 塊															
第 7 塊															
第 8 塊															
第 9 塊															
第 10 塊															
第 11 塊															
第 12 塊															
第 13 塊															
第 14 塊															
中間列板															
舷頂列板															
艙頂總數															

測量者簽字：註 - 見下頁

TM2-T(i) 報告的註釋：

- 1 本報告應用於記錄強力甲板板和舷頂列板橫剖面的厚度測量：
貨物區域內一個、兩個或三個剖面，包括附錄 3 中典型橫剖面圖表表明的結構項目（1）、（2）和（3）。
- 2 對於油船，所有甲板板列板均應記錄，對於礦砂/油船，僅對開口線外的甲板板列板予以記錄。
- 3 頂部區域包括甲板板、甲板邊板和舷頂列板（包括圓形舷緣）。
- 4 應註明測量的確切肋骨號。
- 5 所記錄的單點測量應代表多點測量的平均值。
- 6 最大允許減少量可在附加的文件中說明。

舷側外板和甲板板厚度測量報告（一、兩或三個橫剖面）（TM2-T(ii)）

船名：船級標識號：報告編號：IMO 編號：

舷側外板																											
列板位置	第.....號肋骨的第一個橫剖面圖								第.....號肋骨的第二個橫剖面圖								第.....號肋骨的第三個橫剖面圖										
	編號 或 符號	原始 厚度 (mm)	最大允 許減小 量(mm)	測量		減小量 P	減小量 S		編號 或 符號	原始 厚度 (mm)	最大允 許減小 量(mm)	測量		減小量 P	減小量 S		編號 或 符號	原始 厚度 (mm)	最大允 許減小 量(mm)	測量		減小量 P	減小量 S				
				P	S		mm	%				P	S		mm	%				P	S		mm	%	P	S	mm
舷頂列板下第 1 塊列板																											
第 2 塊																											
第 3 塊																											
第 4 塊																											
第 5 塊																											
第 6 塊																											
第 7 塊																											
第 8 塊																											
第 9 塊																											
第 10 塊																											
第 11 塊																											
第 12 塊																											
第 13 塊																											
第 14 塊																											
第 15 塊																											
第 16 塊																											
第 17 塊																											
第 18 塊																											
第 19 塊																											
第 20 塊																											
龍骨列板																											
艙底總數																											

註 - 見下頁

測量者簽字：.....

TM2-T(ii) 報告的註釋：

- 1 本報告應用於記錄橫剖面處舷側外板的厚度測量：
貨物區域內一個、兩個或三個剖面，包括附錄 3 中典型橫剖面圖表表明的結構項目（4）、（5）、（6）和（7）。
- 2 船底區域包括龍骨板、船底板和舳部板。
- 3 應註明測量的確切肋骨號。
- 4 所記錄的單點測量應代表多點測量的平均值。
- 5 最大允許減小量可在附加的文件中說明。

船名：_____ 船級標識號：_____ 報告編號：_____ IMO 編號：_____

[illegible]

註一 見下頁

TM3-T 報告的註釋：

- 1 本報告應用於記錄橫剖面處縱向構件的厚度測量：

貨物區域內一個、兩個或三個剖面，包括附錄 3 中典型橫剖面圖表表明的相應結構項目（8）至（20）。
- 2 應註明測量的確切肋骨號。
- 3 所記錄的單點測量應代表多點測量的平均值。
- 4 最大允許減小量可在附加的文件中說明。

船名	船級標識號	報告編號	IMO 編號

則量者簽字：.....
註一 見下頁

TM4-T 報告的註釋：

- 1 本報告應用於記錄橫向構件的厚度測量，包括附錄 3 中典型橫剖面圖表表明的相應結構項目（25）至（32）。
- 2 測量區域的指導參見附錄。
- 3 所記錄的單點測量應代表多點測量的平均值。
- 4 最大允許減小量可在附加的文件中說明。

水密/油密橫艙壁厚度測量報告（貨油艙或貨艙處所內）（TM5-T）

船名：_____ 船級標識號：_____ 報告編號：_____ IMO 編號：_____

[illegible]

TM5-T 報告的註釋：

- 1 本報告應用於記錄水密/油密橫艙壁的厚度測量。
- 2 測量區域的指導參見附錄 3。
- 3 所記錄的單點測量應代表多點測量的平均值。
- 4 最大允許減小量可在附加的文件中說明。

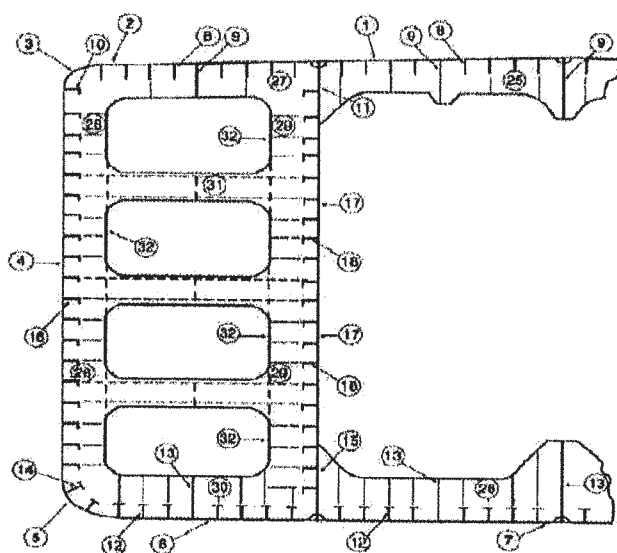
TM6-T 報告的註釋

- 1 本報告應用於記錄其他結構件的厚度測量，包括附錄 3 中所示的結構項目（36）、（37）和（38）。
- 2 所記錄的單點測量應代表多點測量的平均值。
- 3 最大允許減小量可在附加的文件中說明。

附錄3

測厚指導

油船表明縱向和橫向構件的典型橫剖面



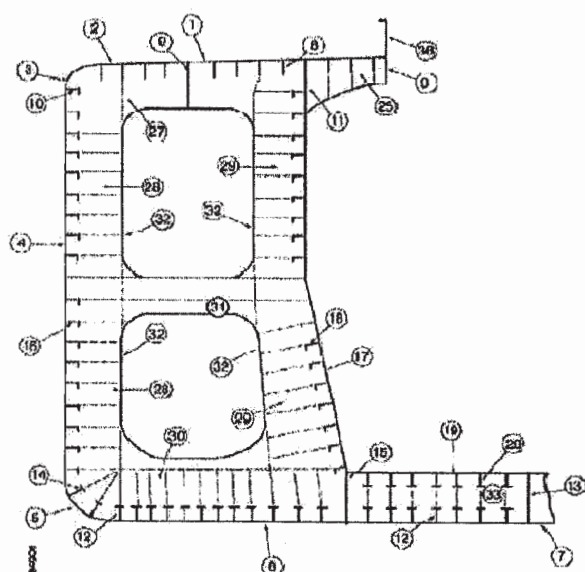
TM2-T(i)&(ii)報告
① 強力甲板板
② 甲板邊板
③ 舷頂列板
④ 舷側板
⑤ 舳板
⑥ 船底外板
⑦ 龍骨板

TM6-T 報告
⑩ 艙口圍板
⑪ 艙口間甲板板
⑫ 艙口蓋
⑬
⑭

TM3-T 報告
⑧ 甲板縱骨
⑨ 甲板縱桁
⑩ 舷頂列板縱骨
⑪ 縱向艙壁頂列板
⑫ 船底縱骨
⑬ 船底縱桁
⑭ 舳縱骨
⑮ 縱向艙壁底列板
⑯ 舷側縱骨
⑰ 縱向艙壁板(剩餘部分)
⑱ 縱向艙壁縱骨
⑲ 內底板
⑳ 內底縱骨
㉑
㉒
㉓
㉔

TM4-T報告
⑮ 甲板橫樑(中央艙)
⑯ 肋板(中央艙)
⑰ 甲板橫樑(邊艙)
⑱ 舷側垂直強肋骨
㉒ 縱向艙壁垂直強肋骨
㉓ 肋板(邊艙)
㉔ 支撐
㉕ 橫樑面板
㉖ 雙層底肋板
㉗
㉘

礦砂/油船表明縱向和橫向構件的典型橫剖面



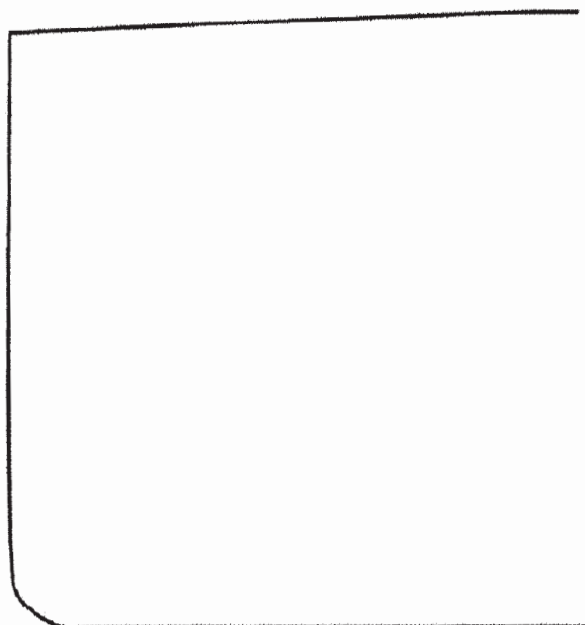
TM2-T(i)&(ii) 報告
① 強力甲板板
② 甲板邊板
③ 舷頂列板
④ 舷側板
⑤ 舳板
⑥ 船底外板
⑦ 龍骨板

TM6-T 報告
⑩ 艙口圍板
⑪ 艙口間甲板板
⑫ 艙口蓋
⑬
⑭

TM3-T 報告
⑧ 甲板縱骨
⑨ 甲板縱桁
⑩ 舷頂列板縱骨
⑪ 縱向艙壁頂列板
⑫ 船底縱骨
⑬ 船底縱桁
⑭ 舳縱骨
⑮ 縱向艙壁底列板
⑯ 舷側縱骨
⑰ 縱向艙壁板(剩餘部分)
⑱ 縱向艙壁縱骨
⑲ 內底板
⑳ 內底縱骨
㉑
㉒
㉓
㉔

TM4-T 報告
㉕ 甲板橫樑(中央艙)
㉖ 肋板(中央艙)
㉗ 甲板橫樑(邊艙)
㉘ 舷側垂直強肋骨
㉙ 縱向艙壁垂直強肋骨
㉚ 肋板(邊艙)
㉛ 支撐
㉜ 橫樑面板
㉝ 雙層底肋板
㉞
㉟

橫剖面概要（應用於典型油船、礦砂/油船剖面不適用時的縱向和橫向構件）



TM2-T(i)&(ii)報告

- ① 強力甲板板
- ② 甲板邊板
- ③ 舷頂列板
- ④ 舷側板
- ⑤ 舳板
- ⑥ 船底外板
- ⑦ 龍骨板

TM6-T 報告

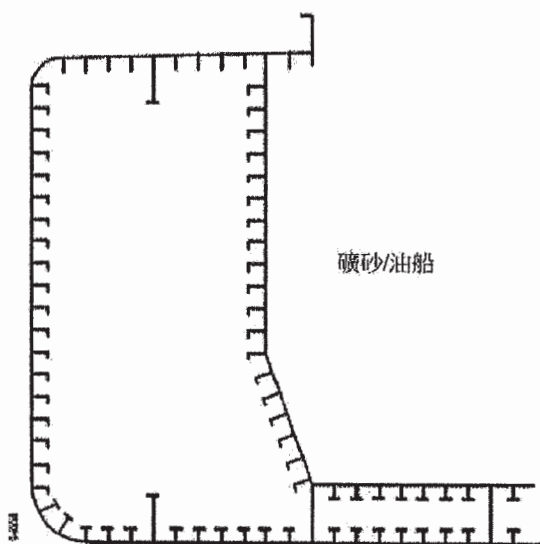
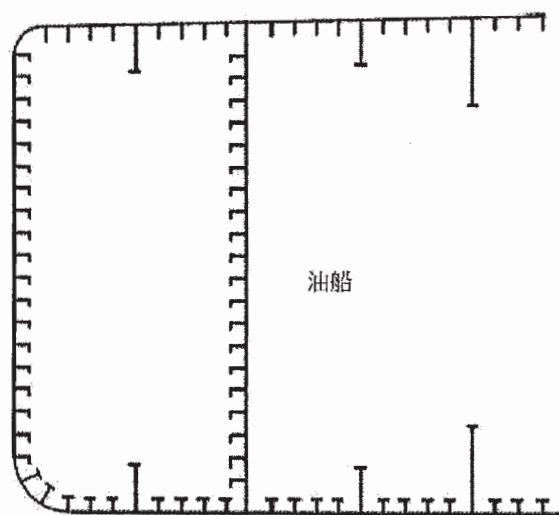
- ⑧ 艙口圍板
- ⑨ 艙口間甲板板
- ⑩ 艙口蓋
- ⑪
- ⑫

TM3-T 報告

- ⑧ 甲板縱骨
- ⑨ 甲板縱桁
- ⑩ 舷頂列板縱骨
- ⑪ 縱向艙壁頂列板
- ⑫ 船底縱骨
- ⑬ 船底縱桁
- ⑭ 舳縱骨
- ⑮ 縱向艙壁底列板
- ⑯ 舷側縱骨
- ⑰ 縱向艙壁板(剩餘部分)
- ⑱ 縱向艙壁縱骨
- ⑲ 內底板
- ⑳ 內底縱骨
- ㉑
- ㉒
- ㉓
- ㉔

TM4-T 報告

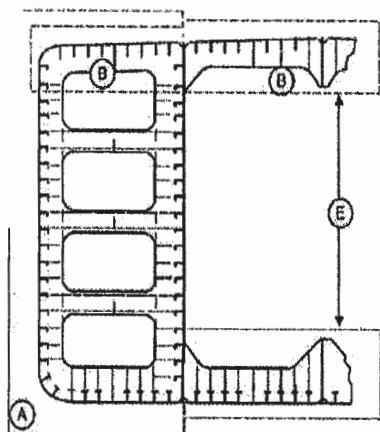
- ⑮ 甲板橫樑(中央艙)
- ⑯ 肋板(中央艙)
- ⑰ 甲板橫樑(邊艙)
- ⑱ 舷側垂直強肋骨
- ㉑ 縱向艙壁垂直強肋骨
- ㉒ 肋板(邊艙)
- ㉓ 支撐
- ㉔ 橫樑面板
- ㉕ 雙層底肋板
- ㉖
- ㉗

TM2-T(i)&(ii)和 TM3-T 報告的表明所有縱向構件的典型橫剖面

近觀檢驗要求

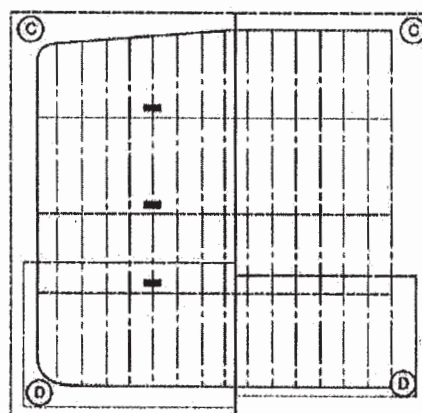
(油船和礦砂/油船表明與近觀檢驗要求相關的典型測厚區域的橫剖面)

油船：
典型橫剖面



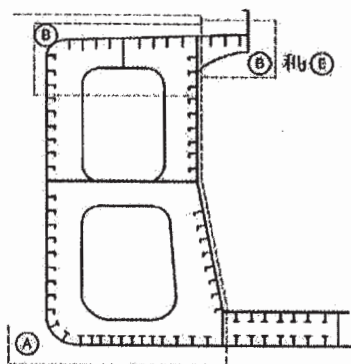
TM3-T 和 TM4-T (如適當) 報告的厚度

油船：
典型橫艙壁



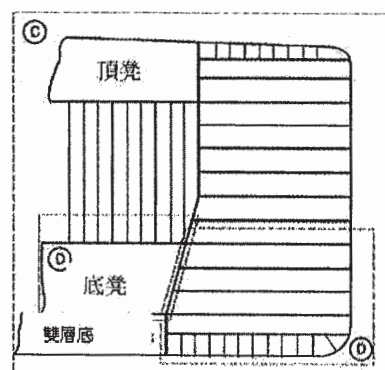
TM5-T 報告的厚度

礦砂/油船：
典型橫剖面



TM3-T 和 TM4-T (如適用) 報告的厚度

礦砂/油船：
典型橫艙壁



TM5-T 報告的厚度

近觀檢驗區域

厚度測量範圍和形式的建議
參見附件4。

附件 11

與油船加強檢驗計劃有關的技術評估導則

換證檢驗

1 簡介

本導則包含與技術評估有關的資料和建議，可結合油船換證檢驗的計劃加以使用。如 5.1.5 所述，本導則是一個建議的方法，在認為必要和適當時，可由主管機關決定，結合制定所要求的檢驗計劃予以施用。

2 目的和原則

2.1 目的

本導則所述的技術評估的宗旨是幫助確定臨界結構區域、指定可疑區域，並把注意力放在那些極易發生損耗或損壞、或表明有損耗或損壞史的結構件或結構件區域。該資料可能有助於指定要進行測厚、近觀檢驗和液艙試驗的位置、區域和液艙。

2.2 最低要求

本導則不可用於降低附件 1、2 和 3 中分別對近觀檢驗、測厚和液艙試驗的要求，這些要求在任何情況下都應作為最低要求予以遵守。

2.3 時限

如同檢驗計劃的其他方面一樣，本導則所述的技術評估應由船東或經營者配合主管機關，在換證檢驗開始之前予以實施，即在開

始檢驗之前且通常在檢驗完成之日前至少 12 至 15 個月。

2.4 應予考慮的方面

2.4.1 特定船舶下列方面的技術評估可作為指定檢驗液艙和區域的基礎，這些技術評估可包括對相關可能蝕耗的風險進行定量或定性評估：

- .1 設計特徵，如不同結構組件的應力等級、設計細節和高強度鋼（HTS）的使用範圍；
- .2 與特定船舶及類似船舶（如有）的腐蝕、裂紋、屈曲、凹陷和修理有關的過去史；和
- .3 與所載貨物類型、貨油/壓載的不同液艙的使用、液艙保護以及塗層（如有）狀況有關的資料。

2.4.2 對各種結構件和區域易損壞或易蝕耗的相關風險的技術評估，應根據諸如參考資料 1 和 2 所列的經認可原則和慣例進行評判和確定。

3 技術評估

3.1 總則

3.1.1 有三種基本形式的可能缺陷，它們可能成為與檢驗計劃有關的技術評估對象，即腐蝕、裂紋和屈曲。碰撞損壞通常不包含在檢驗計劃中，因為凹陷通常在備忘錄中註明且由驗船師作為常規情況進行處理。

3.1.2 結合檢驗計劃過程開展的技術評估，原則上應按圖 1 的圖解形式表明，該圖表明如何結合檢驗計劃程序進行技術評定。該方法的

依據是對基本上與設計和腐蝕有關的知識和經驗的一種風險評估。

3.1.3 應考慮到設計中有關容易因振動、高應力或疲勞造成屈曲或裂紋的結構細節。

3.1.4 腐蝕與老化過程有關，並且與新船防腐系統的質量和營運中的後續維護密不可分。腐蝕也可導致裂紋和（或）屈曲。

3.2 方法

3.2.1 設計細節

3.2.1.1 本船及姐妹船和（或）類似船舶（如有）的損壞經歷，是計劃過程中使用的主要資料來源。此外，還應包括從設計圖紙中選擇的結構細節。應考慮的典型損壞經歷包括：

- .1 裂紋的數量、範圍、位置和發生次數；和
- .2 屈曲位置。

3.2.1.2 該資料可在檢驗報告和（或）船東檔案中包括船東自查結果中找到。這些缺陷應予以分析、註明並標記在草圖上。

3.2.1.3 此外，還應利用一般經驗。例如，應參照參考資料 1，其中包括各種油船結構細節的典型損壞和建議的修理方法目錄。

3.2.1.4 在使用這些圖表時，應一道審核主要結構圖紙，以比對實際結構，並查找易受損壞的類似細節。圖 2 所示是一個實例。

3.2.1.5 除使用上述圖表外，審核主要結構圖紙還應包括核查已出現過裂紋的典型設計細節。應仔細考慮造成損壞的因素。

3.2.1.6 高強度鋼（HTS）的使用是一個重要因素。在使用普通低碳鋼

時有着良好營運史的構件，在使用高強度鋼及其較高相關應力時，可能更易受損。甲板和船底結構的縱向材料使用高強度鋼的經驗普遍和總體上較好。在其他受到較高動應力的部位如舷側結構，使用高強度鋼的經驗則不那麼令人鼓舞。

3.2.1.7 在這一方面，根據相關方法對典型和重要的組件及構件的應力計算可能證明有用，並應予以考慮。

3.2.1.8 所選擇的在該過程中確定的結構區域應予以記錄，並標記在將要納入檢驗計劃的結構圖上。

3.2.2 腐蝕

3.2.2.1 為評估相關的腐蝕風險，通常應考慮以下資料：

- .1 液艙和處所的使用狀況；
- .2 塗層狀況；
- .3 陽極狀況；
- .4 掃艙程序；
- .5 以前腐蝕損壞；
- .6 貨油艙用作壓載艙的時間；
- .7 腐蝕風險方案（見參考資料 2，表 3.1）；和
- .8 加熱液艙的位置。

3.2.2.2 參考資料 2 以典型狀況圖給出明確實例，其可用於判定和描述塗層狀況。

3.2.2.3 腐蝕風險的評估應基於參考資料 2，以及船齡和為制定檢驗計劃而收集的資料推測出的船舶狀況的相關資料。

3.2.2.4 應列出各種液艙和處所相應指明的腐蝕風險。

3.2.3 近觀檢驗和測厚的位置

3.2.3.1 根據腐蝕風險表和設計經驗的評估，可指定初次近觀檢驗和測厚（剖面）的位置。

3.2.3.2 通常應指定已判定具備最大腐蝕風險的液艙和處所內的測厚剖面。

3.2.3.3 最初應根據最大腐蝕風險指定進行近觀檢驗的液艙和處所，並應始終包括壓載艙。選擇的原則是隨船齡的增長或在資料缺乏或不可靠時增大範圍。

參考資料

1 油船結構合作論壇（TSCF），“油船結構檢查和狀況評估指導手冊，1986”。

2 油船結構合作論壇（TSCF），“油船結構狀況評估和維護，1992”。

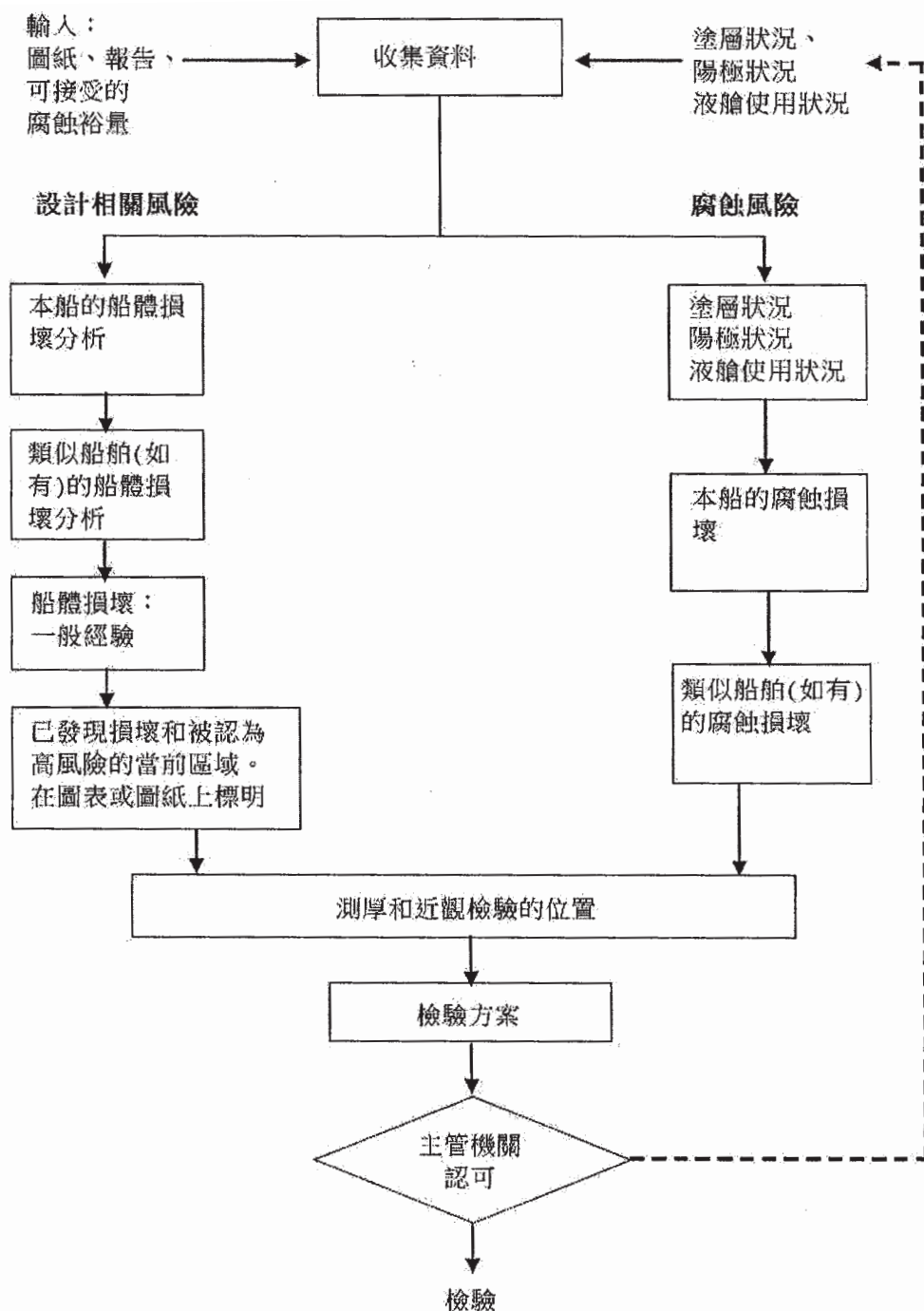


圖1 - 技術評估和檢驗計劃過程

位置：縱骨與橫框架的連接		
例1：縱向扶強材連接切口處腹板和扁鋼裂紋		
典型損壞		建議修理
注：可能出現一處或多處裂紋		腹板扁鋼割換並部分換新或予以焊補
造成損壞因素： 1. 扁鋼扶強材的不對稱連接導致疲勞載荷下扶強材根部處產生高應力。 2. 縱骨與腹板的連接面積不足。 3. 板厚周邊包焊處的焊縫有缺陷。 4. 應力集中區域有高度局部腐蝕，如扁鋼扶強材連接處、縱骨切口處角隅，以及腹板與船體連接切口處。 5. 橫向腹板處應力集中。 6. 動力波浪載荷/船舶運動。		
圖1	油船結構合作論壇 主題：結構細節的目錄	圖1

圖2 - 典型損壞和修理示例（根據參考資料1複製）

附件 12

油船船體樑總縱強度衡準

1 一般要求

1.1 本衡準應按 8.1.2 要求，用於船體樑總縱強度的評估。

1.2 為使所評估的船舶總縱強度能被承認為有效，縱向內部構件和船體外板之間的角焊縫應處於良好狀況，以保持船體外板和縱向內部構件的完整性。

2 總縱強度的評估

對船長 130m 及以上且船齡在 10 年以上的油船，應在“貨船構造安全證書”或“貨船安全證書”的換證檢驗（SC 換證檢驗）期間，酌情以測得、換新或加強的結構件厚度為基礎，按本附件的要求對船體樑總縱強度進行評估。船體樑總縱強度的狀況評估應根據附錄 3 中規定的方法確定。

2.1 船體樑的甲板 and 底部折板橫剖面面積的計算

2.1.1 應在 SC 換證檢驗期間，酌情利用測得、換新或加強的結構件厚度，對船體樑的甲板折板（甲板板和甲板縱骨）以及底部折板（船底板和船底縱骨）橫剖面面積進行計算。

2.1.2 如甲板或底部折板的橫剖面面積減小量超過其各自的建造面積（即船舶建造時的原始剖面面積）的 10%，則應採取下列任一措施：

- .1 對甲板或船底位置進行換新或加強，以使實際剖面面積不小於建造面積的 90%；或

- .2 在 SC 換證檢驗期間，酌情利用測得、換新或加強的結構件厚度，應用附錄 1 中規定的計算方法計算船體樑的橫剖面的實際剖面模數 (Z_{act})。

2.2 船體樑橫剖面模數的要求

2.2.1 根據 2.1.2.2 計算的船體樑橫剖面實際剖面模數應根據適用情況符合下列任一要求：

- .1 對於 2002 年 7 月 1 日或以後建造的船舶，根據 2.1.2.2 計算的船體樑橫剖面實際剖面模數 Z_{act} 應不小於主管機關確定的減少極限值，同時考慮到本組織通過的建議案；
或
- .2 對於 2002 年 7 月 1 日以前建造的船舶，只要 Z_{act} 在任何情況下不小於附錄 2 中規定的最小剖面模數的減小極限值，則根據 2.1.2.2 要求計算的船體樑橫剖面實際剖面模數 Z_{act} 應符合主管機關或認可的船級社要求的營運船舶最小剖面模數衡準。

附錄 1

船體樑船中剖面的剖面模數計算衡準

- 1 在計算船體樑橫剖面模數時，應考慮到所有縱向連續強力構件的剖面面積。
- 2 對較大開口，即長度超過 2.5m 或寬度超過 1.2m 以及採用扇形焊接的扇形孔，應始終在剖面模數計算中扣除其剖面面積。
- 3 對較小開口（人孔、減輕孔、焊縫處的單個扇形孔等），只要其寬度或陰影區寬度在一個橫剖面上的總和所減少的甲板或船底剖面模數不超過 3%，且縱骨和縱向桁材上減輕孔、流水孔和焊縫處單個扇形孔的高度不超過腹板高度的 25%（但對扇形孔深度最大不超過 75mm），則不必扣除其剖面面積。
- 4 較小開口寬度總和在一個橫剖面上小於船底或甲板區域的 $0.06(B-\Sigma b)$ （ B =船寬， Σb =較大開口的總寬度），可視作等同於上述剖面模數的減小。
- 5 投影區域將通過畫兩條為 30° 角的切線獲得。
- 6 甲板剖面模數與舷側型甲板線有關。
- 7 船底剖面模數與基線有關。
- 8 如得到縱艙壁或高腹板桁材的有效支持，連續凸形甲板和連續縱向艙口圍板應包含在縱向構件剖面面積中。甲板剖面模數應通過慣性力矩除以下列距離求得，但此距離應大於到舷側甲板邊線的距離：

$$y_r = y \left(0.9 + 0.2 \frac{x}{B} \right)$$

式中：

y = 中和軸至連續強力構件頂點的距離；

x = 連續強力構件頂點至船體中心線的距離；

x 和 y 應在 y_r 最大值處測量。

- 9 多艙口間的縱桁將通過特殊計算予以考慮。

附錄 2

營運船舶最小總縱強度的減小極限值

1 營運油船的最小剖面模數（ Z_{mc} ）的減小極限值由下列公式得到：

$$Z_{mc} = cL^2 B (C_b + 0.7)k \quad (\text{cm}^3)$$

式中：

L = 船長。 L 係指在夏季載重線上首柱前緣至舵柱後緣，或如無承舵柱時至舵桿中心的距離，m。 L 應不小於夏季載重線總長的96%，且不必大於97%。對於特殊船艙和船艙布置的船舶， L 可予以特殊考慮。

B = 最大型寬，m。

C_b = 基於 L 和 B 及相應於夏季載重線吃水 d 的型方形係數。 C_b 應取不小於0.6。

$$C_b = \frac{d \text{ 吃水的型排水量}(\text{m}^3)}{LBd}$$

$$c = 0.9c_n$$

$$c_n = 10.75 - \left(\frac{300-L}{100}\right)^{1.5}, \text{ 對 } 130 \text{ m} \leq L \leq 300 \text{ m}$$

$$c_n = 10.75, \text{ 對 } 300 \text{ m} \leq L \leq 350 \text{ m}$$

$$c_n = 10.75 - \left(\frac{L-350}{150}\right)^{1.5}, \text{ 對 } 350 \text{ m} \leq L \leq 500 \text{ m}$$

k = 材料係數，如：

k = 1.0，對屈服應力為235 N/mm²及以上的低碳鋼；

k = 0.78，對屈服應力為315 N/mm²及以上的高強度鋼；

k = 0.72，對屈服應力為355 N/mm²及以上的高強度鋼。

2 上述 1 中基於剖面模數要求的船體樑所有縱向連續構件尺寸應保持在船中 $0.4L$ 範圍內。但在特殊情況下，考慮到船舶種類、船型和裝載條件，該尺寸可向船中 $0.4L$ 區域的兩端逐漸減小，但不應影響船舶的裝載適應性。

3 但是，上述標準可能不適用於特殊船型或特殊設計的船舶，如特殊主要比例和（或）重量分布的船舶。

附錄 3

總縱強度評估和修理方法的測厚取樣方法

1 總縱強度評估範圍

如果船體樑長度包含了壓載艙和貨油艙，總縱強度評估應在船中 $0.4L$ 範圍內。如果鄰近的壓載艙和貨油艙延伸至船中 $0.4L$ 之外，總縱強度評估應在船中 $0.5L$ 範圍內。

2 厚度測量的取樣方法

2.1 按照第 2.5 節的要求，應選擇橫剖面以對儘可能多的腐蝕環境中的不同液艙進行厚度測量，例如與裝有加熱盤管的貨油艙同處一個共同界面的壓載艙、其他壓載艙、允許注入海水的貨油艙和其他貨油艙。如有，應選擇與裝有加熱盤管的貨油艙同處一個共同界面的壓載艙和允許注入海水的油艙。

2.2 應按照附件 2 對橫剖面的最低數量進行取樣。橫剖面應位於懷疑會產生，或從 2.3 規定的甲板板和船底板測量中已發現的，最大厚度縮減的區域，並應在已進行局部換新或加強的區域之外。

2.3 在貨物區域內應按照附件 2 的要求測量的每塊甲板板和（或）船底板上，應至少測量兩個點。

2.4 在應按照附件 2 的要求測量的每個橫剖面的甲板和船底的 $0.1D$ （ D 為船舶型深）範圍內，應在腹板和面板上測量每根縱骨和縱桁，並應在縱骨之間測量每塊板的一個點。

2.5 對於除 2.4 規定的按照附件 2 的要求在每個橫剖面處進行測量者外的縱向構件，應在腹板和面板上測量每根縱骨和縱桁，並在每塊列板的每塊

板上至少測量一個點。

2.6 每一構件的厚度應通過每一構件上橫剖面處所有測量值的平均值來確定。

3 總縱強度不足時的附加測量

3.1 如果按照本附件中的總縱強度要求，發現一個或一個以上的橫剖面有缺陷，應增加進行厚度測量的橫剖面數量以使船中 0.5L 區域內的每個液艙均已取樣。對部分在 0.5L 區域內，但延伸至 0.5L 區域外的液艙處所也應進行取樣。

3.2 在每個修理區域前部的一個橫剖面 and 每個修理區域後部的一個橫剖面上也應進行附加的厚度測量，該厚度測量的範圍應足以確保鄰近修理剖面的區域也符合本規則的要求。

4 有效的修理方法

4.1 為滿足本附件要求而進行的換新或加強應符合 4.2。

4.2 經換新或加強的結構件的最小連續長度應不小於該處主要構件間距的兩倍。此外，更換的構件（板、扶強材、樑腹板和折板等）前部和後部的每個連接件對接處的厚度減小應不在顯著腐蝕範圍內（相關的每一特定構件允許縮減量的 75%）。如果對接處的厚度差超過較小厚度的 15%，應採取厚度平穩過渡。

4.3 涉及設置複板或改變結構件的替代修理方法應經特殊考慮。在考慮設置複板時，應限於下列情況：

- .1 恢復和（或）增加總縱強度；
- .2 應加強的甲板或船底板的厚度減小應不在顯著腐蝕範圍（相關

甲板板的允許縮減量的 75%) 以內；

- .3 定位和布置，包括複板的終止應按照主管機關認可的標準進行；
- .4 複板連續至船中整個 $0.5L$ 的長度範圍；和
- .5 對接焊中採用連續填角焊和全焊透焊縫，並根據複板的長度採用塞焊。採用的焊接工藝應經主管機關批准。

4.4 考慮到抗皺折力和縱向構件和外板之間的焊接狀況，鄰近更換區域且與安裝的複板相連的現有結構應能承受施加的載荷。

**INTERNATIONAL CODE ON THE ENHANCED PROGRAMME OF
INSPECTIONS DURING SURVEYS OF BULK CARRIERS
AND OIL TANKERS, 2011 (2011 ESP CODE)**

Resolution A.1049(27)

Adopted on 30 November 2011

THE ASSEMBLY,

RECALLING Article 15(j) of the Convention on the International Maritime Organization regarding the functions of the Assembly in relation to regulations and guidelines concerning maritime safety and the prevention and control of marine pollution from ships,

RECALLING ALSO resolution A.744(18) by which the Assembly adopted the *Guidelines on the enhanced programme of inspections during surveys of bulk carriers and oil tankers* (hereinafter referred to as "the Guidelines"),

NOTING that the 1994 Conference of Contracting Governments to the International Convention for the Safety of Life at Sea (SOLAS), 1974 (hereinafter referred to as "the Convention") adopted regulation XI-1/2 of the Convention to make the provisions of the Guidelines mandatory,

NOTING ALSO resolutions MSC.49(66), MSC.105(73), MSC.125(75), MSC.144(77), MSC.197(80), MSC.261(84) and resolution 2 of the 1997 Conference of Contracting Governments to the Convention, by which amendments to the Guidelines were adopted by the Maritime Safety Committee and the Conference of Contracting Governments to the Convention, in accordance with article VIII(b) and regulation XI-1/2 of the Convention, as appropriate,

RECOGNIZING that the numerous amendments made to the Guidelines necessitated a comprehensive revision in order to ensure the effective implementation of their provisions and to maintain the highest practical level of safety,

HAVING CONSIDERED the recommendation made by the Maritime Safety Committee at its eighty-ninth session,

1. ADOPTS the International Code on the Enhanced Programme of Inspections during Surveys of Bulk Carriers and Oil Tankers, 2011 (2011 ESP Code), as set out in the annex to the present resolution;
2. INVITES Contracting Governments to the Convention to note that the 2011 ESP Code will become effective upon entry into force of the associated amendments to chapter XI-1 of the Convention;
3. REQUESTS the Secretary-General of the Organization to transmit certified copies of the present resolution and the 2011 ESP Code, contained in the annex, to all Contracting Governments to the Convention after the aforementioned amendments to chapter XI-1 of the Convention have been adopted;
4. ALSO REQUESTS the Secretary-General of the Organization to transmit copies of the present resolution and the 2011 ESP Code contained in the annex to all Members of the Organization which are not Contracting Governments to the SOLAS Convention after the aforementioned amendments to chapter XI-1 of the Convention have been adopted;
5. FURTHER REQUESTS the Maritime Safety Committee to keep the Code under review and update it as necessary, in the light of experience gained in its application.

Annex

**INTERNATIONAL CODE ON THE ENHANCED PROGRAMME OF INSPECTIONS
DURING SURVEYS OF BULK CARRIERS AND OIL TANKERS, 2011
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ANNEX A

CODE ON THE ENHANCED PROGRAMME OF INSPECTIONS DURING
THE SURVEYS OF BULK CARRIERS

Part A

CODE ON THE ENHANCED PROGRAMME OF INSPECTIONS DURING SURVEYS OF
BULK CARRIERS HAVING SINGLE-SIDE SKIN CONSTRUCTION

1 General

1.1 Application

1.1.1 The Code should apply to all self-propelled bulk carriers of 500 gross tonnage and above other than double-side skin bulk carriers as defined in paragraph 1.2.1 of part B of annex A.

1.1.2 The Code should apply to surveys of hull structure and piping systems in way of cargo holds, cofferdams, pipe tunnels, void spaces, fuel oil tanks, within the cargo length area and all ballast tanks.

1.1.3 The Code contains the minimum extent of examination, thickness measurements and tank testing. The survey should be extended when substantial corrosion and/or structural defects are found and include additional close-up survey when necessary.

1.1.4 Ships subject to compliance with regulation XII/6.1 of the Convention should be subject to the additional thickness measurement guidance contained in annex 11.

1.1.5 Ships subject to compliance with resolution MSC.168(79) should be subject to the additional thickness measurement guidance contained in annex 15.

1.1.6 For bulk carriers with hybrid cargo hold arrangements, e.g. with some cargo holds of single-side skin and others of double-side skin, the requirements of part B of annex A apply to cargo holds of double-side skin and associated wing spaces.

1.1.7 The surveys should be carried out during the surveys prescribed by regulation I/10 of the 1974 SOLAS Convention, as amended.

1.2 Definitions

1.2.1 *Bulk carrier* is a ship which is constructed generally with single deck, topside tanks and hopper side tanks in cargo spaces, and is intended primarily to carry dry cargo in bulk and includes combination carriers.

1.2.2 *Ballast tank* is a tank which is used for salt water ballast, or, where applicable, a space which is used for both cargo and salt water ballast will be treated as a ballast tank when substantial corrosion has been found in that space.

1.2.3 *Spaces* are separate compartments including holds, tanks, cofferdams and void spaces bounding cargo holds, decks and the outer hull.

1.2.4 *Overall survey* is a survey intended to report on the overall condition of the hull structure and determine the extent of additional close-up surveys.

1.2.5 *Close-up survey* is a survey where the details of structural components are within the close visual inspection range of the surveyor, i.e. normally within reach of hand.

1.2.6 *Transverse section* is the cross section of the hull perpendicular to the ship's centerline and includes all longitudinal members such as plating, longitudinals and girders at the deck, side and bottom, inner bottom and hopper side plating, longitudinal bulkheads, and bottom plating in top wing tanks.

1.2.7 *Representative spaces* are those which are expected to reflect the condition of other spaces of similar type and service and with similar corrosion prevention systems. When selecting representative spaces account should be taken of the service and repair history on board and identifiable critical and/or suspect areas.

1.2.8 *Suspect areas* are locations showing substantial corrosion and/or are considered by the surveyor to be prone to rapid wastage.

1.2.9 *Substantial corrosion* is an extent of corrosion such that assessment of corrosion pattern indicates wastage in excess of 75% of allowable margins, but within acceptable limits. For ships built under the IACS Common Structural Rules, substantial corrosion is an extent of corrosion such that the assessment of the corrosion pattern indicates a gauged (or measured) thickness between $t_{net} + 0.5$ mm and t_{net} .

1.2.10 A *corrosion prevention system* is normally considered a full hard protective coating. Hard protective coating should usually be epoxy coating or equivalent. Other coating systems, which are neither soft nor semi-hard coatings, may be considered acceptable as alternatives provided that they are applied and maintained in compliance with the manufacturer's specifications.

1.2.11 *Coating condition* is defined as follows:

GOOD condition with only minor spot rusting;

FAIR condition with local breakdown of coating at edges of stiffeners and weld connections and/or light rusting over 20% or more of areas under consideration, but less than as defined for POOR condition; and

POOR condition with general breakdown of coating over 20% or more of areas or hard scale at 10% or more of areas under consideration.

1.2.12 *Critical structural areas* are locations which have been identified from calculations to require monitoring or from the service history of the subject ship or from similar or sister ships to be sensitive to cracking, buckling or corrosion which would impair the structural integrity of the ship.

1.2.13 *Cargo length area* is that part of the ship which includes cargo holds and adjacent areas including fuel tanks, cofferdams, ballast tanks and void spaces.

1.2.14 *Intermediate survey* is a survey carried out either at the second or third annual survey or between these surveys.

1.2.15 A *prompt and thorough repair* is a permanent repair completed at the time of survey to the satisfaction of the surveyor, therein removing the need for the imposition of any associated condition of classification or recommendation.

1.2.16 *Convention* means the International Convention for the Safety of Life at Sea, 1974, as amended.

1.2.17 *Specially considered* (in connection with close-up surveys and thickness measurements) means sufficient close-up inspection and thickness measurements are taken to confirm the actual average condition of the structure under the coating.

1.3 Repairs

1.3.1 Any damage in association with wastage over the allowable limits (including buckling, grooving, detachment or fracture), or extensive areas of wastage over the allowable limits, which affects or, in the opinion of the Administration, will affect the ship's structural, watertight or weathertight integrity, should be promptly and thoroughly (see 1.2.15) repaired. Areas to be considered include:

- .1 side structure and side plating;
- .2 deck structure and deck plating;
- .3 bottom structure and bottom plating;
- .4 inner bottom structure and inner bottom plating;
- .5 inner side structure and inner side plating;
- .6 watertight or oiltight bulkheads;
- .7 hatch covers or hatch coamings; and
- .8 items in 3.3.10.

For locations where adequate repair facilities are not available, the Administration may allow the ship to proceed directly to a repair facility. This may require discharging the cargo and/or temporary repairs for the intended voyage.

1.3.2 Additionally, when a survey results in the identification of corrosion or structural defects, either of which, in the opinion of the Administration, will impair the ship's fitness for continued service, remedial measures should be implemented before the ship continues in service.

1.4 Surveyors

For bulk carriers of 20,000 tons deadweight and above, two surveyors should jointly carry out the first scheduled renewal survey after the bulk carrier passes 10 years of age (i.e. third renewal survey), and all subsequent renewal surveys and intermediate surveys. On bulk carriers of 100,000 tons deadweight and above, the intermediate survey between 10 and 15 years of age should be performed by two surveyors. If the surveys are carried out by a recognized organization, the surveyors should be exclusively employed by such recognized organizations.

1.5 *Thickness measurements and close-up surveys*

In any kind of survey, i.e. renewal, intermediate, annual or other surveys having the scope of the foregoing ones, thickness measurements of structures in areas where close-up surveys are required should be carried out simultaneously with close-up surveys.

2 **Renewal survey**

2.1 *General*

2.1.1 The renewal survey may be commenced at the fourth annual survey and be progressed during the succeeding year with a view to completion by the fifth anniversary date.

2.1.2 As part of the preparation for the renewal survey, the survey programme should be dealt with in advance of the survey. The thickness measurement should not be held before the fourth annual survey.

2.1.3 The survey should include, in addition to the requirements of the annual survey, examination, tests and checks of sufficient extent to ensure that the hull and related piping, as required in 2.1.5, is in a satisfactory condition and is fit for its intended purpose for the new period of validity of the Cargo Ship Safety Construction Certificate, subject to proper maintenance and operation and to periodical surveys being carried out at the due dates.

2.1.4 All cargo holds, ballast tanks, pipe tunnels, cofferdams and void spaces bounding cargo holds, decks and outer hull should be examined, and this examination should be supplemented by thickness measurement and testing as required by 2.6 and 2.7, to ensure that the structural integrity remains effective. The examination should be sufficient to discover substantial corrosion, significant deformation, fractures, damages or other structural deterioration, that may be present.

2.1.5 All piping systems within the above spaces should be examined and operationally tested under working pressure to the attending surveyor's satisfaction to ensure that the tightness and condition remain satisfactory.

2.1.6 The survey extent of ballast tanks converted to void spaces should be specially considered in relation to the requirements for ballast tanks.

2.1.7 Concurrent crediting to both intermediate survey and renewal survey for surveys and thickness measurements of spaces should not be acceptable.

2.2 *Dry-dock survey*

2.2.1 A survey in dry-dock should be a part of the renewal survey. There should be a minimum of two inspections of the outside of the ship's bottom during the five-year period of the certificate. In all cases, the maximum interval between bottom inspections should not exceed 36 months.

2.2.2 For ships of 15 years of age and over, inspection of the outside of the ship's bottom should be carried out with the ship in dry-dock. For ships of less than 15 years of age, alternate inspections of the ship's bottom not conducted in conjunction with the renewal survey may be carried out with the ship afloat. Inspection of the ship afloat should only be carried out when the conditions are satisfactory and the proper equipment and suitably qualified staff is available.

2.2.3 If a survey in dry-dock is not completed in conjunction with the renewal survey or if the 36 month maximum interval referred to in 2.2.1 is not complied with, the Cargo Ship Safety Construction Certificate should cease to be valid until a survey in dry-dock is completed.

2.2.4 The overall and close-up surveys and thickness measurements, as applicable, of the lower portions of the cargo holds and ballast tanks should be carried out in accordance with the applicable requirements for renewal surveys, if not already performed.

Note: Lower portions of the cargo holds and ballast tanks are considered to be the parts below light ballast water line.

2.3 *Space protection*

2.3.1 Where provided, the condition of the corrosion prevention system of ballast tanks should be examined. For ballast tanks, excluding double-bottom tanks, where a hard protective coating is found in POOR condition as defined in 1.2.11, and it is not renewed, or where a soft or semi-hard coating has been applied, or where a hard protective coating has not been applied from the time of construction, the tanks in question should be examined at annual intervals. Thickness measurements should be carried out as deemed necessary by the surveyor. When such breakdown of hard protective coating is found in water ballast double-bottom tanks and it is not renewed, where a soft or semi-hard coating has been applied or where a hard protective coating has not been applied from the time of construction, the tanks in question may be examined at annual intervals. When considered necessary by the surveyor, or where extensive corrosion exists, thickness measurement should be carried out.

2.3.2 Where a hard protective coating is provided in cargo holds and is found in GOOD condition, the extent of close-up surveys and thickness measurements may be specially considered.

2.4 *Hatch covers and coamings*

The hatch covers and coamings should be surveyed as follows:

2.4.1 A thorough inspection of the items listed in 3.3 should be carried out in addition to all hatch covers and coamings.

2.4.2 Checking of the satisfactory operation of all mechanically operated hatch covers should be made, including:

- .1 stowage and securing in open condition;
- .2 proper fit and efficiency of sealing in closed condition; and
- .3 operational testing of hydraulic and power components, wires, chains, and link drives.

2.4.3 The effectiveness of sealing arrangements of all hatch covers by hose testing or equivalent should be checked.

2.4.4 Thickness measurement of the hatch cover and coaming plating and stiffeners should be carried out as given in annex 2.

2.5 *Extent of overall and close-up surveys*

2.5.1 An overall survey of all tanks and spaces should be carried out at the renewal survey. Fuel oil tanks in the cargo length area should be surveyed as follows:

Renewal survey No.1 Age ≤ 5	Renewal survey No.2 5 < Age ≤ 10	Renewal survey No.3 10 < Age ≤ 15	Renewal survey No.4 and subsequent 15 < Age
None	One	Two	Half, minimum two
Notes: 1. These requirements apply to tanks of integral (structural) type. 2. If a selection of tanks is accepted to be examined, then different tanks should be examined at each renewal survey, on a rotational basis. 3. Peak tanks (all uses) should be examined internally at each renewal survey. 4. At renewal survey No.3 and subsequent renewal surveys, one deep tank for fuel oil in the cargo area should be included, if fitted.			

2.5.2 The minimum requirements for close-up surveys at renewal survey are given in annex 1.

2.5.3 The surveyor may extend the close-up survey as deemed necessary taking into account the maintenance of the spaces under survey, the condition of the corrosion prevention system and where spaces have structural arrangements or details which have suffered defects in similar spaces or on similar ships according to the available information.

2.5.4 For areas in spaces where hard protective coatings are found to be in a GOOD condition, the extent of close-up surveys according to annex 1 may be specially considered. Refer also to 2.3.2.

2.6 *Extent of thickness measurements*

2.6.1 The minimum requirements for thickness measurements at the renewal survey are given in annex 2. Annex 11 provides additional thickness measurement guidelines applicable to the vertically corrugated transverse watertight bulkhead between cargo holds No.1 and No.2 on ships subject to compliance with regulation XII/6.1 of the Convention. For additional thickness measurement guidelines applicable to the side shell frames and brackets on ships subject to compliance with resolution MSC.168(79), reference is made to 1.1.5 and annex 15.

2.6.2 Representative thickness measurements to determine both general and local levels of corrosion in the shell frames and their end attachments in all cargo holds and ballast tanks should be carried out. Thickness measurement should also be carried out to determine the corrosion levels on the transverse bulkhead plating. The extent of thickness measurements may be specially considered provided the surveyor is satisfied by the close-up examination, that there is no structural diminution, and the hard protective coating where applied remains efficient.

2.6.3 Provisions for extended measurements for areas with substantial corrosion as defined in 1.2.9 are given in annex 10 and may be additionally specified in the survey programme as required in 5.1. These extended thickness measurements should be carried out before the survey is credited as completed. Suspect areas identified at previous surveys should be examined. Areas of substantial corrosion identified at previous surveys should have thickness measurements taken.

2.6.4 The surveyor may further extend the thickness measurements as deemed necessary.

2.6.5 For areas in tanks where hard protective coatings are found to be in GOOD condition as defined in 1.2.11, the extent of thickness measurements according to annex 2 may be specially considered by the Administration.

2.6.6 Transverse sections should be chosen where the largest reductions are suspected to occur or are revealed from deck plating measurements.

2.7 *Extent of tank pressure testing*

2.7.1 All boundaries of water ballast tanks, deep tanks and cargo holds used for water ballast within the cargo length area should be pressure tested. For fuel oil tanks, only representative tanks should be pressure tested.

2.7.2 The surveyor may extend the tank testing as deemed necessary.

2.7.3 Boundaries of ballast tanks should be tested with a head of liquid to the top of air pipes.

2.7.4 Boundaries of ballast holds should be tested with a head of liquid to near the top of hatches.

2.7.5 Boundaries of fuel oil tanks should be tested with a head of liquid to the highest point that liquid will rise under service conditions. Tank testing of fuel oil tanks may be specially considered based on a satisfactory external examination of the tank boundaries and a confirmation from the master stating that the pressure testing has been carried out according to the requirements with satisfactory results.

2.7.6 The testing of double-bottom tanks and other spaces not designed for the carriage of liquid may be omitted, provided a satisfactory internal examination together with an examination of the tanktop is carried out.

2.8 *Additional renewal survey requirements after determining compliance with regulations XII/12 and XII/13 of the Convention*

2.8.1 For ships complying with the requirements of regulation XII/12 of the Convention for hold, ballast and dry space water level detectors, the renewal survey should include an examination and a test of the water ingress detection system and of their alarms.

2.8.2 For ships complying with the requirements of regulation XII/13 of the Convention for the availability of pumping systems, the renewal survey should include an examination and a test of the means for draining and pumping ballast tanks forward of the collision bulkhead and bilges of dry spaces any part of which extends forward of the foremost cargo hold, and of their controls.

3 Annual survey

3.1 General

The annual survey should consist of an examination for the purpose of ensuring, as far as practicable, that the hull, weather decks, hatch covers, coamings and piping are maintained in a satisfactory condition and should take into account the service history, condition and extent of the corrosion prevention system of ballast tanks and areas identified in the survey report file.

3.2 Examination of the hull

3.2.1 Examination of the hull plating and its closing appliances should be carried out as far as can be seen.

3.2.2 Examination of watertight penetrations should be carried out as far as practicable.

3.3 Examination of weather decks, hatch covers and coamings

3.3.1 It should be confirmed that no unapproved changes have been made to the hatch covers, hatch coamings and their securing and sealing devices since the last survey.

3.3.2 A thorough survey of cargo hatch covers and coamings is only possible by examination in the open as well as closed positions and should include verification of proper opening and closing operation. As a result, at least the hatch covers sets within the forward 25% of the ship's length and at least one additional set, such that all the sets on the ship are assessed at least once in every five-year period, should be surveyed open, closed and in operation to the full extent in each direction at each annual survey, including:

- .1 stowage and securing in open condition;
- .2 proper fit and efficiency of sealing in closed condition; and
- .3 operational testing of hydraulic and power components, wires, chains and link drives.

The closing of the covers should include the fastening of all peripheral, and cross joint cleats or other securing devices. Particular attention should be paid to the condition of hatch covers in the forward 25% of the ship's length, where sea loads are normally greatest.

3.3.3 If there are indications of difficulty in operating and securing hatch covers, additional sets above those required by 3.3.2, at the discretion of the surveyor, should be tested in operation.

3.3.4 Where the cargo hatch securing system does not function properly, repairs should be carried out under the supervision of the Administration. Where hatch covers or coamings undergo substantial repairs, the strength of securing devices should be upgraded to comply with annex 13.

3.3.5 For each cargo hatch cover set, at each annual survey, the following items should be surveyed:

- .1 cover panels, including side plates, and stiffener attachments that may be accessible in the open position by close-up survey (for corrosion, cracks, deformation);

- .2 sealing arrangements of perimeter and cross joints (gaskets for condition and permanent deformation, flexible seals on combination carriers, gasket lips, compression bars, drainage channels and non-return valves);
- .3 clamping devices, retaining bars, cleating (for wastage, adjustment, and condition of rubber components);
- .4 closed cover locating devices (for distortion and attachment);
- .5 chain or rope pulleys;
- .6 guides;
- .7 guiderails and track wheels;
- .8 stoppers;
- .9 wires, chains, tensioners and gypsies;
- .10 hydraulic system, electrical safety devices and interlocks; and
- .11 end and interpanel hinges, pins and stools where fitted.

3.3.6 At each hatchway, at each annual survey, the coamings, with plating, stiffeners and brackets should be checked for corrosion, cracks and deformation, especially of the coaming tops including close-up survey.

3.3.7 Where considered necessary, the effectiveness of sealing arrangements may be proved by hose or chalk testing supplemented by dimensional measurements of seal compressing components.

3.3.8 Where portable covers, wooden or steel pontoons are fitted, the satisfactory condition of the following should be confirmed, where applicable:

- .1 wooden covers and portable beams, carriers or sockets for the portable beam, and their securing devices;
- .2 steel pontoons, including close-up survey of hatch cover plating;
- .3 tarpaulins;
- .4 cleats, battens and wedges;
- .5 hatch securing bars and their securing devices;
- .6 loading pads/bars and the side plate edge;
- .7 guideplates and chocks; and
- .8 compression bars, drainage channels and drain pipes (if any).

3.3.9 The flame screens on vents to all bunker tanks should be examined.

3.3.10 Bunker and vent piping systems, including ventilators should be examined.

3.4 Examination of cargo holds

3.4.1 For bulk carriers of 10 to 15 years of age, the following should be carried out:

- .1 overall survey of all cargo holds;
- .2 close-up examination of sufficient extent, minimum 25% of frames, to establish the condition of the lower region of the shell frames including approximately lower one-third length of the side frame at the side shell and side frame end attachment and the adjacent shell plating in the forward cargo hold. Where this level of survey reveals the need for remedial measures, the survey should be extended to include a close-up survey of all of the shell frames and adjacent shell plating of that cargo hold as well as a close-up survey of sufficient extent of all remaining cargo holds;
- .3 when considered necessary by the surveyor, or where extensive corrosion exists, thickness measurement should be carried out. If the results of these thickness measurements indicate that substantial corrosion is found, the extent of thickness measurements should be increased in accordance with annex 10. These extended thickness measurements should be carried out before the annual survey is credited as completed. Suspect areas identified at previous surveys should be examined. Areas of substantial corrosion identified at previous surveys should have thickness measurements taken;
- .4 where the hard protective coating in cargo holds is found to be in GOOD condition, the extent of close-up surveys and thickness measurements may be specially considered; and
- .5 all piping and penetrations in cargo holds, including overboard piping, should be examined.

3.4.2 For bulk carriers over 15 years of age, the following should be carried out:

- .1 overall survey of all cargo holds;
- .2 close-up examination of sufficient extent, minimum 25% of frames, to establish the condition of the lower region of the shell frames including approximately lower one-third length of the side frame at the side shell and side frame end attachment and the adjacent shell plating in the forward cargo hold and one other selected cargo hold. Where this level of survey reveals the need for remedial measures, the survey should be extended to include a close-up survey of all of the shell frames and adjacent shell plating of the cargo hold as well as a close-up survey of sufficient extent of all remaining cargo holds;
- .3 when considered necessary by the surveyor, or when extensive corrosion exists, thickness measurement should be carried out. If the results of these thickness measurements indicate that substantial corrosion is found, the extent of thickness measurements should be increased in accordance with annex 10. These extended thickness measurements should be carried out before the annual survey is credited as completed. Suspect areas identified at previous surveys should be examined. Areas of substantial corrosion identified at previous surveys should have thickness measurements taken;

- .4 where hard protective coating is fitted in cargo holds and is found in GOOD condition, the extent of the close-up surveys and thickness measurements may be specially considered; and
- .5 all piping and penetrations in cargo holds, including overboard piping, should be examined.

3.5 Examination of ballast tanks

Examination of ballast tanks should be carried out when required as a consequence of the results of the renewal survey and intermediate survey. When considered necessary by the Administration, or when extensive corrosion exists, thickness measurement should be carried out. If the results of these thickness measurements indicate that substantial corrosion is found, the extent of thickness measurements should be increased in accordance with annex 10. These extended thickness measurements should be carried out before the survey is credited as completed. Suspect areas identified at previous surveys should be examined. Areas of substantial corrosion identified at previous surveys should have thickness measurements taken.

3.6 Additional annual survey requirements for the foremost cargo hold of ships subject to regulation XII/9 of the Convention in accordance with the requirements of annex 12

3.6.1 Ships subject to regulation XII/9 of the Convention are those meeting all of the following conditions:

- .1 bulk carriers of 150 m in length and upwards of single-side skin construction;
- .2 carrying solid bulk cargoes having a density of 1,780 kg/m³ and above;
- .3 constructed before 1 July 1999; and
- .4 constructed with an insufficient number of transverse watertight bulkheads to enable them to withstand flooding of the foremost cargo hold in all loading conditions and remain afloat in a satisfactory condition of equilibrium as specified in regulation XII/4.4 of the Convention.

3.6.2 In accordance with regulation XII/9 of the Convention, for the foremost cargo hold of such ship the additional survey requirements listed in annex 12 should be applied.

3.7 Additional annual survey requirements after determining compliance with regulations XII/12 and XII/13 of the Convention

3.7.1 For ships complying with the requirements of regulation XII/12 of the Convention for hold, ballast and dry cargo space water level detectors, the annual survey should include an examination and a test, at random, of the water ingress detection systems and of their alarms.

3.7.2 For ships complying with the requirements of regulation XII/13 of the Convention for the availability of pumping systems, the annual survey should include an examination and a test, of the means for draining and pumping ballast tanks forward of the collision bulkhead and bilges of dry spaces any part of which extends forward of the foremost cargo hold, and of their controls.

4 Intermediate survey

4.1 General

4.1.1 Items that are additional to the requirements of the annual survey may be surveyed either at the second or third annual survey or between these surveys.

4.1.2 The extent of survey is dependent upon the age of the ship as specified in 4.2, 4.3 and 4.4.

4.1.3 Concurrent crediting to both intermediate survey and renewal survey for surveys and thickness measurements of space should not be acceptable.

4.2 Bulk carriers 5 to 10 years of age

4.2.1 Ballast tanks

4.2.1.1 For tanks used for water ballast, an overall survey of representative tanks selected by the surveyor should be carried out. The selection should include fore and aft peak tanks and a number of other tanks, taking into account the total number and type of ballast tanks. If such overall survey reveals no visible structural defects, the examination may be limited to verification that the corrosion prevention system remains efficient.

4.2.1.2 Where POOR coating condition, corrosion or other defects are found in water ballast tanks or where hard protective coating was not applied from the time of construction, the examination should be extended to other ballast tanks of the same type.

4.2.1.3 In ballast tanks other than double-bottom tanks, where a hard protective coating is found in POOR condition and it is not renewed, or where soft or semi-hard coating has been applied, or where a hard protective coating was not applied from the time of construction, the tanks in question should be examined and thickness measurements carried out as considered necessary at annual intervals. When such breakdown of coating is found in ballast double-bottom tanks, where a soft or semi-hard coating has been applied, or where a hard protective coating has not been applied, the tanks in question may be examined at annual intervals. When considered necessary by the surveyor, or where extensive corrosion exists, thickness measurements should be carried out.

4.2.1.4 In addition to the requirements above, suspect areas identified at previous renewal surveys should be overall and close-up surveyed.

4.2.2 Cargo holds

4.2.2.1 An overall survey of all cargo holds, including close-up survey of sufficient extent, minimum 25% of frames, should be carried out to establish the condition of:

- .1 shell frames including their upper and lower end attachments, adjacent shell plating, and transverse bulkheads in the forward cargo hold and one other selected cargo hold; and
- .2 areas found to be suspect areas at previous surveys.

4.2.2.2 Where considered necessary by the surveyor as a result of the overall and close-up survey as described in 4.2.2.1, the survey should be extended to include a close-up survey of all of the shell frames and adjacent shell plating of that cargo hold as well as a close-up survey of sufficient extent of all remaining cargo holds.

4.2.3 *Extent of thickness measurement*

4.2.3.1 Thickness measurement should be carried out to an extent sufficient to determine both general and local corrosion levels at areas subject to close-up survey as described in 4.2.2.1. The minimum requirement for thickness measurements at the intermediate survey are areas found to be suspect areas at previous surveys.

4.2.3.2 The extent of thickness measurement may be specially considered provided the surveyor is satisfied by the close-up survey, that there is no structural diminution and the hard protective coatings are found to be in a GOOD condition.

4.2.3.3 Where substantial corrosion is found, the extent of thickness measurements should be increased in accordance with the requirements of annex 10. These extended thickness measurements should be carried out before the survey is credited as completed. Suspect areas identified at previous surveys should be examined. Areas of substantial corrosion identified at previous surveys should have thickness measurements taken.

4.3 *Bulk carriers 10 to 15 years of age*

4.3.1 The requirements of the intermediate survey should be the same extent as the previous renewal survey as required in 2 and 5.1. However, internal examination of fuel tanks and pressure testing of all tanks are not required unless deemed necessary by the attending surveyor.

4.3.2 In application of 4.3.1, the intermediate survey may be commenced at the second annual survey and be progressed during the succeeding year with a view to completion at the third annual survey in lieu of the application of 2.1.1.

4.3.3 In application of 4.3.1, an underwater survey may be considered in lieu of the requirements of 2.2.

4.4 *Bulk carriers exceeding 15 years of age*

4.4.1 The requirements of the intermediate survey should be to the same extent as the previous renewal survey required in 2 and 5.1. However, internal examination of fuel tanks and pressure testing of all tanks are not required unless deemed necessary by the attending surveyor.

4.4.2 In application of 4.4.1, the intermediate survey may be commenced at the second annual survey and be progressed during the succeeding year with a view to completion at the third annual survey in lieu of the application of 2.1.1.

4.4.3 In application of 4.4.1, a survey in dry-dock should be part of the intermediate survey. The overall and close-up surveys and thickness measurements, as applicable, of the lower portions of the cargo holds and water ballast tanks should be carried out in accordance with the applicable requirements for intermediate surveys, if not already performed.

Note: Lower portions of the cargo holds and ballast tanks are considered to be the parts below light ballast water line.

5 Preparations for survey

5.1 Survey programme

5.1.1 The owner in cooperation with the Administration should work out a specific survey programme prior to the commencement of any part of:

- .1 the renewal survey; and
- .2 the intermediate survey for bulk carriers over 10 years of age.

The survey programme should be in a written format based on the information in annex 4A. The survey should not commence until the survey programme has been agreed.

5.1.1.1 Prior to the development of the survey programme, the survey planning questionnaire should be completed by the owner based on the information set out in annex 4B, and forwarded to the Administration.

5.1.1.2 The survey programme at intermediate survey may consist of the survey programme at the previous renewal survey supplemented by the condition evaluation report of that renewal survey and later relevant survey reports. The survey programme should be worked out taking into account any amendments to the survey requirements after the last renewal survey carried out.

5.1.2 In developing the survey programme, the following documentation should be collected and consulted with a view to selecting tanks, holds, areas and structural elements to be examined:

- .1 survey status and basic ship information;
- .2 documentation on board, as described in 6.2 and 6.3;
- .3 main structural plans (scantlings drawings), including information regarding use of high-tensile steels (HTS);
- .4 relevant previous survey and inspection reports from both the classification society and the owner;
- .5 information regarding the use of ship's holds and tanks, typical cargoes and other relevant data;
- .6 information regarding corrosion prevention level on the new building; and
- .7 information regarding the relevant maintenance level during operation.

5.1.3 The submitted survey programme should account for and comply, as a minimum, with the requirements of 2.7 and annexes 1 and 2 for close-up survey, thickness measurement and tank testing, respectively, and is to include relevant information including at least:

- .1 basic ship information and particulars;
- .2 main structural plans (scantling drawings), including information regarding use of high-tensile steels (HTS);
- .3 plan of holds and tanks;

- .4 list of holds and tanks with information on use, protection and condition of coating;
- .5 conditions for survey (e.g. information regarding hold and tank cleaning, gas-freeing, ventilation, lighting, etc.);
- .6 provisions and methods for access to structures;
- .7 equipment for surveys;
- .8 nomination of holds and tanks and areas for close-up survey (see 2.5);
- .9 nomination of sections for thickness measurement (see 2.6);
- .10 nomination of tanks for testing (see 2.7); and
- .11 damage experience related to ship in question.

5.1.4 The Administration will advise the owner of the maximum acceptable structural corrosion diminution levels applicable to the ship.

5.1.5 Use may also be made of the Guidelines for technical assessment in conjunction with the planning of enhanced surveys for bulk carriers contained in annex 9. These Guidelines are a recommended tool which may be invoked at the discretion of the Administration, when considered necessary and appropriate, in conjunction with the preparation of the required survey programme.

5.2 *Conditions for survey*

5.2.1 The owner should provide the necessary facilities for a safe execution of the survey.

5.2.2 In order to enable the attending surveyors to carry out the survey, provisions for proper and safe access should be agreed between the owner and the Administration.

5.2.3 Details of the means of access should be provided in the survey planning questionnaire.

5.2.4 In cases where the provisions of safety and required access are judged by the attending surveyor(s) not to be adequate, the survey of the spaces involved should not proceed.

5.2.5 Cargo holds, tanks and spaces should be safe for access. Cargo holds, tanks and spaces should be gas free and properly ventilated. Prior to entering a tank, void or enclosed space, it should be verified that the atmosphere in the tank is free from hazardous gas and contains sufficient oxygen.

5.2.6 In preparation for survey and thickness measurements and to allow for a thorough examination, all spaces should be cleaned including removal from surfaces of all loose accumulated corrosion scale. Spaces should be sufficiently clean and free from water, scale, dirt, oil residues, etc., to reveal corrosion, deformation, fractures, damages or other structural deterioration as well as the condition of the coating. However, those areas of structure whose renewal has already been decided by the owner need only be cleaned and descaled to the extent necessary to determine the limits of the areas to be renewed.

5.2.7 Sufficient illumination should be provided to reveal corrosion, deformation, fractures, damages or other structural deterioration as well as the condition of the coating.

5.2.8 Where soft or semi-hard coatings have been applied, safe access should be provided for the surveyor to verify the effectiveness of the coating and to carry out an assessment of the conditions of internal structures which may include spot removal of the coating. When safe access cannot be provided, the soft or semi-hard coating should be removed.

5.2.9 The surveyor(s) should always be accompanied by at least one responsible person, assigned by the owner, experienced in tank and enclosed spaces inspection. In addition a backup team of at least two experienced persons should be stationed at the hatch opening of the tank or space that is being surveyed. The back-up team should continuously observe the work in the tank or space and should keep lifesaving and evacuation equipment ready for use.

5.2.10 A communication system should be arranged between the survey party in the cargo hold, tank or space being examined, the responsible officer on deck and, as the case may be, the navigation bridge. The communication arrangements should be maintained throughout the survey.

5.3 Access to structures

5.3.1 For overall survey, means should be provided to enable the surveyor to examine the structure in a safe and practical way.

5.3.2 For close-up surveys of the hull structure, other than cargo hold shell frames, one or more of the following means for access, acceptable to the surveyor, should be provided:

- .1 permanent staging and passages through structures;
- .2 temporary staging and passages through structures;
- .3 lifts and moveable platforms;
- .4 portable ladders;
- .5 boats or rafts; and
- .6 other equivalent means.

5.3.3 For close-up surveys of the cargo hold shell frames of bulk carriers less than 100,000 dwt, one or more of the following means for access, acceptable to the surveyor, should be provided:

- .1 permanent staging and passages through structures;
- .2 temporary staging and passages through structures;
- .3 portable ladder restricted to not more than 5 m in length may be accepted for surveys of lower section of a shell frame including bracket;
- .4 hydraulic arm vehicles such as conventional cherry pickers, lifts and movable platforms;
- .5 boats or rafts provided the structural capacity of the hold is sufficient to withstand static loads at all levels of water; and
- .6 other equivalent means.

5.3.4 For close-up surveys of the cargo hold shell frames of bulk carriers of 100,000 dwt and above, the use of portable ladders should not be accepted and one or more of the following means for access, acceptable to the surveyor, should be provided:

Annual surveys, intermediate survey under 10 years of age and first renewal survey:

- .1 permanent staging and passages through structures;
- .2 temporary staging and passages through structures;
- .3 hydraulic arm vehicles such as conventional cherry pickers, lifts and movable platforms;
- .4 boats or rafts provided the structural capacity of the hold is sufficient to withstand static loads at all levels of water; and
- .5 other equivalent means.

Subsequent intermediate surveys and renewal surveys:

- .1 either permanent or temporary staging and passages through structures for close-up survey of at least the upper part of hold frames;
- .2 hydraulic arm vehicles such as conventional cherry pickers for surveys of lower and middle part of shell frames as alternative to staging;
- .3 lifts and movable platforms;
- .4 boats or rafts provided the structural capacity of the hold is sufficient to withstand static loads at all levels of water; and
- .5 other equivalent means.

5.3.5 Notwithstanding the above requirements, the use of a portable ladder fitted with a mechanical device to secure the upper end of the ladder is acceptable for the "close-up examination of sufficient extent, minimum 25% of frames, to establish the condition of the lower region of the shell frames, including approximately lower one third length of side frame at side shell and side frame and attachment and the adjacent shell plating of the forward cargo hold" at annual survey, required in 3.4.1.2 and the "one other selected cargo hold" required in 3.4.2.2.

5.4 *Equipment for survey*

5.4.1 Thickness measurements should normally be carried out by means of ultrasonic test equipment. The accuracy of the equipment should be proven to the surveyor as required.

5.4.2 One or more of the following fracture detection procedures may be required if deemed necessary by the surveyor:

- .1 radiographic equipment;
- .2 ultrasonic equipment;

.3 magnetic particle equipment; and/or

.4 dye penetrant.

5.4.3 Explosimeter, oxygen-meter, breathing apparatus, lifelines, riding belts with rope and hook and whistles together with instructions and guidance on their use should be made available during the survey. A safety checklist should be provided.

5.4.4 Adequate and safe lighting should be provided for the safe and efficient conduct of the survey.

5.4.5 Adequate protective clothing should be made available and used (e.g. safety helmet, gloves, safety shoes, etc.) during the survey.

5.5 *Surveys at sea or at anchorage*

5.5.1 Surveys at sea or at anchorage may be accepted provided the surveyor is given the necessary assistance from the personnel on board. Necessary precautions and procedures for carrying out the survey should be in accordance with 5.1, 5.2, 5.3 and 5.4.

5.5.2 A communication system should be arranged between the survey party in the spaces and the responsible officer on deck. This system should also include the personnel in charge of ballast pump handling if boats or rafts are used.

5.5.3 Surveys of tanks or applicable holds by means of boats or rafts should only be undertaken with the agreement of the surveyor, who should take into account the safety arrangements provided, including weather forecasting and ship response under foreseeable conditions and provided the expected rise of water within the tank does not exceed 0.25 m.

5.5.4 When rafts or boats will be used for close-up survey the following conditions should be observed:

- .1 only rough duty, inflatable rafts or boats, having satisfactory residual buoyancy and stability even if one chamber is ruptured, should be used;
- .2 the boat or raft should be tethered to the access ladder and an additional person should be stationed down the access ladder with a clear view of the boat or raft;
- .3 appropriate lifejackets should be available for all participants;
- .4 the surface of water in the tank or hold should be calm (under all foreseeable conditions the expected rise of water within the tank should not exceed 0.25 m) and the water level stationary. On no account should the level of the water be rising while the boat or raft is in use;
- .5 the tank, hold or space must contain clean ballast water only. Even a thin sheen of oil on the water is not acceptable; and
- .6 at no time should the water level be allowed to be within 1 m of the deepest under deck web face flat so that the survey team is not isolated from a direct escape route to the tank hatch. Filling to levels above the deck transverses should only be contemplated if a deck access manhole is fitted and open in the bay being examined, so that an escape route for the survey party is available at all times. Other effective means of escape to the deck may be considered.

5.5.5 Rafts or boats alone may be allowed for inspection of the under deck areas for tanks or spaces, if the depth of the webs is 1.5 m or less.

5.5.6 If the depth of the webs is more than 1.5 m, rafts or boats alone may be allowed only:

- .1 when the coating of the under-deck structure is in GOOD condition and there is no evidence of wastage; or
- .2 if a permanent means of access is provided in each bay to allow safe entry and exit. This means:
 - .1 access direct from the deck via a vertical ladder and a small platform fitted approximately 2 m below the deck in each bay; or
 - .2 access to deck from a longitudinal permanent platform having ladders to deck in each end of the tank. The platform should, for the full length of the tank, be arranged in level with, or above, the maximum water level needed for rafting of under deck structure. For this purpose, the ullage corresponding to the maximum water level should be assumed not more than 3 m from the deck plate measured at the midspan of deck transverses and the middle length of the tank.

If neither of the above conditions are met, then staging or other equivalent means should be provided for the survey of the under-deck areas.

5.5.7 The use of rafts or boats alone in 5.5.5 and 5.5.6 does not preclude the use of boats or rafts to move about within a tank during a survey.

5.6 *Survey planning meeting*

5.6.1 The establishment of proper preparation and the close cooperation between the attending surveyor(s) and the owner's representatives on board prior to and during the survey are an essential part in the safe and efficient conduct of the survey. During the survey on board safety meetings should be held regularly.

5.6.2 Prior to commencement of any part of the renewal and intermediate survey, a survey planning meeting should be held between the attending surveyor(s), the owner's representative in attendance, the thickness measurement company operator (as applicable) and the master of the ship or an appropriately qualified representative appointed by the master or company for the purpose to ascertain that all the arrangements envisaged in the survey programme are in place, so as to ensure the safe and efficient conduct of the survey work to be carried out (see also 7.1.2).

5.6.3 The following is an indicative list of items that should be addressed in the meeting:

- .1 schedule of the vessel (i.e. the voyage, docking and undocking manoeuvres, periods alongside, cargo and ballast operations, etc.);
- .2 provisions and arrangements for thickness measurements (i.e. access, cleaning/descaling, illumination, ventilation, personal safety);
- .3 extent of the thickness measurements;
- .4 acceptance criteria (refer to the list of minimum thicknesses);

- .5 extent of close-up survey and thickness measurement considering the coating condition and suspect areas/areas of substantial corrosion;
- .6 execution of thickness measurements;
- .7 taking representative readings in general and where uneven corrosion/pitting is found;
- .8 mapping of areas of substantial corrosion; and
- .9 communication between attending surveyor(s), the thickness measurement company operator(s) and owner representative(s) concerning findings.

6 Documentation on board

6.1 General

6.1.1 The owner should obtain, supply and maintain on board documentation as specified in 6.2 and 6.3, which should be readily available for the surveyor. The condition evaluation report referred to in 6.2 should include a translation into English.

6.1.2 The documentation should be kept on board for the lifetime of the ship.

6.2 Survey report file

6.2.1 A survey report file should be a part of the documentation on board consisting of:

- .1 reports of structural surveys (annex 6);
- .2 condition evaluation report (annex 7); and
- .3 thickness measurement reports (annex 8).

6.2.2 The survey report file should be available also in the owner's and the Administration offices, or in the office of the organization recognized by the Administration.

6.3 Supporting documents

The following additional documentation should be available on board:

- .1 survey programme as required under 5.1 until such time as the renewal survey, or intermediate survey, as applicable, has been completed.
- .2 main structural plans of cargo holds and ballast tanks;
- .3 previous repair history;
- .4 cargo and ballast history;
- .5 inspections by ship's personnel with reference to:
 - .1 structural deterioration in general;
 - .2 leakages in bulkheads and piping;

- .3 condition of coating or corrosion prevention system, if any. Guidance for reporting is shown in annex 3; and

- .6 any other information that would help to identify critical structural areas and/or suspect areas requiring inspection.

6.4 *Review of documentation on board*

Prior to survey, the surveyor should examine the completeness of the documentation on board, and its contents as a basis for the survey.

7 Procedures for thickness measurements

7.1 *General*

7.1.1 The required thickness measurements, if not carried out by the recognized organization acting on behalf of the Administration, should be witnessed by a surveyor of the recognized organization. The surveyor should be on board to the extent necessary to control the process.

7.1.2 The thickness measurement company should be part of the survey planning meeting to be held prior to commencing the survey.

7.1.3 Thickness measurements of structures in areas where close-up surveys are required should be carried out simultaneously with close-up surveys.

7.1.4 In all cases the extent of the thickness measurements should be sufficient as to represent the actual average condition.

7.1.5 Procedural requirements for thickness measurements are set out in annex 14.

7.2 *Certification of thickness measurement company*

The thickness measurements should be carried out by a qualified company certified by an organization recognized by the Administration according to principles stated in annex 5.

7.3 *Reporting*

7.3.1 A thickness measurement report should be prepared and submitted to the Administration. The report should give the location of measurements, the thickness measured as well as corresponding original thickness. Furthermore, the report should give the date when the measurements were carried out, type of measuring equipment, names of personnel and their qualifications and be signed by the operator. The thickness measurement report should follow the principles as specified in the recommended procedures for thickness measurements set out in annex 8.

7.3.2 The surveyor should review the final thickness measurement report and countersign the cover page.

8 Reporting and evaluation of survey

8.1 *Evaluation of survey report*

8.1.1 The data and information on the structural condition of the ship collected during the survey should be evaluated for acceptability and continued structural integrity of the ship.

8.1.2 The analysis of data should be carried out and endorsed by the Administration or recognized organization authorized by the Administration and the conclusions of the analysis should form a part of the condition evaluation report.

8.2 *Reporting*

8.2.1 Principles for survey reporting are shown in annex 6.

8.2.2 When a survey is split between different survey stations, a report should be made for each portion of the survey. A list of items examined and/or tested (pressure testing, thickness measurements, etc.) and an indication of whether the item has been credited, should be made available to the next attending surveyor(s), prior to continuing or completing the survey.

8.2.3 A condition evaluation report of the survey and results should be issued to the owner as shown in annex 7 and placed on board the ship for reference at future surveys. The condition evaluation report should be endorsed by the Administration or by the recognized organization on behalf of the Administration.

ANNEX 1

REQUIREMENTS FOR CLOSE-UP SURVEY AT RENEWAL SURVEYS

Age ≤ 5 years Renewal Survey No. 1	5 < Age ≤ 10 years Renewal Survey No. 2	10 < Age ≤ 15 years Renewal Survey No. 3	Age > 15 years Renewal Survey No. 4 and subsequent
(A) 25% of shell frames in the forward cargo hold at representative positions (A) Selected frames in remaining cargo holds (B) One transverse web with associated plating and longitudinals in two representative water ballast tanks of each type (i.e. topside, or hopper side tank) (C) Two selected cargo hold transverse bulkheads, including internal structure of upper and lower stools, where fitted (D) All cargo hold hatch covers and coamings (plating and stiffeners)	(A) All shell frames in the forward cargo hold and 25% of shell frames in each of the remaining cargo holds including upper and lower end attachments and adjacent shell plating (A) For bulk carriers of 100,000 dwt and above, all shell frames in the forward cargo hold and 50% of shell frames in each of the remaining cargo holds, including upper and lower end attachments and adjacent shell plating. (B) One transverse web with associated plating and longitudinals in each water ballast tank (B) Forward and aft transverse bulkhead in one ballast tank, including stiffening system (C) All cargo hold transverse bulkheads, including internal structure of upper and lower stools, where fitted (D) All cargo hold hatch covers and coamings (plating and stiffeners) (E) All deck plating and under deck structure inside line of hatch openings between all cargo hold hatches	(A) All shell frames in the forward cargo hold and 50% of frames in each of the remaining cargo holds, including upper and lower end attachments and adjacent shell plating (B) All transverse bulkheads in ballast tanks, including stiffening system (B) All transverse webs with associated plating and longitudinals in each water ballast tank Areas (C), (D), and (E) as for renewal survey No.2	(A) All shell frames in all cargo holds including upper and lower end attachments and adjacent shell plating. Areas (B)–(E) as for column 3

- (A) Cargo hold transverse frame.
- (B) Transverse web or watertight transverse bulkhead in water ballast tanks.
- (C) Cargo hold transverse bulkhead platings, stiffeners and girders.
- (D) Cargo hold hatch covers and coamings.
- (E) Deck plating inside line of hatch openings between cargo hold hatches.
- See sketches of appendix 3 to annex 8 for areas corresponding to (A), (B), (C), (D) and (E).
- See also sketch in annex 15 for zones of side shell frames for ships subject to compliance with resolution MSC.168(79).

Note: Close-up survey of transverse bulkheads to be carried out at four levels:

- Level (a) Immediately above the inner bottom and immediately above the line of gussets (if fitted) and shedders for ships without lower stool.
- Level (b) Immediately above and below the lower stool shelf plate (for those ships fitted with lower stools), and immediately above the line of the shedder plates.
- Level (c) About mid-height of the bulkhead.
- Level (d) Immediately below the upper deck plating and immediately adjacent to the upper wing tank, and immediately below the upper stool shelf plate for those ships fitted with upper stools, or immediately below the topside tank.

ANNEX 2

REQUIREMENTS FOR THICKNESS MEASUREMENTS AT RENEWAL SURVEYS

Age ≤ 5 years	5 < Age ≤ 10 years	10 < Age ≤ 15 years	Age > 15 years
1	2	3	4
1 Suspect areas 2 Within the cargo length area: two transverse sections of deck plating outside line of cargo hatch openings 3 Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to annex 1 4 Wind and water strakes in way of transverse sections considered under point 2 above 5 Selected wind and water strakes outside the cargo length area 6 See 1.1.5 and annex 15 for additional thickness measurement guidelines applicable to the side shell frames and brackets on ships subject to compliance with resolution MSC.168(79)	1 Suspect areas 2 Within the cargo length area: cargo hatch openings 2 two transverse sections, one of which should be in the amidship area, outside line of cargo hatch openings 3 Measurement, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to annex 1 4 All wind and water strakes within the cargo length area 5 Selected wind and water strakes outside the cargo length area 6 See 1.1.5 and annex 15 for additional thickness measurement guidelines applicable to the side shell frames and brackets on ships subject to compliance with resolution MSC.168(79) 7 As required by annex 12 for ships subject to compliance with regulation XII/6.1 of the Convention	1 Suspect areas 2 Within the cargo length area: each deck plate outside line of cargo hatch openings 2 three transverse sections, one of which should be in the amidship area, outside line of cargo hatch openings 3 each bottom plate 3 Point 3 referred to in column 3 4 All wind and water strakes, full length 5 See 1.1.5 and annex 15 for additional thickness measurement guidelines applicable to the side shell frames and brackets on ship subject to compliance with resolution MSC.168(79) 6 As required by annex 12 for ships subject to compliance with regulation XII/6.1 of the Convention	

ANNEX 3

OWNER'S INSPECTION REPORT

Structural condition

Ship's name:							
Owner's inspection report – Structural condition							
For tank/hold No:							
Grade of steel: deck: side:							
bottom: longitudinal bulkhead:							
Elements	Cracks	Buckles	Corrosion	Coating condition	Pitting	Modification/repair	Other
Deck:							
Bottom:							
Side:							
Side framing:							
Longitudinal bulkheads:							
Transverse bulkheads:							
Repairs carried out due to:							
Thickness measurements carried out (dates):							
Results in general:							
Overdue surveys:							
Outstanding conditions of class:							
Comments:							
Date of inspection:							
Inspected by:							
Signature:							

ANNEX 4A

SURVEY PROGRAMME

Basic information and particulars

Name of ship:
IMO number:
Flag State:
Port of registry:
Gross tonnage:
Deadweight (metric tonnes):
Length between perpendiculars (m):
Shipbuilder:
Hull number:
Recognized organization (RO):
RO ship identity:
Date of build of the ship:
Owner:
Thickness measurement company:

1 Preamble**1.1 Scope**

1.1.1 The present survey programme covers the minimum extent of overall surveys, close-up surveys, thickness measurements and pressure testing within the cargo length area, cargo holds, ballast tanks, including fore and aft peak tanks, required by the Code.

1.1.2 The arrangements and safety aspects of the survey should be acceptable to the attending surveyor(s).

1.2 Documentation

All documents used in the development of the survey programme should be available on board during the survey as required by section 6.

2 Arrangement of cargo holds, tanks and spaces

This section of the survey programme should provide information (either in the form of plans or text) on the arrangement of cargo holds, tanks and spaces that fall within the scope of the survey.

3 List of cargo holds, tanks and spaces with information on their use, extent of coatings and corrosion prevention system

This section of the survey programme should indicate any changes relating to (and should update) the information on the use of the holds and tanks of the ship, the extent of coatings and the corrosion prevention system provided in the survey planning questionnaire.

4 Conditions for survey

This section of the survey programme should provide information on the conditions for survey, e.g. information regarding cargo hold and tank cleaning, gas freeing, ventilation, lighting, etc.

5 Provisions and method of access to structures

This section of the survey programme should indicate any changes relating to (and should update) the information on the provisions and methods of access to structures provided in the survey planning questionnaire.

6 List of equipment for survey

This section of the survey programme should identify and list the equipment that will be made available for carrying out the survey and the required thickness measurements.

7 Survey requirements**7.1 Overall survey**

This section of the survey programme should identify and list the spaces that should undergo an overall survey for this ship in accordance with 2.5.1.

7.2 Close-up survey

This section of the survey programme should identify and list the hull structures that should undergo a close-up survey for this ship in accordance with 2.5.2.

8 Identification of tanks for tank testing

This section of the survey programme should identify and list the cargo holds and tanks that should undergo tank testing for this ship in accordance with 2.7.

9 Identification of areas and sections for thickness measurements

This section of the survey programme should identify and list the areas and sections where thickness measurements should be taken in accordance with 2.6.1.

10 Minimum thickness of hull structures

This section of the survey programme should specify the minimum thickness for hull structures of this ship that are subject to survey, according to (a) or (b):

- (a) Determined from the attached wastage allowance table and the original thickness to the hull structure plans of the ship;
- (b) Given in the following table(s):

Area or location	Original as-built thickness (mm)	Minimum thickness (mm)	Substantial corrosion thickness (mm)
Deck			
Plating			
Longitudinals			
Longitudinal girders			
Cross deck plating			
Cross deck stiffeners			
Bottom			
Plating			
Longitudinals			
Longitudinal girders			
Inner bottom			
Plating			
Longitudinals			
Longitudinal girders			
Floors			
Ship side in way of topside tanks			
Plating			
Longitudinals			
Ship side in way of hopper side tanks			
Plating			
Longitudinals			
Ship side in way of tanks (if applicable)			
Plating			
Longitudinals			
Longitudinal stringers			
Ship side in way of cargo holds			
Plating			
Side frames webs			
Side frames flanges			
Upper brackets webs			
Upper brackets flanges			
Lower brackets webs			
Lower brackets flanges			
Longitudinal bulkhead (if applicable)			
Plating			
Longitudinals (if applicable)			
Longitudinal girders (if applicable)			
Transverse bulkheads			
Plating			
Stiffeners (if applicable)			
Upper stool plating			
Upper stool stiffeners			
Lower stool plating			
Lower stool stiffeners			

Area or location	Original as-built thickness (mm)	Minimum thickness (mm)	Substantial corrosion thickness (mm)
Transverse web frames in topside tanks			
Plating			
Flanges			
Stiffeners			
Transverse web frames in hopper tanks			
Plating			
Flanges			
Stiffeners			
Hatch covers			
Plating			
Stiffeners			
Hatch coamings			
Plating			
Stiffeners			

Note: The wastage allowance tables should be attached to the survey programme.

11 Thickness measurement company

This section of the survey programme should identify changes, if any, relating to the information on the thickness measurement company provided in the survey planning questionnaire.

12 Damage experience related to the ship

This section of the survey programme should, using the tables provided below, provide details of the hull damages for at least the last three years in way of the cargo holds, ballast tanks and void spaces within the cargo length area. These damages are subject to survey.

Hull damages sorted by location for this ship

Cargo hold, tank or space number or area	Possible cause, if known	Description of the damages	Location	Repair	Date of repair

Hull damages for sister or similar ships (if available) in the case of design-related damage

Cargo hold, tank or space number or area	Possible cause, if known	Description of the damages	Location	Repair	Date of repair

13 Areas Identified with substantial corrosion from previous surveys

This section of the survey programme should identify and list the areas of substantial corrosion from previous surveys.

14 Critical structural areas and suspect areas

This section of the survey programme should identify and list the critical structural areas and the suspect areas, when such information is available.

15 Other relevant comments and information

This section of the survey programme should provide any other comments and information relevant to the survey.

Appendices**Appendix 1 – List of plans**

5.1.3.2 requires that main structural plans of cargo holds and ballast tanks (scantling drawings), including information on regarding use of high tensile steel (HTS) should be available. This appendix of the survey programme should identify and list the main structural plans which form part of the survey programme.

Appendix 2 – Survey planning questionnaire

The survey planning questionnaire (annex 4B), which has been submitted by the owner, should be appended to the survey programme.

Appendix 3 – Other documentation

This part of the survey programme should identify and list any other documentation that forms part of the plan.

Prepared by the owner in cooperation with the Administration for compliance with 5.1.3:

Date:

(name and signature of authorized owner's representative)

Date:

(name and signature of authorized representative of the Administration)

ANNEX 4B

SURVEY PLANNING QUESTIONNAIRE

1 The following information will enable the owner in cooperation with the Administration to develop a survey programme complying with the requirements of the Code. It is essential that the owner provides, when completing the present questionnaire, up-to-date information. The present questionnaire, when completed, should provide all information and material required by the Code.

Particulars

Ship's name:

IMO number:

Flag State:

Port of registry:

Owner:

Recognized organization:

RO Ship Identity:

Gross tonnage:

Deadweight (metric tonnes):

Date of build:

Information on access provision for close-up surveys and thickness measurement

2 The owner should indicate, in the table below, the means of access to the structures subject to close-up survey and thickness measurement. A close-up survey is an examination where the details of structural components are within the close visual inspection range of the attending surveyor, i.e. normally within reach of hand.

Hold/Tank No.	Structure	Temporary staging	Rafts	Ladders	Direct access	Other means (please specify)
F.P.	Fore peak					
A.P.	Aft peak					
Cargo holds	Hatch side coamings					
	Topside sloping plate					
	Upper stool plating					
	Cross deck					
	Side shell, frames and brackets					
	Transverse bulkhead					
	Hopper tank plating					
	Lower stool					
	Tank top					
	Under deck structure					
Topside tanks	Side shell and structure					
	Sloping plate and structure					
	Webs and bulkheads					
	Hopper sloping plate and structure					
Hopper tanks	Side shell and structure					
	Bottom structure					
	Webs and bulkheads					
	Double-bottom structure					
	Upper stool internal structure					
	Lower stool internal structure					

History of bulk cargoes of a corrosive nature (e.g. high sulphur content)

Owner's inspections

3 Using a format similar to that of the table below (which is given as an example), the owner should provide details of the results of their inspections, for the last 3 years – in accordance with the Code – on all CARGO holds and BALLAST tanks and VOID spaces within the cargo area.

Tank/Hold No.	Corrosion protection (1)	Coating extent (2)	Coating condition (3)	Structural deterioration (4)	Hold and tank history (5)
Cargo holds					
Topside tanks					
Hopper tanks					
Double-side skin tanks					
Double-bottom tanks					
Upper stools					
Lower stools					
Fore peak					
Aft peak					
Miscellaneous other spaces:					

Note:

Indicate tanks which are used for oil/ballast.

- 1) HC = hard coating; SC = soft coating;
SH = semi-hard coating; NP = no protection
- 2) U = upper part; M = middle part;
L = lower part; C = complete
- 3) G = good; F = fair; P = poor;
RC = recoated (during the last three years)
- 4) N = no findings recorded; Y = findings recorded, description of findings should be attached to this questionnaire
- 5) DR = Damage & Repair; L = Leakages;
CV = Conversion (description to be attached to this questionnaire)

Name of owner's representative:

.....

Signature:

Date:

List the reports of port State control inspections containing hull structural related deficiencies and relevant information on rectification of the deficiencies:

List non-conformities related to hull maintenance including the associated corrective actions:

[illegible]

ANNEX 5

PROCEDURES FOR CERTIFICATION OF A COMPANY ENGAGED IN THICKNESS MEASUREMENT OF HULL STRUCTURES**1 Application**

This guidance applies for certification of a company which intends to engage in the thickness measurement of hull structures of ships.

2 Procedures for certification*Submission of documents*

2.1 The following documents should be submitted to an organization recognized by the Administration for approval:

- .1 outline of the company, e.g. organization and management structure;
- .2 experience of the company on thickness measurement of hull structures of ships;
- .3 technicians' careers, i.e. experience of technicians as thickness measurement operators, technical knowledge and experience of hull structure, etc. Operators should be qualified according to a recognized industrial NDT Standard;
- .4 equipment used for thickness measurement such as ultrasonic testing machines and their maintenance/calibration procedures;
- .5 a guide for thickness measurement operators;
- .6 training programmes for technicians for thickness measurement; and
- .7 measurement record format in accordance with recommended procedures for thickness measurements (see annex 8).

Auditing of the company

2.2 Upon reviewing the documents submitted with satisfactory results, the company should be audited in order to ascertain that the company is duly organized and managed in accordance with the documents submitted, and eventually is capable of conducting thickness measurement of the hull structure of ships.

2.3 Certification is conditional upon an on board demonstration of thickness measurement as well as satisfactory reporting.

3 Certification

3.1 Upon satisfactory results of both the audit of the company referred to in 2.2 and the demonstration tests referred to in 2.3, the Administration or organization recognized by the Administration should issue a certificate of approval as well as a notice to the effect that the thickness measurement operation system of the company has been certified.

3.2 Renewal/endorsement of the certificate should be made at intervals not exceeding three years by verification that original conditions are maintained.

4 Report of any alteration to the certified thickness measurement operation system

In cases where any alteration to the certified thickness measurement operation system of the company is made, such an alteration should be immediately reported to the organization recognized by the Administration. Re-audit should be made where deemed necessary by the organization recognized by the Administration.

5 Withdrawal of the certification

The certification may be withdrawn in the following cases:

- .1 where the measurements were improperly carried out or the results were improperly reported;
- .2 where the surveyor found any deficiencies in the approved thickness measurement operation systems of the company; and
- .3 where the company failed to report any alteration referred to in 4 to the organization recognized by the Administration as required.

ANNEX 6

SURVEY REPORTING PRINCIPLES

As a principle, for bulk carriers subject to the Code, the surveyor should include the following contents in his report for survey of hull structure and piping systems, as relevant for the survey.

1 General**1.1** A survey report should be generated in the following cases:

- .1 in connection with commencement, continuation and/or completion of periodical hull surveys, i.e. annual, intermediate and renewal surveys, as relevant;
- .2 when structural damages/defects have been found;
- .3 when repairs, renewals or modifications have been carried out; and
- .4 when condition of class (recommendation) has been imposed or has been deleted.

1.2 The reporting should provide:

- .1 evidence that prescribed surveys have been carried out in accordance with applicable requirements;
- .2 documentation of surveys carried out with findings, repairs carried out and condition of class (recommendation) imposed or deleted;
- .3 survey records, including actions taken, which should form an auditable documentary trail. Survey reports should be kept in the survey report file required to be on board;
- .4 information for planning of future surveys; and
- .5 information which may be used as input for maintenance of classification rules and instructions.

1.3 When a survey is split between different survey stations, a report should be made for each portion of the survey. A list of items surveyed, relevant findings and an indication of whether the item has been credited, are to be made available to the next attending surveyor, prior to continuing or completing the survey. Thickness measurement and tank testing carried out is also to be listed for the next surveyor.

2 Extent of the survey**2.1** Identification of compartments where an overall survey has been carried out.

2.2 Identification of locations, in each ballast tank and cargo hold including hatch covers and coamings, where a close-up survey has been carried out, together with information on the means of access used.

2.3 Identification of locations, in each ballast tank and cargo hold including hatch covers and coamings, where thickness measurement has been carried out.

Note: As a minimum, the identification of location of close-up survey and thickness measurement should include a confirmation, with description of individual structural members, corresponding to the extent of requirements stipulated in annex A based on type of periodical survey and the ship's age.

Where only partial survey is required, i.e. 25% of shell frames, one transverse web, two selected cargo hold transverse bulkheads, the identification should include location within each ballast tank and cargo hold by reference to frame numbers.

2.4 For areas in ballast tanks and cargo holds where protective coating is found to be in good condition and the extent of close-up survey and/or thickness measurement has been specially considered, structures subject to special consideration should be identified.

2.5 Identification of tanks subject to tank testing.

2.6 Identification of piping systems on deck and within cargo holds, ballast tanks, pipe tunnels, cofferdams and void spaces where:

- .1 examination including internal examination of piping with valves and fittings and thickness measurement, as relevant, has been carried out; and
- .2 operational test to working pressure has been carried out.

3 Result of the survey

3.1 Type, extent and condition of protective coating in each tank, as relevant (rated GOOD, FAIR or POOR) including identification of tanks fitted with anodes.

3.2 Structural condition of each compartment with information on the following, as relevant:

- .1 Identification of findings, such as:
 - .1 corrosion with description of location, type and extent;
 - .2 areas with substantial corrosion;
 - .3 cracks/fractures with description of location and extent;
 - .4 buckling with description of location and extent; and
 - .5 indents with description of location and extent;
- .2 identification of compartments where no structural damages/defects are found. The report may be supplemented by sketches/photos; and
- .3 thickness measurement report should be verified and signed by the surveyor controlling the measurements on board.

4 Actions taken with respect to findings

4.1 Whenever the attending surveyor is of the opinion that repairs are required, each item to be repaired should be identified in a numbered list. Whenever repairs are carried out, details of the repairs effected should be reported by making specific reference to relevant items in the numbered list.

4.2 Repairs carried out should be reported with identification of:

- .1 compartment;
- .2 structural member;
- .3 repair method (i.e. renewal or modification), including:
 - .1 steel grades and scantlings (if different from the original); and
 - .2 sketches/photos, as appropriate;
- .4 repair extent; and
- .5 non-destructive test (NDT)/tests.

4.3 For repairs not completed at the time of survey, condition of class/recommendation should be imposed with a specific time limit for the repairs. In order to provide correct and proper information to the surveyor attending for survey of the repairs, condition of class/recommendation should be sufficiently detailed with identification of each item to be repaired. For identification of extensive repairs, reference may be made to the survey report.

ANNEX 7

CONDITION EVALUATION REPORT

Issued upon completion of renewal survey

General particulars

Ship's name:	Class/Administration identity number:
	Previous class/Administration identity number(s):
	IMO number:
Port of registry:	National flag:
	Previous national flag(s):
Deadweight (metric tonnes):	Gross tonnage:
	National:
	ITC (1969):
Date of build:	Classification notation:
Date of major conversion:	
Type of conversion:	Owner:
	Previous owner(s):

1 The survey reports and documents listed below have been reviewed by the undersigned and found to be satisfactory.

2 A summary of the survey is attached herewith on sheet 2.

3 The renewal survey has been completed in accordance with the present Code on (date)

Condition evaluation report completed by	Name	Title
Office	Signature	
	Date	
Condition evaluation report verified by	Name	Title
Office	Signature	
	Date	

Attached reports and documents:

- 1)
- 2)
- 3)
- 4)
- 5)

Contents of condition evaluation report

- | | | |
|--------|---|--|
| Part 1 | – General particulars: | - See front page |
| Part 2 | – Report review: | - Where and how survey was done |
| Part 3 | – Close-up survey: | - Extent (which tanks/holds) |
| Part 4 | – Thickness measurements: | - Reference to thickness measurement report |
| | | - Summary of where measured |
| | | - Separate form indicating the spaces with substantial corrosion, and corresponding: <ul style="list-style-type: none"> - thickness diminution - corrosion pattern |
| Part 5 | – Tank/hold corrosion prevention system: | - Separate form indicating: <ul style="list-style-type: none"> - location of coating - condition of coating (if applicable) |
| Part 6 | – Repairs: | - Identification of spaces/areas |
| Part 7 | – Condition of class/flag State requirements: | |
| Part 8 | – Memoranda: | - Acceptable defects |
| | | - Any points of attention for future surveys, e.g. for suspect areas |
| | | - Extended annual/intermediate survey due to coating breakdown |
| Part 9 | – Conclusion: | - Statement on evaluation/verification of survey report |

Extract of thickness measurements

Reference is made to the thickness measurement report:

Position of substantially corroded tanks/areas ¹ or areas with deep pitting ³	Thickness diminution [%]	Corrosion pattern ²	Remarks: (e.g. reference to attached sketches)

Notes:

- 1 Substantial corrosion, i.e. 75 to 100% of acceptable margins wasted.
- 2 P = Pitting
C = Corrosion in general
- 3 Any bottom plating with a pitting intensity of 20% or more, with wastage in the substantial corrosion range or having an average depth of pitting of ¼ or more of actual plate thickness should be noted.

Tank/hold corrosion prevention system

Tank/hold Nos. ¹	Tank/hold protection ²	Coating condition ³	Remarks

Notes:

1 All ballast tanks and cargo holds should be listed.

2 C = Coating
NP = No protection

3 Coating condition according to the following standard:

GOOD condition with only minor spot rusting.

FAIR condition with local breakdown of coating at edges of stiffeners and weld connections and/or light rusting over 20% or more of areas under consideration, but less than as defined for POOR condition.

POOR condition with general breakdown of coating over 20% or more of areas or hard scale at 10% or more of areas under consideration.

If coating condition POOR is given, extended annual surveys should be introduced. This should be noted in part 8 of the Contents of condition evaluation report.

ANNEX 8

RECOMMENDED PROCEDURES FOR THICKNESS MEASUREMENTS**General**

1 These procedures should be used for recording thickness measurements as required by part A of annex A.

2 Reporting forms TM1-BC, TM2-BC(i), TM2-BC(ii), TM3-BC, TM4-BC, TM5-BC, TM6-BC, TM7-BC(i) and TM7-BC(ii), set out in appendix 2 should be used for recording thickness measurements and the maximum allowance diminution should be stated. The maximum allowable diminution could be stated in an attached document.

3 Appendix 3 contains guidance diagrams and notes relating to the reporting forms and the requirements for thickness measurement.

4 The reporting forms should, where appropriate, be supplemented by data presented on structural sketches.

Appendix 1	General particulars
Appendix 2	Reports on thickness measurement
Appendix 3	Guidance on thickness measurement

Appendix 1

GENERAL PARTICULARS

Ship's name:
 IMO number:
 Class/Administration identity number:
 Port of registry:
 Gross tonnage:
 Deadweight:
 Date of build:
 Classification society:

Name of company performing thickness measurement:
 Thickness measurement company certified by:
 Certificate number:
 Certificate valid from: to
 Place of measurement:
 First date of measurement:
 Last date of measurement:
 Renewal survey/intermediate survey due:
 Details of measurement equipment:
 Qualification of operator:

Report number: consisting of pages
 Name of operator: Name of surveyor:
 Signature of operator: Signature of surveyor:
 Company official stamp: Administration:

Official stamp

Appendix 2

REPORTS ON THICKNESS MEASUREMENT

Reports on thickness measurement of all deck plating, all bottom shell plating or side shell plating (TM1-BC)

Ship's name.....		IMO number.....		Class Identity No.....		Report No.....							
STRAKE POSITION		No. or letter		Orig. thk. (mm)		Forward reading		Aft reading		Mean diminution		Maximum allowable diminution (mm)	
PLATE POSITION						Gauged		Diminution P		Diminution S			
						P S		mm %		mm %		P S	
12th forward													
11th													
10th													
9th													
8th													
7th													
6th													
5th													
4th													
3rd													
2nd													
1st													
Amidships													
1st aft													
2nd													
3rd													
4th													
5th													
6th													
7th													
8th													
9th													
10th													
11th													
12th													
Operator's signature.....		Notes — see following page											

Notes to report TM1-BC:

- 1 This report should be used for recording the thickness measurement of:
 - .1 All strength deck plating within the cargo length area.
 - .2 Keel, bottom shell plating and bilge plating within the cargo length area.
 - .3 Side shell plating that is all wind and water strakes within the cargo length area.
 - .4 Side shell plating that is selected wind and water strakes outside the cargo length area.
- 2 The strake position should be clearly indicated as follows:
 - .1 For strength deck, indicate the number of the strake of plating inboard from the stringer plate.
 - .2 For bottom plating, indicate the number of the strake of plating outboard from the keel plate.
 - .3 For side shell plating, give number of the strake of plating below sheerstrake and letter as shown on shell expansion.
- 3 Only the deck plating strakes outside line of openings should be recorded.
- 4 Measurements should be taken at the forward and aft areas of all plates.
- 5 The single measurements recorded should represent the average of multiple measurements.
- 6 The maximum allowable diminution could be stated in an attached document.

Report on thickness measurement of shell and deck plating (one, two or three transverse sections) (TM2-BC(i))

Ship's name.....

IMO number.....

Class Identity No.....

Report No.....

STRAKE POSITION	FIRST TRANSVERSE SECTION AT FRAME NUMBER.....					SECOND TRANSVERSE SECTION AT FRAME NUMBER.....					THIRD TRANSVERSE SECTION AT FRAME NUMBER.....					Max allow. dimin. (mm)
	No. or letter	Orig. thk (mm)	Gauged		Diminution P	Diminution S	Max allow. dimin. (mm)	No. or letter	Orig. thk (mm)	Gauged		Diminution P	Diminution S			
			P	S						P	S			P	S	
Stringer plate																
1st strake inboard																
2nd																
3rd																
4th																
5th																
6th																
7th																
8th																
9th																
10th																
11th																
12th																
13th																
14th																
centre strake																
sheerstrake																
TOTAL																

Operator's signature.....

Notes — see following page

Notes to report TM2-BC(i):

- 1 This report should be used for recording the thickness measurement of strength deck plating and sheer-strake plating transverse sections:

One, two or three sections within the cargo length area, comprising structural items (1), (2) and (3) as shown on the diagram of typical transverse sections (appendix 3).
- 2 Only the deck plating outside the line of openings should be recorded.
- 3 The topside area comprises deck plating, stringer plate and sheer-strake (including rounded gunwales).
- 4 The exact frame station of measurement should be stated.
- 5 The single measurements recorded should represent the average of multiple measurements.
- 6 The maximum allowable diminution could be stated in an attached document.

Report on thickness measurement of shell and deck plating (one, two or three transverse sections) (TM2-BC(ii))

Ship's name.....IMO number.....Class Identity No.....Report No.....

SHELL PLATING

STRAKE POSITION	FIRST TRANSVERSE SECTION AT FRAME NUMBER.....					SECOND TRANSVERSE SECTION AT FRAME NUMBER.....					THIRD TRANSVERSE SECTION AT FRAME NUMBER.....					
	No. or letter	Orig. thk (mm)	Gauged	Diminution P	Diminution S	No. or letter	Orig. thk (mm)	Gauged	Diminution P	Diminution S	No. or letter	Orig. thk (mm)	Gauged	Diminution P	Diminution S	Max allow. dimin. (mm)
			P	S	%			P	S	%			P	S	%	
1st below sheerstrake																
2nd																
3rd																
4th																
5th																
6th																
7th																
8th																
9th																
10th																
11th																
12th																
13th																
14th																
15th																
16th																
17th																
18th																
19th																
20th																
Keel strake																
BOTTOM TOTAL																

Operator's signature.....Notes – see following page

Notes to report TM2-BC(ii):

- 1 This report should be used for recording the thickness measurements of shell plating at transverse sections:

One, two or three sections within the cargo length area comprising structural items (4), (5), (6), and (7) as shown on the diagram of typical transverse sections (appendix 3).
- 2 The bottom area comprises keel, bottom and bilge plating.
- 3 The exact frame station of measurement should be stated.
- 4 The single measurements recorded should represent the average of multiple measurements.
- 5 The maximum allowable diminution could be stated in an attached document.

Notes to report TM3-BC:

- 1 This report should be used for recording the thickness measurement of longitudinal members at transverse sections:

One, two or three sections within the cargo length area, comprising the appropriate structural items (8) to (20) as shown on the diagram of typical transverse sections (appendix 3).
- 2 The exact frame station of measurement should be stated.
- 3 The single measurements recorded should represent the average of multiple measurements.
- 4 The maximum allowable diminution could be stated in an attached document.

Notes to report TM4-BC:

- 1 This report should be used for recording the thickness measurement of transverse structural members, comprising appropriate structural items (23) to (25) as shown on the diagram of typical transverse sections (appendix 3).
- 2 Guidance for areas of measurement is indicated in appendix 3.
- 3 The single measurements recorded should represent the average of multiple measurements.
- 4 The maximum allowable diminution could be stated in an attached document.

Notes to report TM5-BC:

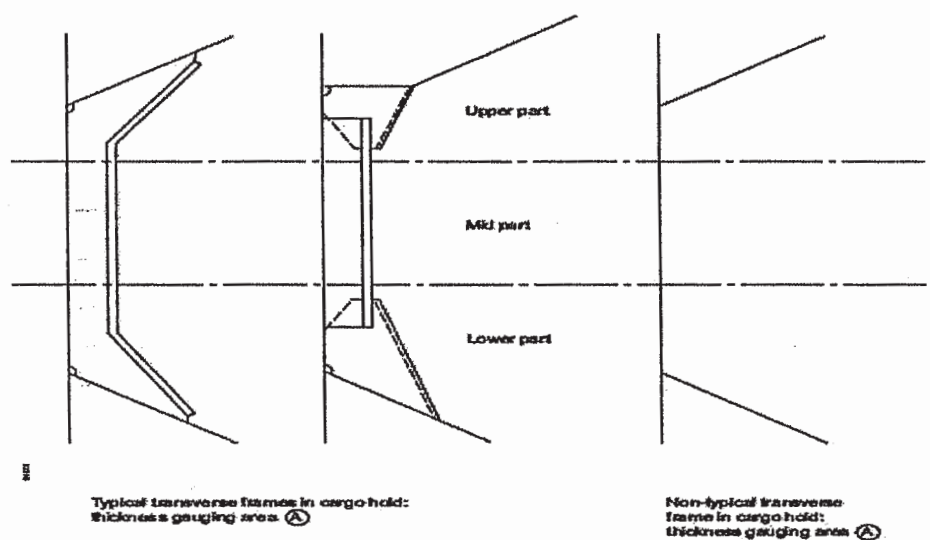
- 1 This report form should be used for recording the thickness measurement of cargo hold transverse bulkheads.
- 2 Guidance for areas of measurement is indicated in appendix 3.
- 3 The single measurements recorded should represent the average of multiple measurements.
- 4 The maximum allowable diminution could be stated in an attached document.

Notes to report TM6-BC:

- 1 This report should be used for recording the thickness measurement of miscellaneous structural members including structural items (28), (29), (30) and (31) as shown on the diagram of typical transverse sections in appendix 3.
- 2 Guidance for areas of measurement is indicated in appendix 3.
- 3 The single measurements recorded should represent the average of multiple measurements.
- 4 The maximum allowable diminution could be stated in an attached document.

Notes to report TM7-BC(I):

- 1 This report should be used for recording the thickness measurement of:
 - cargo hold transverse frames; and
 - structural item number (34) as shown on the diagram of typical transverse section indicating longitudinal and transverse members in appendix 3.
- 2 Guidance for areas of measurement is indicated in appendix 3.
- 3 The single measurements recorded should represent the average of multiple measurements.
- 4 The maximum allowable diminution could be stated in an attached document.



Notes on report TM7-BC(ii):

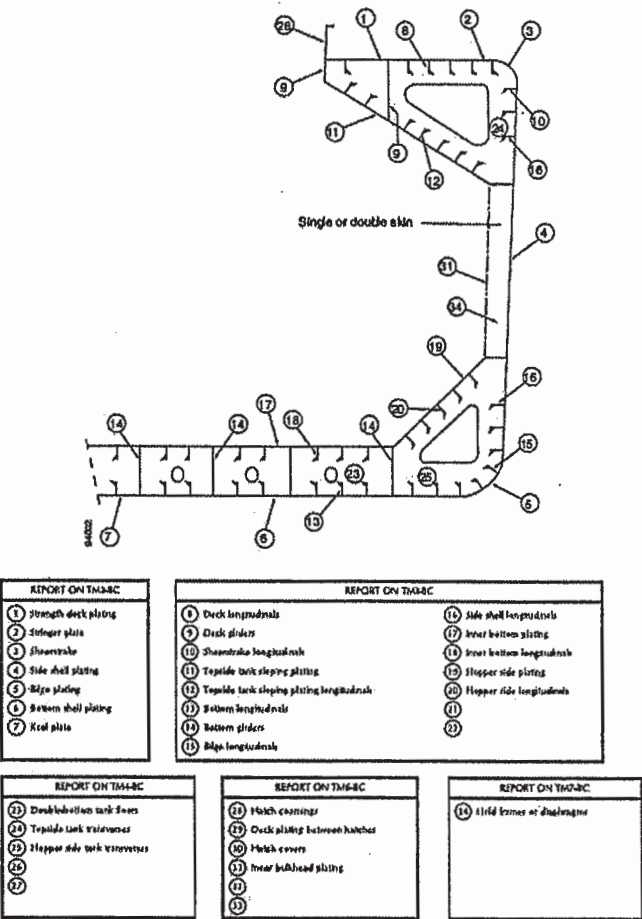
- 1 This report should be used for recording the thickness measurement of:
Cargo hold transverse frames for application of resolution MSC.168(79).
- 2 Guidance for areas of measurement is provided in annex 15.
- 3 Symbols should be applied as follows:

t_M	=	thickness as measured, in mm
t_{REN}	=	thickness at which renewal is required in accordance with paragraph 2.1.2 of annex 2 to resolution MSC.168(79)
t_{COAT}	=	$0.75 \cdot$ (thickness, in mm, as required by annex 1 to resolution MSC.168(79), in paragraph 3 for frame webs and in paragraph 4 for upper and lower brackets).
- 4 The maximum allowable diminution could be stated in an attached document.

Appendix 3

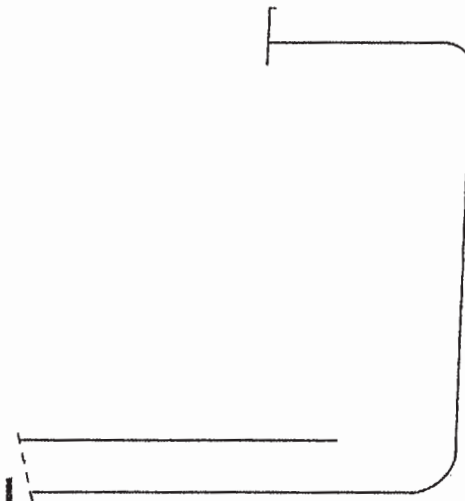
GUIDANCE ON THICKNESS MEASUREMENT

Typical transverse section indicating longitudinal and transverse members



Transverse section outline

(To be used for longitudinal and transverse members where the typical transverse section is not applicable)



REPORT ON TM3-B/C	
①	Strength deck plating
②	Stringer plate
③	Sheerstrake
④	Side shell plating
⑤	Bilge plating
⑥	Bottom shell plating
⑦	Keel plate

REPORT ON TM3-B/C	
⑧	Deck longitudinal
⑨	Deck girder
⑩	Sheerstrake longitudinal
⑪	Topside deck sloping plating
⑫	Topside deck sloping plating longitudinal
⑬	Bottom longitudinal
⑭	Bottom girder
⑮	Ridge longitudinal
⑯	Side shell longitudinal
⑰	Inner bottom plating
⑱	Inner bottom longitudinal
⑲	Hopper side plating
⑳	Hopper side longitudinal
㉑	
㉒	

REPORT ON TM4-B/C	
㉓	Doublebottom curb plates
㉔	Topside tank transverse
㉕	Hopper side tank transverse
㉖	
㉗	

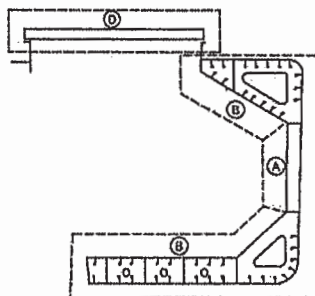
REPORT ON TM4-B/C	
㉘	Hatch coaming
㉙	Deck plating between hatches
㉚	Hatch covers
㉛	Inner bottom shell plating
㉜	
㉝	

REPORT ON TM4-B/C	
㉞	Hold frames or diagonal braces

Close-up survey and thickness measurement areas

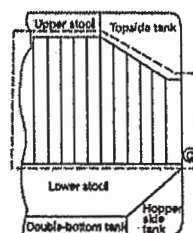
(Typical areas for thickness measurement of cargo hold frames, structural members and transverse bulkheads in association with close-up survey requirements)

Typical transverse section
Areas (A), (B) and (C)



Thickness to be reported on TM3-BC, TM4-BC, TM6-BC and TM7-BC as appropriate

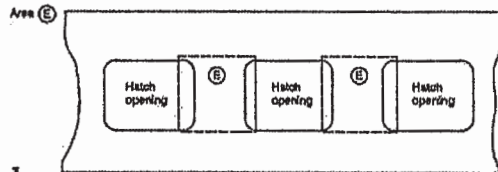
A cargo hold transverse bulkhead
Area (C)



Thickness to be reported on TM5-BC

Typical areas of deck plating inside line of
hatch openings between cargo hold hatches

Area (E)



Thickness to be reported on TM8-BC

ANNEX 9

GUIDELINES FOR TECHNICAL ASSESSMENT IN CONJUNCTION WITH THE PLANNING OF ENHANCED SURVEYS FOR BULK CARRIERS – RENEWAL SURVEY HULL**1 Introduction**

These Guidelines contain information and suggestions concerning technical assessments which may be of use in conjunction with the planning of enhanced renewal surveys of bulk carriers. As indicated in 5.1.5, the Guidelines are a recommended tool which may be invoked at the discretion of an Administration, when considered necessary and appropriate, in conjunction with the preparation of the required survey programme.

2 Purpose and principles**2.1 Purpose**

The purpose of the technical assessments described in these Guidelines is to assist in identifying critical structural areas, nominating suspect areas and in focusing attention on structural elements or areas of structural elements which may be particularly susceptible to, or evidence a history of, wastage or damage. This information may be useful in nominating locations, areas, holds and tanks for thickness measurement, close-up survey and tank testing.

Critical structural areas are locations which have been identified from calculations to require monitoring or from the service history of the subject ship or from similar or sister ships (if available) to be sensitive to cracking, buckling or corrosion which would impair the structural integrity of the ship.

2.2 Minimum requirements

These Guidelines may not be used to reduce the requirements of annexes 1 and 2 and paragraph 2.7 of part A for close-up survey, thickness measurement and tank testing, respectively, which are, in all cases, to be complied with as a minimum.

2.3 Timing

As with other aspects of survey planning, the technical assessments described in these Guidelines should be completed by the owner or operator in cooperation with the Administration well in advance of the commencement of the renewal survey, i.e. prior to commencing the survey and normally at least 12 to 15 months before the survey's completion due date.

2.4 Aspects to be considered

2.4.1 Technical assessments, which may include quantitative or qualitative evaluation of relative risks of possible deterioration, of the following aspects of a particular ship may be used as a basis for the nomination of holds, tanks and areas for survey:

- .1 design features such as stress levels on various structural elements, design details and extent of use of high-tensile steel;
- .2 former history with respect to corrosion, cracking, buckling, indents and repairs for the particular ship as well as similar vessels, where available; and

- .3 information with respect to types of cargo carried, protection of tanks, and condition of coating, if any, of holds and tanks.

2.4.2 Technical assessments of the relative risks of susceptibility to damage or deterioration of various structural elements and areas should be judged and decided on the basis of recognized principles and practices, such as may be found in reference 3.

3 Technical assessment

3.1 General

3.1.1 There are three basic types of possible failure which may be the subject of technical assessment in connection with planning of surveys: corrosion, cracks and buckling. Contact damages are not normally covered by the survey plan since indents are usually noted in memoranda and assumed to be dealt with as a normal routine by surveyors.

3.1.2 Technical assessments performed in conjunction with the survey planning process should, in principle, be as shown schematically in figure 1 which depicts, schematically, how technical assessments can be carried out in conjunction with the survey planning process. The approach is based on an evaluation of experience and knowledge basically related to:

- .1 design; and
- .2 corrosion.

3.1.3 The design should be considered with respect to structural details which may be susceptible to buckling or cracking as a result of vibration, high stress levels or fatigue.

3.1.4 Corrosion is related to the ageing process, and is closely connected with the quality of corrosion protection at new building, and subsequent maintenance during the service life. Corrosion may also lead to cracking and/or buckling.

3.2 Methods

3.2.1 Design details

3.2.1.1 Damage experience related to the ship in question and similar ships, where available, is the main source of information to be used in the process of planning. In addition, a selection of structural details from the design drawings should be included.

3.2.1.2 Typical damage experience to be considered will consist of:

- .1 number, extent, location and frequency of cracks; and
- .2 location of buckles.

3.2.1.3 This information may be found in the survey reports and/or the owner's files, including the results of the owner's own inspections. The defects should be analysed, noted and marked on sketches.

3.2.1.4 In addition, general experience should be utilized. For example, figure 2 shows typical locations in bulk carriers which experience has shown may be susceptible to structural damage. Also, reference should be made to reference 3 which contains a catalogue of typical damages and proposed repair methods for various bulk carrier structural details.

3.2.1.5 Such figures should be used together with a review of the main drawings, in order to compare with the actual structure and search for similar details which may be susceptible to damage. An example is shown in figure 3.

3.2.1.6 The review of the main structural drawings, in addition to using the above-mentioned figures, should include checking typical design details where cracking has been experienced. The factors contributing to damage should be carefully considered.

3.2.1.7 The use of high-tensile steel (HTS) is an important factor. Details showing good service experience where ordinary, mild steel has been used may be more susceptible to damage when HTS, and its higher associated stresses, are utilized. There is extensive and, in general, good experience with the use of HTS for longitudinal material in deck and bottom structures. Experience in other locations, where the dynamic stresses may be higher, is less favourable, e.g. side structures.

3.2.1.8 In this respect, stress calculations of typical and important components and details, in accordance with relevant methods, may prove useful and should be considered.

3.2.1.9 The selected areas of the structure identified during this process should be recorded and marked on the structural drawings to be included in the survey programme.

3.2.2 *Corrosion*

3.2.2.1 In order to evaluate relative corrosion risks, the following information is generally to be considered:

- .1 usage of tanks, holds and spaces;
- .2 condition of coatings;
- .3 cleaning procedures;
- .4 previous corrosion damage;
- .5 ballast use and time for cargo holds;
- .6 risk of corrosion in cargo holds and ballast tanks; and
- .7 location of ballast tanks adjacent to heated fuel oil tanks.

3.2.2.2 Reference 2 gives definitive examples which can be used for judging and describing coating condition, using typical pictures of conditions.

3.2.2.3 For bulk carriers, reference 3 should be used as the basis for the evaluation, together with the age of the ship and relevant information on the anticipated condition of the ship as derived from the information collected in order to prepare the survey programme.

3.2.2.4 The various tanks, holds and spaces should be listed with the corrosion risks nominated accordingly.

3.2.3 *Locations for close-up survey and thickness measurement*

3.2.3.1 On the basis of the table of corrosion risks and the evaluation of design experience, the locations for initial close-up survey and thickness measurement (sections) may be nominated.

3.2.3.2 The sections subject to thickness measurement should normally be nominated in tanks, holds and spaces where corrosion risk is judged to be the highest.

3.2.3.3 The nomination of tanks, holds and spaces for close-up survey should, initially, be based on highest corrosion risk, and should always include ballast tanks. The principle for the selection should be that the extent is increased by age or where information is insufficient or unreliable.

References

- 1 TSCF, Guidance Manual for the Inspection and Condition Assessment of Tanker Structures, 1986.
- 2 TSCF, Condition Evaluation and Maintenance of Tanker Structures, 1992.
- 3 IACS, Bulk Carriers: Guidelines for Surveys, Assessment and Repair of Hull Structures, 2007.

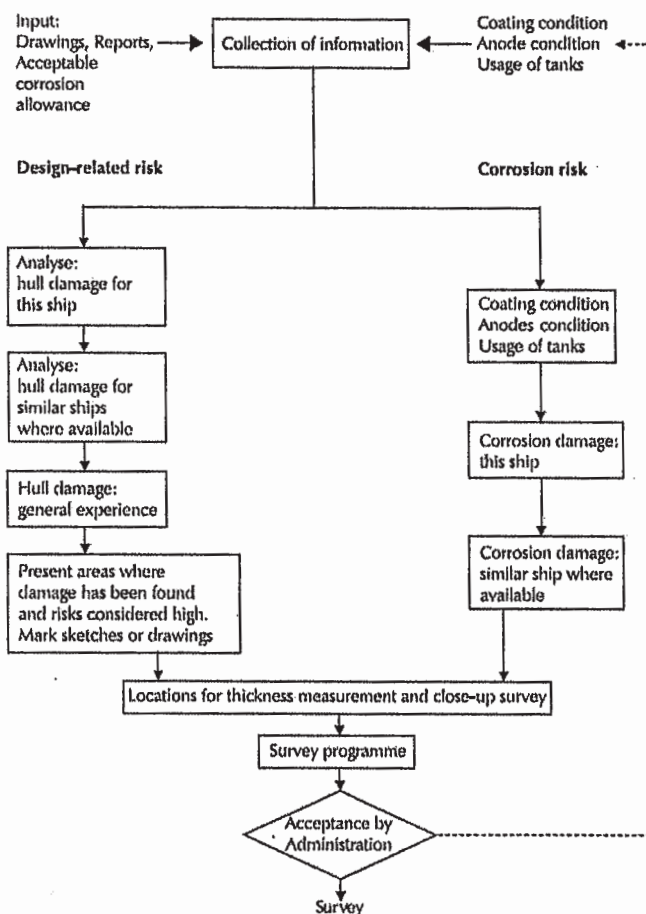


Figure 1 – Technical assessment and the survey planning process

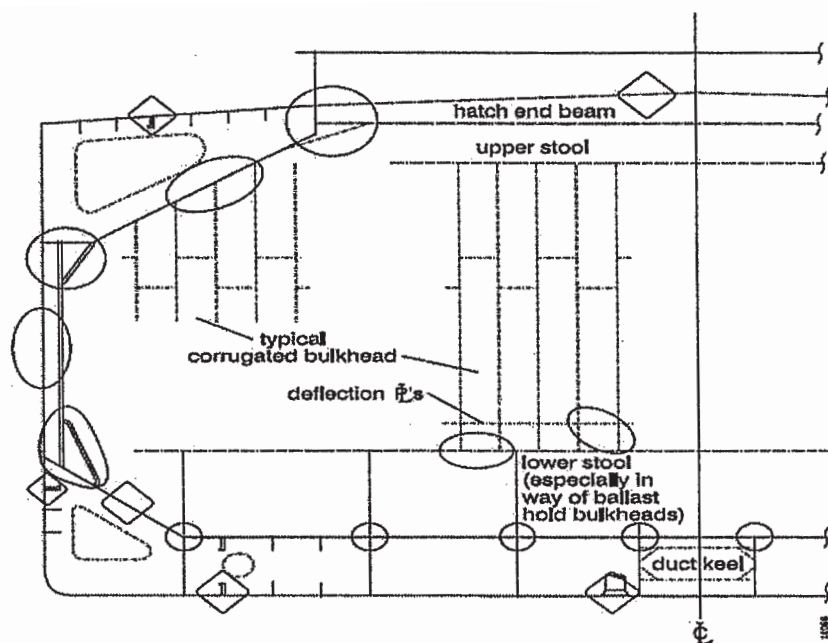


Figure 2 – Typical locations susceptible to structural damage or corrosion

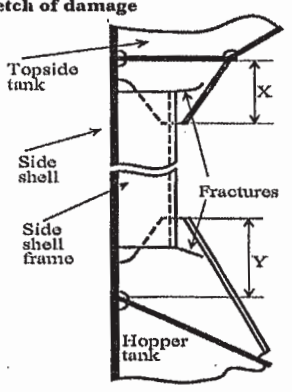
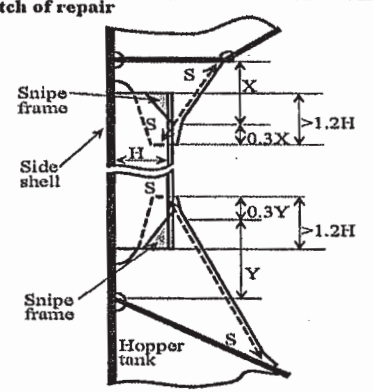
BULK CARRIERS		Guidelines for Surveys, Assessment and Repair of Hull Structure
Part 1	Cargo hold region	Example No.
Area 3	Cargo hold side structure	1-a
Detail of damage	Fractures in brackets at termination of frame	
Sketch of damage		Sketch of repair
 Separate bracket configuration		 S=Snipped end
Notes on possible cause of damage 1. This type of damage is caused due to stress concentration.		Notes on repairs 1. For small fractures, e. g. hairline fractures, the fracture can be vee-d out, ground, examined by NDT for fractures, and rewelded. 2. For larger/significant fractures consideration is to be given to cropping and partly renewing/renewing the frame brackets. If renewing the brackets, end of frames can be sniped to soften them. 3. If felt prudent, soft toes are to be incorporated at the boundaries of the bracket to the hopper plating. 4. Attention to be given to the structure in wing tanks in way of the extended bracket arm, i.e. reinforcement provided in line with the bracket.

Figure 3 – Typical damage and repair example (reproduced from reference 3)

ANNEX 10

**REQUIREMENTS FOR EXTENT OF THICKNESS MEASUREMENT AT AREAS
OF SUBSTANTIAL CORROSION**

**Renewal survey of bulk carriers within the cargo area
Shell plating**

Structural member	Extent of measurement	Pattern of measurement
1 Bottom and side shell plating	a Suspect plate, plus four adjacent plates	a Five-point pattern for each panel between longitudinals
	b See other tables for particulars on gauging in way of tanks and cargo holds	
2 Bottom/side shell longitudinals	Minimum of three longitudinals in way of suspect areas	Three measurements in line across web Three measurements on flange

Transverse bulkheads in cargo holds

Structural member	Extent of measurement	Pattern of measurement
1 Lower stool	a Transverse band within 25 mm of welded connection to inner bottom	a Five-point pattern between stiffeners over 1 m length
	b Transverse band within 25 mm of welded connection to shelf plate	b Ditto
2 Transverse bulkhead	a Transverse band at approximately mid-height	a Five-point pattern over 1 m ² of plating
	b Transverse band at part of bulkhead adjacent to upper deck or below upper stool shelf plate (for those ships fitted with upper stools)	b Five-point pattern over 1 m ² of plating

Deck structure including cross strips, main cargo hatchways, hatch covers, coamings and topside tanks

Structural member	Extent of measurement	Pattern of measurement
1 Cross-deck strip plating	Suspect cross-deck strip plating	Five-point pattern between under deck stiffeners over 1 m length
2 Under-deck stiffeners	a Transverse members	a Five-point pattern at each end and mid-span
	b Longitudinal member	b Five-point pattern on both web and flange
3 Hatch covers	a Side and end skirts, each three locations	a Five-point pattern at each location
	b Three longitudinal bands, outboard strakes (2) and centerline strake (1)	b Five-point measurement each band
4 Hatch coamings	Each side and end of coaming, one band lower third, one band upper two-thirds of coaming	Five-point measurement each band, i.e. end or side coaming
5 Topside water ballast tanks	a Watertight transverse bulkheads	
	i lower third of bulkhead	i five-point pattern over 1 m ² of plating
	ii upper two-thirds of bulkhead	ii five-point pattern over 1 m ² of plating
	iii stiffeners	iii five-point pattern over 1 m length
	b Two representative swash transverse bulkheads	
	i lower third of bulkhead	i five-point pattern over 1 m ² of plating
	ii upper two-thirds of bulkhead	ii five-point pattern over 1 m ² of plating
	iii stiffeners	iii five-point pattern over 1 m length
	c Three representative bays of slope plating	
	i lower third of tank	i five-point pattern over 1 m ² of plating
	ii upper two-thirds of tank	ii five-point pattern over 1 m ² of plating
	d Longitudinals, suspect and adjacent	d Five-point pattern both web and flange over 1 m length
6 Main deck plating	Suspect plates and adjacent (4)	Five-point pattern over 1 m ² of plating
7 Main deck longitudinals	Minimum of three longitudinals where plating measured	Five-point pattern on both web and flange over 1 m length
8 Web frames/transverses	Suspect plates	Five-point pattern over 1 m ²

Double-bottom and hopper structure

Structural member	Extent of measurement	Pattern of measurement
1 Inner/double-bottom plating	Suspect plate plus all adjacent plates	Five-point pattern for each panel between longitudinals over 1 m length
2 Inner/double-bottom longitudinals	Three longitudinals where plates measured	Three measurements in line across web, and three measurements on flange
3 Longitudinal girders or transverse floors	Suspect plates	Five-point pattern over about 1 m ²
4 Watertight bulkheads (WT floors)	a Lower third of tank	a Five-point pattern over 1 m ² of plating
	b Upper two thirds of tank	b Five-point pattern alternate plates over 1 m ² of plating
5 Web frames	Suspect plate	Five-point pattern over 1 m ² of plating
6 Bottom/side shell longitudinals	Minimum of three longitudinals in way of suspect areas	Three measurements in line across web, and three measurements on flange

Cargo holds

Structural member	Extent of measurement	Pattern of measurement
1 Side shell frames	Suspect frame and each adjacent	a At each end and mid span: five-point pattern of both web and flange
		b Five-point pattern within 25 mm of welded attachment to both shell and lower slope plate

ANNEX 11

GUIDELINES FOR THE GAUGING OF THE VERTICALLY CORRUGATED TRANSVERSE WATERTIGHT BULKHEAD BETWEEN HOLDS NOS. 1 AND 2

1 Gauging is necessary to determine the general condition of the structure and to define the extent of possible repairs and/or reinforcements of the vertically corrugated transverse watertight bulkhead for verification of the compliance with the bulk carrier bulkhead and double-bottom strength standards, defined in regulation XII/1.7 of the Convention.

2 Taking into account the buckling model specified in the bulk carrier bulkhead and double-bottom strength standards, defined in regulation XII/1.7 of the Convention, in the evaluation of strength of the bulkhead, it is essential to determine the thickness diminution at the critical levels shown in figures 1 and 2 of this annex.

3 The gauging should be carried out at the levels as described below. To adequately assess the scantlings of each individual vertical corrugation, each corrugation flange, web, shedder plate and gusset plate within each of the levels given below should be gauged.

Level (a) Ships without lower stool (see figure 1):

Locations:

- The mid-breadth of the corrugation flanges at approximately 200 mm above the line of shedder plates;
- The middle of gusset plates between corrugation flanges, where fitted;
- The middle of the shedder plates;
- The mid-breadth of the corrugation webs at approximately 200 mm above the line of shedder plates.

Level (b) Ships with lower stool (see figure 2):

Locations:

- The mid-breadth of the corrugation flanges at approximately 200 mm above the line of shedder plates;
- The middle of gusset plates between corrugation flanges, where fitted;
- The middle of the shedder plates;
- The mid-breadth of the corrugation webs at approximately 200 mm above the line of shedder plates.

Level (c) Ships with or without lower stool (see figures 1 and 2):

Locations:

- The mid-breadth of the corrugation flanges and webs at about the mid-height of the corrugation.

4 Where the thickness changes within the horizontal levels, the thinner plate should be gauged.

5 Steel renewal and/or reinforcement should comply with the bulk carrier bulkhead and double-bottom strength standards, defined in regulation XII/1.7 of the Convention.

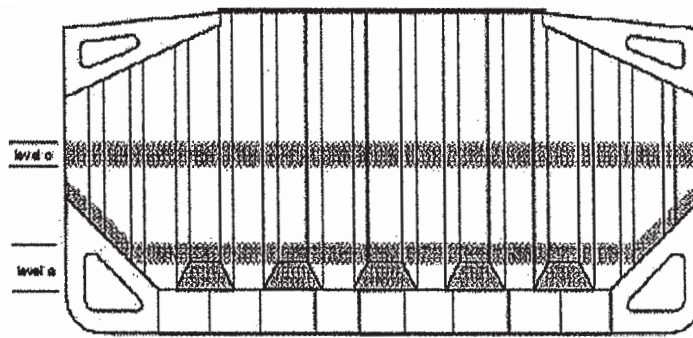


Figure 1 – Ships without lower stool

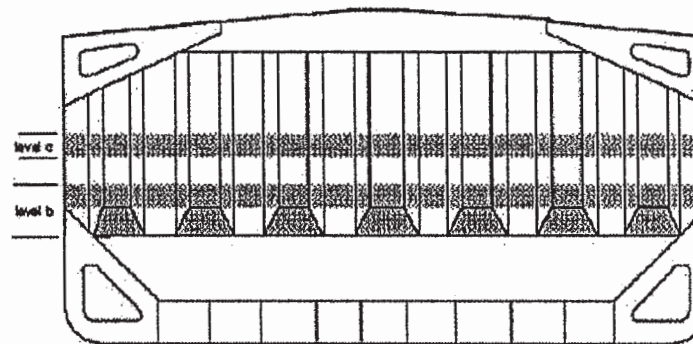


Figure 2 – Ships with lower stool

ANNEX 12

**ADDITIONAL ANNUAL SURVEY REQUIREMENTS FOR THE FOREMOST CARGO HOLD
OF SHIPS SUBJECT TO REGULATION XII/9 OF THE CONVENTION****1 General**

In the case of bulk carriers over five years of age, the annual survey should include, in addition to the requirements of the annual surveys prescribed in chapter 3 of the present Code, an examination of the following items.

2 Extent of survey**2.1 For bulk carriers of 5 to 15 years of age**

2.1.1 An overall survey of the foremost cargo hold, including close-up survey of sufficient extent, minimum 25% of frames, should be carried out to establish the condition of:

- .1 shell frames including their upper and lower end attachments, adjacent shell plating, and transverse bulkheads; and
- .2 areas found to be suspect areas at the previous renewal survey.

2.1.2 Where considered necessary by the surveyor as a result of the overall and close-up survey as described in 2.1.1 above, the survey should be extended to include a close-up survey of all of the shell frames and adjacent shell plating of the cargo hold.

2.2 For bulk carriers exceeding 15 years of age

An overall survey of the foremost cargo hold, including close-up survey should be carried out to establish the condition of:

- .1 all shell frames including their upper and lower end attachments, adjacent shell plating, and transverse bulkheads; and
- .2 areas found to be suspect areas at the previous renewal survey.

3 Extent of thickness measurement

3.1 Thickness measurement should be carried out to an extent sufficient to determine both general and local corrosion levels at areas subject to close-up survey, as described in 2.1 and 2.2 above. The minimum requirement for thickness measurements are areas found to be suspect areas at the previous renewal survey. Where substantial corrosion is found, the extent of thickness measurements should be increased with the requirements of annex 10.

3.2 The thickness measurement may be dispensed with provided the surveyor is satisfied by the close-up survey, there is no structural diminution and the protective coating, where applied, remains effective.

4 Special consideration

Where the protective coating, as referred to in the explanatory note below, in the foremost cargo hold is found to be in GOOD condition, the extent of close-up surveys and thickness measurements may be specially considered.

Explanatory note:

For existing bulk carriers, where owners may elect to coat or recoat cargo holds as noted above, consideration may be given to the extent of the close-up and thickness measurement surveys. Prior to the coating of cargo holds of existing ships, scantlings should be ascertained in the presence of a surveyor.

ANNEX 13

STRENGTH OF CARGO HATCH COVER SECURING ARRANGEMENTS
FOR BULK CARRIERS

1 Securing devices

The strength of securing devices should comply with the following requirements:

- .1 Panel hatch covers should be secured by appropriate devices (bolts, wedges or similar) suitably spaced alongside the coamings and between cover elements. Arrangement and spacing should be determined with due attention to the effectiveness for weathertightness, depending upon the type and the size of the hatch cover, as well as on the stiffness of the cover edges between the securing devices.

- .2 The net sectional area of each securing device should not be less than:

$$A = 1.4 a / f \text{ (cm}^2\text{)}$$

where:

- a = spacing between securing devices not to be taken less than 2 m
 f = $(\sigma_Y / 235)^e$
 σ_Y = specified minimum upper yield stress in N/mm² of the steel used for fabrication, not to be taken greater than 70% of the ultimate tensile strength
 e = 0.75 for $\sigma_Y > 235$
 1.0 for $\sigma_Y \leq 235$.

Rods or bolts should have a net diameter not less than 19 mm for hatchways exceeding 5 m² in area.

- .3 Between cover and coaming and at cross-joints, a packing line pressure sufficient to obtain weathertightness should be maintained by the securing devices. For packing line pressures exceeding 5 N/mm, the cross section area should be increased in direct proportion. The packing line pressure should be specified.

- .4 The cover edge stiffness should be sufficient to maintain adequate sealing pressure between securing devices. The moment of inertia, I , of edge elements should not be less than:

$$I = 6 p a^4 \text{ (cm}^4\text{)}$$

where:

- p = packing line pressure in N/mm, minimum 5 N/mm
 a = spacing in metres of securing devices.

- .5 Securing devices should be of reliable construction and securely attached to the hatchway coamings, decks or covers. Individual securing devices on each cover are to have approximately the same stiffness characteristics.

- .6 Where rod cleats are fitted, resilient washers or cushions should be incorporated.
- .7 Where hydraulic cleating is adopted, a positive means should be provided to ensure that it remains mechanically locked in the closed position in the event of failure of the hydraulic system.

2 Stoppers

- 2.1 Nos. 1 and 2 hatch covers should be effectively secured, by means of stoppers, against the transverse forces arising from a pressure of 175 kN/m².
- 2.2 No.2 hatch covers should be effectively secured, by means of stoppers, against the longitudinal forces acting on the forward end arising from a pressure of 175 kN/m².
- 2.3 No.1 hatch cover should be effectively secured, by means of stoppers, against the longitudinal forces acting on the forward end arising from a pressure of 230 kN/m². This pressure may be reduced to 175 kN/m² if a forecastle is fitted.
- 2.4 The equivalent stress in stoppers and their supporting structures and calculated in the throat of the stopper welds should not exceed the allowable value of $0.8 \sigma_Y$.

3 Materials and welding

Where stoppers or securing devices are fitted to comply with this annex, they should be manufactured of materials, including welding electrodes, to the satisfaction of the Administration.

ANNEX 14

PROCEDURAL REQUIREMENTS FOR THICKNESS MEASUREMENTS

1 General

Thickness measurements required in the context of hull structural surveys, if not carried out by the society itself, should be witnessed by a surveyor. The attendance of the surveyor should be recorded. This also applies to thickness measurements taken during voyages.

2 Survey meeting

2.1 Prior to commencement of the renewal or intermediate survey, a meeting should be held between the attending surveyor(s), the owner's representative(s) in attendance, the thickness measurement firm's representative(s) and the master of the ship or an appropriately qualified representative appointed by the master or Company so as to ensure the safe and efficient execution of the surveys and thickness measurements to be carried out on board.

2.2 Communication with the thickness measurement operator(s) and owner's representative(s) should be agreed during the meeting, with respect to the following:

- .1 reporting of thickness measurements on regular basis; and
- .2 prompt notification to the surveyor in case of findings such as:
 - .1 excessive and/or extensive corrosion or pitting/grooving of any significance;
 - .2 structural defects like buckling, fractures and deformed structures;
 - .3 detached and/or holed structure; and
 - .4 corrosion of welds.

2.3 The survey report should indicate where and when the meeting took place and who attended (the name of the surveyor(s), the owner's representative(s) and the thickness measurement firm's representative(s)).

3 Monitoring of the thickness measurement process on board

3.1 The surveyor should decide final extent and location of thickness measurements after overall survey of representative spaces on board.

3.2 In case the owner prefers to commence the thickness measurements prior to the overall survey, then the surveyor should advise that the planned extent and locations of thickness measurements are subject to confirmation during the overall survey. Based on findings, the surveyor may require additional thickness measurements to be taken.

3.3 The surveyor should direct the gauging operation by selecting locations such that readings taken represent, on average, the condition of the structure for that area.

3.4 Thickness measurements taken mainly to evaluate the extent of corrosion, which may affect the hull girder strength, should be carried out in a systematic manner such that all longitudinal structural members are gauged, as required.

3.5 Where thickness measurements indicate substantial corrosion or wastage in excess of allowable diminution, the surveyor should direct locations for additional thickness measurements in order to delineate areas of substantial corrosion and to identify structural members for repairs/renewals.

3.6 Thickness measurements of structures in areas where close-up surveys are required should be carried out simultaneously with close-up survey.

4 Review and verification

4.1 Upon completion of the thickness measurements, the surveyor should confirm that no further gaugings are needed, or specify additional gaugings.

4.2 Where these guidelines allow the extent of thickness measurements to be reduced after special considerations by the surveyor, these special considerations should be reported, where appropriate.

4.3 In case thickness measurements are partly carried out, the extent of remaining thickness measurements should be reported for the use of the next surveyor.

ANNEX 15

**GUIDELINES FOR THE THICKNESS MEASUREMENTS OF SIDE SHELL FRAMES
AND BRACKETS IN SINGLE-SIDE SKIN BULK CARRIERS REQUIRED
TO COMPLY WITH RESOLUTION MSC.168(79)****1 General**

Thickness measurements should be conducted to determine the general condition of the structure and to define the extent of possible steel renewals or other measures for the webs and flanges of side shell frames and brackets for verification of the compliance with resolution MSC.168(79).

2 Zones of side shell frames and brackets

2.1 For the purpose of steel renewal, sand blasting and coating, four zones A, B, C and D are defined as shown in figure 1.

2.2 Zones A and B should be considered the most critical zones.

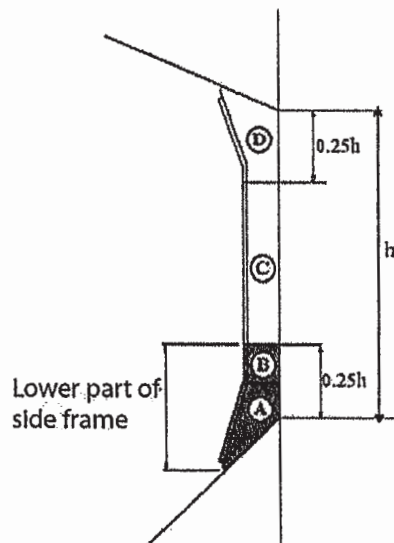


Figure 1 – Zones of side shell frames and brackets

3 Pitting and grooving

3.1 Pits can grow in a variety of shapes, some of which should be ground before assessment.

3.2 Pitting corrosion may be found under coating blisters, which should be removed before inspection.

3.3 To measure the remaining thickness of pits or grooving the normal ultrasonic transducer (generally 10 mm diameter) will not suffice. A miniature transducer (3 to 5 mm diameter) should be used. Alternatively the firm conducting the thickness measurement should use a pit gauge to measure the depth of the pits and grooving and calculate the remaining thickness.

Assessment based upon area

3.4 This is the method specified in paragraph 2.5 of annex 2 to resolution MSC.168(79) and is based upon the intensity determined from figure 2 below.

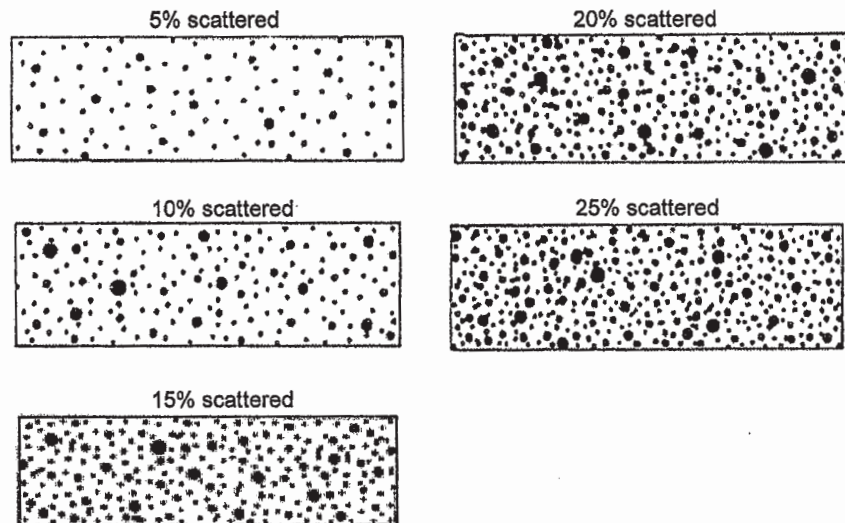


Figure 2 – Pitting intensity diagrams (from 5 to 25% intensity)

3.5 If pitting intensity is higher than 15% in an area (see figure 2), then thickness measurements should be taken to determine the extent of the pitting corrosion. The 15% is based upon pitting or grooving on only one side of the plate.

3.6 In cases where pitting is evident as defined above (exceeding 15%) then an area of 300 mm diameter or more (or, where this is impracticable on the frame flange or the side shell, hopper tank plating or topside tank plating attached to the side frame, an equivalent rectangular area), at the most pitted part, should be cleaned to bare metal, and the thickness measured in way of the five deepest pits within the cleaned area. The least thickness measured in way of any of these pits is to be taken as the thickness to be recorded.

3.7 The minimum acceptable remaining thickness in any pit or groove is equal to:

- .1 75% of the as built thickness, for pitting or grooving in the cargo hold side frame webs and flanges.
- .2 70% of the as built thickness, for pitting or grooving in the side shell, hopper tank and topside tank plating attached to the cargo hold side frame, over a width up to 30 mm from each side of it.

4 Thickness measurement methodology

4.1 Numbers of side frames to be measured should be equivalent to those of the renewal survey or intermediate survey corresponding to the ship's age. Representative thickness measurements should be taken for each zone as specified below.

4.2 Special consideration to the extent of the thickness measurements may be given by the Administration or organization recognized by the Administration, if the structural members show no thickness diminution with respect to the as built thicknesses and the coating is found in "as new" condition (i.e. without breakdown or rusting).

4.3 Where thickness measurement readings close to the criteria are found, the number of hold frames to be measured should be increased.

4.4 If renewal or other measures according to resolution MSC.168(79) should be applied on individual frames in a hold, then all frames in that hold should have thickness measurements taken.

4.5 There is a variety of construction methods used for side shell frames in bulk carriers. Some have faceplates (T sections) on the side shell frames, some have flanged plates and some have bulb plates. The use of faceplates and flanged sections is considered similar for thickness measurement purposes in that both the web and faceplate or web and flange plate should be measured. If bulb plate has been used, then web of the bulb plate should be measured in the normal manner and the sectional modulus should be specially considered if required.

Gaugings for Zones A, B and D

Web plating

4.6 The pattern for thickness measurements in Zones A, B and D should be a five-point pattern. See figure 3. The five-point pattern should be over the depth of the web and the same area vertically. The thickness measurement report should reflect the average reading.

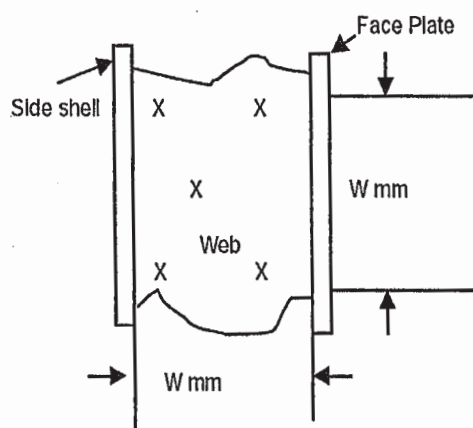


Figure 3 – Typical five-point pattern on the web plate

*Thickness measurements for Zone C**Web plating*

4.7 Depending on the condition of the web in way of Zone C, the web may be measured by taking three readings over the length of Zone C and averaging them. The average reading should be compared with the allowable thickness. If the web plating has general corrosion then this pattern should be expanded to a five-point pattern as noted above.

Thickness measurements for section a) and b) (flanges and side shell plating)

4.8 Where the lower bracket length or depth does not meet the requirements in annex 1 to resolution MSC.168(79), thickness measurements should be taken at sections a) and b) to calculate the actual section modulus required in paragraph 3.4 of annex 2 to resolution MSC.168(79) (see figure 4). At least two readings on the flange/faceplate should be taken on each side of the frame (i.e. fore and aft) in way of section a) and section b).

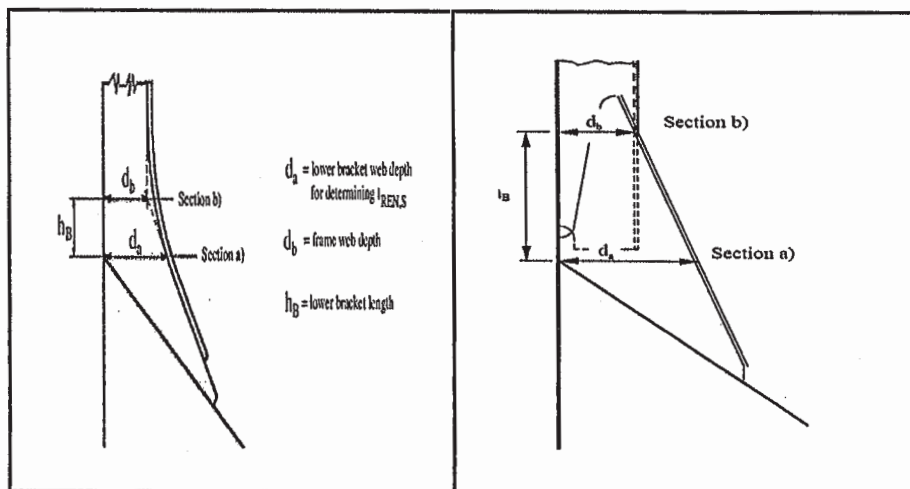


Figure 4 – Sections a) and b)

5 Report on thickness measurement of cargo hold frames

See form TM7-BC(ii) as contained in appendix 2 to annex 8.

References

IACS, Blue Books: Unified Requirement UR Z10.2 Hull Surveys of Bulk Carriers, Revision 27 2009, Annex V.

Resolution MSC.168(79) on Standards and criteria for side structures of bulk carriers of single-side skin construction.

Part B**CODE ON THE ENHANCED PROGRAMME OF INSPECTIONS DURING SURVEYS OF
BULK CARRIERS HAVING DOUBLE-SIDE SKIN CONSTRUCTION****1 General****1.1 Application**

1.1.1 The Code should apply to all self-propelled double-side skin bulk carriers of 500 gross tonnage and above.

1.1.2 The Code should apply to surveys of hull structure and piping systems in way of cargo holds, cofferdams, pipe tunnels, void spaces, fuel oil tanks within the cargo length area and all ballast tanks.

1.1.3 The Code contains the minimum extent of examination, thickness measurements and tank testing. The survey should be extended when substantial corrosion and/or structural defects are found and include additional close-up survey when necessary.

1.1.4 For bulk carriers with hybrid cargo hold arrangements, e.g. with some cargo holds of single-side skin and others of double-side skin, the requirements of part A of annex A apply to cargo holds of single-side skin.

1.1.5 The surveys should be carried out during the surveys prescribed by regulation I/10 of the Convention.

1.2 Definitions

1.2.1 *Double-side skin bulk carrier* is a ship which is constructed generally with single deck, topside tanks and hopper side tanks in cargo spaces, and is intended primarily to carry dry cargo in bulk including ore carriers and combination carriers, in which all cargo holds are bounded by a double-side skin (regardless of the width of the wing space).

1.2.2 *Ballast tank* is a tank which is used solely for salt water ballast or, where applicable, a space which is used for both cargo and salt water ballast will be treated as a ballast tank when substantial corrosion has been found in that space. A double-side tank should be considered, for survey purposes, as a separate tank even if it is in connection to either the topside tank or the hopper side tank.

1.2.3 *Spaces* are separate compartments including holds, tanks, cofferdams and void spaces bounding cargo holds, decks and the outer hull.

1.2.4 *Overall survey* is a survey intended to report on the overall condition of the hull structure and determine the extent of additional close-up surveys.

1.2.5 *Close-up survey* is a survey where the details of structural components are within the close visual inspection range of the surveyor, i.e. normally within reach of hand.

1.2.6 *Transverse section* is the cross section of the hull perpendicular to the ship's centerline and includes all longitudinal members such as plating, longitudinals and girders at the deck sides, bottom, inner bottom, hopper sides, inner sides, top wing inner sides and longitudinal bulkheads.

1.2.7 *Representative spaces* are those which are expected to reflect the condition of other spaces of similar type and service and with similar corrosion prevention systems. When selecting representative spaces, account should be taken of the service and repair history on board and identifiable critical structural areas and/or suspect areas.

1.2.8 *Suspect areas* are locations showing substantial corrosion and/or are considered by the surveyor to be prone to rapid wastage.

1.2.9 *Substantial corrosion* is an extent of corrosion such that assessment of corrosion pattern indicates a wastage in excess of 75% of allowable margins, but within acceptable limits. For ships built under the IACS Common Structural Rules, substantial corrosion is an extent of corrosion such that the assessment of the corrosion pattern indicates a gauged (or measured) thickness between $t_{\text{net}} + 0.5 \text{ mm}$ and t_{net} .

1.2.10 A *corrosion prevention system* is normally considered a full hard protective coating. Hard protective coating should usually be epoxy coating or equivalent. Other coating systems which are neither soft nor semi-hard coatings, may be considered acceptable as alternatives provided that they are applied and maintained in compliance with the manufacturer's specifications.

1.2.11 *Coating condition* is defined as follows:

GOOD condition with only minor spot rusting;

FAIR condition with local breakdown of coating at edges of stiffeners and weld connections and/or light rusting over 20% or more of areas under consideration, but less than as defined for POOR condition;

POOR condition with general breakdown of coating over 20% or more of areas or hard scale at 10% or more of areas under consideration.

1.2.12 *Critical structural areas* are locations which have been identified from calculations to require monitoring or from the service history of the subject ship or from similar or sister ships (if applicable) to be sensitive to cracking, buckling or corrosion which would impair the structural integrity of the ship.

1.2.13 *Cargo length area* is that part of the ship which includes all cargo holds and adjacent areas including fuel tanks, cofferdams, ballast tanks and void spaces.

1.2.14 *Intermediate survey* is a survey carried out either at the second or third annual survey or between these surveys.

1.2.15 A *prompt and thorough repair* is a permanent repair completed at the time of survey to the satisfaction of the surveyor, therein removing the need for the imposition of any associated condition of classification or recommendation.

1.2.16 *Convention* means the International Convention for the Safety of Life at Sea, 1974, as amended.

1.2.17 *Specially considered* (in connection with close-up surveys and thickness measurements) means sufficient close-up inspection and thickness measurements are taken to confirm the actual average condition of the structure under the coating.

1.3 Repairs

1.3.1 Any damage in association with wastage over the allowable limits (including buckling, grooving, detachment or fracture), or extensive areas of wastage over the allowable limits, which affects or, in the opinion of the Administration, will affect the ship's structural, watertight or weathertight integrity, should be promptly and thoroughly (see 1.2.15) repaired. Areas which should be considered include:

- .1 side structure and side plating;
- .2 deck structure and deck plating;
- .3 bottom structure and bottom plating;
- .4 inner bottom structure and inner bottom plating;
- .5 inner side structure and inner side plating;
- .6 watertight or oiltight bulkheads;
- .7 hatch covers or hatch coamings; and
- .8 items in 3.3.10.

For locations where adequate repair facilities are not available, the Administration may allow the ship to proceed directly to a repair facility. This may require discharging the cargo and/or temporary repairs for the intended voyage.

1.3.2 Additionally, when a survey results in the identification of corrosion or structural defects, either of which, in the opinion of the Administration, will impair the ship's fitness for continued service, remedial measures should be implemented before the ship continues in service.

1.4 Surveyors

For bulk carriers of 20,000 tons deadweight and above, two surveyors should jointly carry out the first scheduled renewal survey after the bulk carrier passes 10 years of age (i.e. third renewal survey), and all subsequent renewal surveys and intermediate surveys. If the surveys are carried out by a recognized organization, the surveyors should be exclusively employed by such recognized organizations.

1.5 Thickness measurements and close-up surveys

In any kind of survey, i.e. renewal, intermediate, annual or other surveys having the scope of the foregoing ones, thickness measurements of structures in areas where close-up surveys are required should be carried out simultaneously with close-up surveys.

2 Renewal survey

2.1 General

2.1.1 The renewal survey may be commenced at the fourth annual survey and be progressed during the succeeding year with a view to completion by the fifth anniversary date.

2.1.2 As part of the preparation for the renewal survey, the survey programme should be dealt with in advance of the survey. The thickness measurement should not be held before the fourth annual survey.

2.1.3 The survey should include, in addition to the requirements of the annual survey, examination, tests and checks of sufficient extent to ensure that the hull and related piping, as required in 2.1.5, is in satisfactory condition and is fit for its intended purpose for the new period of validity of the Cargo Ship Safety Construction Certificate, subject to proper maintenance and operation and to periodical surveys being carried out at the due dates.

2.1.4 All cargo holds, ballast tanks, including double-bottom and double-side tanks, pipe tunnels, cofferdams and void spaces bounding cargo holds, decks and outer hull should be examined, and this examination should be supplemented by thickness measurement and testing, as required by 2.6 and 2.7, to ensure that the structural integrity remains effective. The examination should be sufficient to discover substantial corrosion, significant deformation, fractures, damages or other structural deterioration that may be present.

2.1.5 All piping systems within the above spaces should be examined and operationally tested under working pressure to attending surveyor's satisfaction to ensure that tightness and condition remain satisfactory.

2.1.6 The survey extent of ballast tanks converted to void spaces should be specially considered in relation to the requirements for ballast tanks.

2.1.7 Concurrent crediting to both intermediate survey and renewal survey for surveys and thickness measurements of spaces should not be acceptable.

2.2 *Dry-dock survey*

2.2.1 A survey in dry-dock should be a part of the renewal survey. There should be a minimum of two inspections of the outside of the ship's bottom during the five-year period of the certificate. In all cases, the maximum interval between bottom inspections should not exceed 36 months.

2.2.2 For ships of 15 years of age and over, inspection of the outside of the ship's bottom should be carried out with the ship in dry-dock. For ships of less than 15 years of age, alternate inspections of the ship's bottom not conducted in conjunction with the renewal survey may be carried out with the ship afloat. Inspection of the ship afloat should only be carried out when the conditions are satisfactory and the proper equipment and suitably qualified staff is available.

2.2.3 If a survey in dry-dock is not completed in conjunction with the enhanced survey during renewal survey or if the 36-month maximum interval referred to in 2.2.1 is not complied with, the Cargo Ship Safety Construction Certificate should cease to be valid until a survey in dry-dock is completed.

2.2.4 The overall and close-up survey and thickness measurements, as applicable, of the lower portions of the cargo holds and ballast tanks should be carried out in accordance with the applicable requirements for renewal survey, if not already performed.

Note: Lower portions of the cargo holds and ballast tanks are considered to be the parts below light ballast water line.

2.3 *Space protection*

2.3.1 Where provided, the condition of the corrosion prevention system of ballast tanks should be examined. For ballast tanks, excluding double-bottom tanks, where a hard protective coating is found in POOR condition as defined in 1.2.11, and it is not renewed, or where a soft or semi-hard coating has been applied, or where a hard protective coating has not been applied from the time of constructions, the tanks in question should be examined at annual intervals. Thickness measurements should be carried out as deemed necessary by the surveyor. When such breakdown of hard protective coating is found in water ballast double-bottom tanks and it is not renewed, or where a soft or semi-hard coating has been applied or where a hard protective coating has not been applied from the time of construction, the tanks in question may be examined at annual intervals. When considered necessary by the surveyor, or where extensive corrosion exists, thickness measurement should be carried out.

2.3.2 Where a hard protective coating is provided in cargo holds and is found in good condition, the extent of close-up surveys and thickness measurements may be specially considered.

2.4 *Hatch covers and coamings*

The hatch covers and coamings should be surveyed as follows:

2.4.1 A thorough inspection of the items listed in 3.3 should be carried out, in addition to all hatch covers and coamings.

2.4.2 Checking of the satisfactory operation of all mechanically operated hatch covers should be made, including:

- .1 stowage and securing in open condition;
- .2 proper fit and efficiency of sealing in closed condition; and
- .3 operational testing of hydraulic and power components, wires, chains and link drives.

2.4.3 The effectiveness of sealing arrangements of all hatch covers by hose testing or equivalent should be checked.

2.4.4 Thickness measurement of the hatch cover and coaming plating and stiffeners should be carried out as given in annex 2.

2.5 *Extent of overall and close-up surveys*

2.5.1 An overall survey of all tanks and spaces should be carried out at the renewal survey. Fuel oil tanks in the cargo length area should be surveyed as follows:

Renewal survey No.1	Renewal survey No.2	Renewal survey No.3	Renewal survey No.4 and subsequent
Age ≤ 5	5 < Age ≤ 10	10 < Age ≤ 15	15 < Age
None	One	Two	Half, minimum two
Notes: 1. These requirements apply to tanks of integral (structural) type. 2. If a selection of tanks is accepted to be examined, then different tanks should be examined at each renewal survey, on a rotational basis. 3. Peak tanks (all uses) should be examined internally at each renewal survey. 4. At renewal survey no.3 and subsequent renewal surveys, one deep tank for fuel oil in the cargo area should be included, if fitted.			

2.5.2 The minimum requirements for close-up surveys at renewal surveys are given in annex 1, appendix 1 for double-side skin bulk carriers, excluding ore carriers, and in annex 1, appendix 2 for ore carriers respectively.

2.5.3 The surveyor may extend the close-up survey as deemed necessary taking into account the maintenance of the spaces under survey, the condition of the corrosion prevention system and where spaces have structural arrangements or details which have suffered defects in similar spaces or on similar ships according to available information.

2.5.4 For areas in spaces where hard protective coatings are found to be in a GOOD condition, the extent of close-up surveys according to annex 1 may be specially considered (refer also to 2.3.2).

2.6 *Extent of thickness measurements*

2.6.1 The minimum requirements for thickness measurements at the renewal survey are given in annex 2.

2.6.2 Representative thickness measurements to determine both general and local levels of corrosion in the transverse web frames in all water ballast tanks should be carried out. Thickness measurements should also be carried out to determine the corrosion levels on the transverse bulkhead plating. The extent of thickness measurements may be specially considered provided the surveyor is satisfied by the close-up examination that there is no structural diminution, and the hard protective coating where applied remains efficient.

2.6.3 Provisions for extended measurements for areas with substantial corrosion as defined in 1.2.9 are given in annex 10 and may be additionally specified in the survey programme as required by 5.1. These extended thickness measurements should be carried out before the survey is credited as completed. Suspect areas identified at previous surveys should be examined. Areas of substantial corrosion identified at previous surveys should have thickness measurements taken.

2.6.4 The surveyor may further extend the thickness measurements as deemed necessary.

2.6.5 For areas in tanks where hard protective coatings are found to be in GOOD condition as defined in 1.2.11, the extent of thickness measurements according to annex 2 may be specially considered by the Administration.

2.6.6 Transverse sections should be chosen where the largest reductions are suspected to occur or are revealed from deck plating measurements.

2.7 *Extent of tank pressure testing*

2.7.1 All boundaries of water ballast tanks, deep tanks and cargo holds used for water ballast within the cargo length area should be pressure tested. For fuel tanks, only representative tanks should be pressure tested.

2.7.2 The surveyor may extend the tank testing as deemed necessary.

2.7.3 Boundaries of ballast tanks should be tested with a head of liquid to the top of air pipes.

2.7.4 Boundaries of ballast holds should be tested with a head of liquid to near to the top of hatches.

2.7.5 Boundaries of fuel oil tanks should be tested with a head of liquid to the highest point that liquid will rise under service conditions. Tank testing of fuel oil tanks may be specially considered based on a satisfactory external examination of the tank boundaries and a confirmation from the master stating that the pressure testing has been carried out according to the requirements with satisfactory results.

2.7.6 The testing of double-bottom tanks and other spaces not designated for the carriage of liquid may be omitted, provided a satisfactory internal examination together with an examination of the tank top is carried out.

2.8 *Additional renewal survey requirements after determining compliance with regulations XII/12 and XII/13 of the Convention*

2.8.1 For ships complying with the requirements of regulation XII/12 of the Convention for hold, ballast and dry space water level detectors, the renewal survey should include an examination and a test of the water ingress detection system and of their alarms.

2.8.2 For ships complying with the requirements of regulation XII/13 of the Convention for the availability of pumping systems, the renewal survey should include an examination and a test of the means for draining and pumping ballast tanks forward of the collision bulkhead and bilges of dry spaces any part of which extends forward of the foremost cargo hold, and of their controls.

3 *Annual survey*

3.1 *General*

The annual survey should consist of an examination for the purpose of ensuring, as far as practicable, that the hull weather decks, hatch covers, coamings and piping are maintained in a satisfactory condition and should take into account the service history, condition and extent of the corrosion prevention system of ballast tanks and areas identified in the survey report file.

3.2 *Examination of the hull*

3.2.1 Examination of the hull plating and its closing appliances should be carried out as far as can be seen.

3.2.2 Examination of watertight penetrations should be carried out as far as practicable.

3.3 *Examination of weather decks, hatch covers and coamings*

3.3.1 It should be confirmed that no unapproved changes have been made to the hatch covers, hatch coamings and their securing and sealing devices since the last survey.

3.3.2 A thorough survey of cargo hatch covers and coamings is only possible by examination in the open as well as closed positions and should include verification of proper opening and closing operation. As a result, the hatch cover sets within the forward 25% of the ship's length and at least one additional set, such that all sets on the ship are assessed at least once in every five-year period, should be surveyed open, closed and in operation to the full extent in each direction at each annual survey, including:

- .1 stowage and securing in open condition;
- .2 proper fit and efficiency of sealing in closed condition; and
- .3 operational testing of hydraulic and power components, wires, chains and link drives.

The closing of the covers should include the fastening of all peripheral, and cross joint cleats or other securing devices. Particular attention should be paid to the condition of hatch covers in the forward 25% of the ship's length, where sea loads are normally greatest.

3.3.3 If there are indications of difficulty in operating and securing hatch covers, additional sets above those required by 3.3.2, at the discretion of the surveyor, should be tested in operation.

3.3.4 Where the cargo hatch securing system does not function properly, repairs should be carried out under the supervision of the Administration. Where hatch covers or coamings undergo substantial repairs, the strength of securing devices should be upgraded to comply with annex 11.

3.3.5 For each cargo hatch cover set, at each annual survey, the following items should be surveyed:

- .1 cover panels, including side plates, and stiffener attachments that may be accessible in the open position by close-up survey (for corrosion, cracks, deformation);
- .2 sealing arrangements of perimeter and cross joints (gaskets for condition and permanent deformation, flexible seals on combination carriers, gasket lips, compression bars, drainage channels and non-return valves);
- .3 clamping devices, retaining bars, cleating (for wastage, adjustment, and condition of rubber components);
- .4 closed cover locating devices (for distortion and attachment);
- .5 chain or rope pulleys;
- .6 guides;
- .7 guiderails and track wheels;
- .8 stoppers;

- .9 wires, chains, tensioners and gypsies;
- .10 hydraulic system, electrical safety devices and interlocks; and
- .11 end and interpanel hinges, pins and stools where fitted.

3.3.6 At each hatchway, at each annual survey, the coamings, with plating, stiffeners and brackets should be checked for corrosion, cracks and deformation, especially of the coaming tops including close-up survey.

3.3.7 Where considered necessary, the effectiveness of sealing arrangements may be proved by hose or chalk testing supplemented by dimensional measurements of seal compressing components.

3.3.8 Where portable covers, wooden or steel pontoons are fitted, the satisfactory condition of the following should be confirmed:

- .1 wooden covers and portable beams, carriers or sockets for the portable beam, and their securing devices;
- .2 steel pontoons, including close-up survey of hatch cover plating;
- .3 tarpaulins;
- .4 cleats, battens and wedges;
- .5 hatch securing bars and their securing devices;
- .6 loading pads/bars and the side plate edge;
- .7 guide plates and chocks; and
- .8 compression bars, drainage channels and drain pipes (if any).

3.3.9 The flame screens on vents to all bunker tanks should be examined.

3.3.10 Bunker and vent piping systems, including ventilators, should be examined.

3.4 *Examination of cargo holds*

3.4.1 For double-side skin bulk carriers of 10 to 15 years of age, the following should be carried out:

- .1 overall survey of two selected cargo holds;
- .2 when considered necessary by the surveyor, or where extensive corrosion exists, thickness measurement should be carried out. If the results of these thickness measurements indicate that substantial corrosion is found, the extent of thickness measurements should be increased in accordance with annex 10. These extended thickness measurements should be carried out before the survey is credited as complete. Suspect areas identified at previous surveys should be examined. Areas of substantial corrosion identified at previous surveys should have thickness measurements taken; and

- .3 all piping and penetrations in cargo holds, including overboard piping, should be examined.

3.4.2 For double-side skin bulk carriers over 15 years of age, the following should be carried out:

- .1 overall survey of all cargo holds;
- .2 when considered necessary by the surveyor, or where extensive corrosion exists, thickness measurement should be carried out. If the results of these thickness measurements indicate that substantial corrosion is found, the extent of thickness measurements should be increased in accordance with annex 10. These extended thickness measurements should be carried out before the survey is credited as complete. Suspect areas identified at previous surveys should be examined. Areas of substantial corrosion identified at previous surveys should have thickness measurements taken; and
- .3 all piping and penetrations in cargo holds, including overboard piping, should be examined.

3.5 *Examination of ballast tanks*

Examination of ballast tanks should be carried out when required as a consequence of the results of the renewal survey and intermediate survey. When considered necessary by the surveyor, or where extensive corrosion exists, thickness measurement should be carried out. If the results of these thickness measurements indicate that substantial corrosion is found, the extent of thickness measurements should be increased in accordance with annex 10. These extended thickness measurements should be carried out before the survey is credited as complete. Suspect areas identified at previous surveys should be examined. Areas of substantial corrosion identified at previous surveys should have thickness measurements taken.

3.6 *Additional annual survey requirements after determining compliance with regulations XII/12 and XII/13 of the Convention*

3.6.1 For ships complying with the requirements of regulation XII/12 of the Convention for hold, ballast and dry space water level detectors, the annual survey should include an examination and a test, at random, of the water ingress detection systems and of their alarms.

3.6.2 For ships complying with the requirements of regulation XII/13 of the Convention for the availability of pumping systems, the annual survey should include an examination and a test, of the means for draining and pumping ballast tanks forward of the collision bulkhead and bilges of dry spaces any part of which extends forward of the foremost cargo hold, and of their controls.

4 Intermediate survey

4.1 *General*

4.1.1 Items that are additional to the requirements of the annual survey may be surveyed either at the second or third annual survey or between these surveys.

4.1.2 The extent of survey is dependent upon the age of the ship as specified in 4.2, 4.3 and 4.4.

4.1.3 Concurrent crediting to both intermediate survey and renewal survey for surveys and thickness measurements of spaces should not be acceptable.

4.2 *Double-side skin bulk carriers 5 to 10 years of age*

4.2.1 *Ballast tanks*

4.2.1.1 For tanks used for water ballast, an overall survey of representative tanks selected by the surveyor should be carried out. The selection should include fore and aft peak tanks and a number of other tanks, taking into account the total number and type of ballast tanks. If such overall survey reveals no visible structural defects, the examination may be limited to verification that the corrosion prevention system remains efficient.

4.2.1.2 Where POOR coating condition, corrosion or other defects are found in water ballast tanks or where a hard protective coating was not applied from the time of construction, the examination should be extended to other ballast tanks of the same type.

4.2.1.3 In ballast tanks other than double-bottom tanks, where a hard protective coating is found in POOR condition and it is not renewed, or where soft or semi-hard coating has been applied, or where a hard protective coating was not applied from the time of construction, the tanks in question should be examined and thickness measurements carried out as considered necessary at annual intervals. When such breakdown of hard protective coating is found in ballast double-bottom tanks, where a soft or semi-hard coating has been applied, or where a hard protective coating has not been applied, the tanks in question may be examined at annual intervals. When considered necessary by the surveyor, or where extensive corrosion exists, thickness measurements should be carried out.

4.2.1.4 In addition to the above requirements, areas found to be suspect areas at the previous renewal survey should be overall and close-up surveyed.

4.2.2 *Cargo holds*

4.2.2.1 An overall survey of all cargo holds should be carried out.

4.2.2.2 Where considered necessary by the surveyor as a result of the overall survey as described in 4.2.2.1, the survey should be extended to include a close-up survey those areas of the structure in the cargo holds selected by the surveyor.

4.2.3 *Extent of thickness measurements*

4.2.3.1 Thickness measurements should be carried out to an extent sufficient to determine both general and local corrosion levels at areas subject to close-up survey where required as per 4.2.2.2 and as provided in 4.2.1.4.

4.2.3.2 The extent of thickness measurements may be specially considered provided the surveyor is satisfied by the close-up survey that there is no structural diminution and the hard protective coatings are found to be in a GOOD condition.

4.2.3.3 Where substantial corrosion is found, the extent of thickness measurements should be increased in accordance with the requirements of annex 10. These extended thickness measurements should be carried out before the survey is credited as completed. Suspect areas identified at previous surveys should be examined. Areas of substantial corrosion identified at previous surveys should have thickness measurements taken.

4.2.3.4 Where the hard protective coating in cargo holds is found to be in GOOD condition, the extent of close-up surveys and thickness measurements may be specially considered.

4.3 *Double-side skin bulk carriers 10 to 15 years of age*

4.3.1 The requirements of the intermediate survey should be the same extent as the previous renewal survey as required in 2 and 5.1. However, internal examination of fuel oil tanks and pressure testing of all tanks are not required unless deemed necessary by the attending surveyor.

4.3.2 In application of 4.3.1, the intermediate survey may be commenced at the second annual survey and be progressed during the succeeding year with a view to completion at the third annual survey in lieu of the application of 2.1.1.

4.3.3 In application of 4.3.1, an underwater survey may be considered in lieu of the requirements of 2.2.

4.4 *Double-side skin bulk carriers exceeding 15 years of age*

4.4.1 The requirements of the intermediate survey should be to the same extent as the previous renewal survey required in 2 and 5.1. However, internal examination of fuel tanks and pressure testing of all tanks are not required unless deemed necessary by the attending surveyor.

4.4.2 In application of 4.4.1, the intermediate survey may be commenced at the second annual survey and be progressed during the succeeding year with a view to completion at the third annual survey in lieu of the application of 2.1.1.

4.4.3 In application of 4.4.1, a survey in dry-dock should be part of the intermediate survey. The overall and close-up surveys and thickness measurements, as applicable, of the lower portions of the cargo holds and water ballast tanks should be carried out in accordance with the applicable requirements for intermediate surveys, if not already performed.

Note: Lower portions of the cargo holds and ballast tanks are considered to be the parts below light ballast water line.

5 **Preparations for survey**

5.1 *Survey programme*

5.1.1 The owner in cooperation with the Administration should work out a specific survey programme prior to the commencement of any part of:

- .1 the renewal survey; and
- .2 the intermediate survey for double-side skin bulk carriers over 10 years of age.

The survey programme should be in a written format based on the information in annex 4A. The survey should not commence until the survey programme has been agreed.

5.1.1.1 Prior to the development of the survey programme, the survey planning questionnaire should be completed by the owner based on the information set out in annex 4B, and forwarded to the Administration.

5.1.1.2 The survey programme at intermediate survey may consist of the survey programme at the previous renewal survey supplemented by the condition evaluation report of that renewal survey and later relevant survey reports.

5.1.1.3 The survey programme should be worked out taking into account any amendments to the survey requirements after the last renewal survey carried out.

5.1.2 In developing the survey programme, the following documentation should be collected and consulted with a view to selecting tanks, holds, areas and structural elements to be examined:

- .1 survey status and basic ship information;
- .2 documentation on board, as described in 6.2 and 6.3;
- .3 main structural plans (scantlings drawings), including information regarding use of high-tensile steels (HTS);
- .4 relevant previous survey and inspection reports from both the classification society and the owner;
- .5 information regarding the use of ship's holds and tanks, typical cargoes and other relevant data;
- .6 information regarding corrosion prevention level on the new building; and
- .7 information regarding the relevant maintenance level during operation.

5.1.3 The submitted survey programme should account for, and comply, as a minimum, with the provisions of annexes 1 and 2 and 2.7 for close-up survey, thickness measurement and tank testing, respectively, and should include relevant information, including at least:

- .1 basic ship information and particulars;
- .2 main structural plans (scantling drawings), including information regarding use of high-tensile steels (HTS);
- .3 plan of holds and tanks;
- .4 list of holds and tanks with information on use, protection and condition of coating;
- .5 conditions for survey (e.g. information regarding hold and tank cleaning, gas-freeing, ventilation, lighting, etc.);
- .6 provisions and methods for access to structures;
- .7 equipment for surveys;
- .8 nomination of holds and tanks and areas for close-up survey (see 2.5);
- .9 nomination of sections for thickness measurement (see 2.6);
- .10 nomination of tanks for testing (see 2.7); and
- .11 damage experience related to ship in question.

5.1.4 The Administration should advise the owner of the maximum acceptable structural corrosion diminution levels applicable to the ship.

5.1.5 Use may also be made of the Guidelines for technical assessment in conjunction with the planning of enhanced surveys for double-side skin bulk carriers, contained in annex 9. These Guidelines are a recommended tool which may be invoked at the discretion of the Administration, when considered necessary and appropriate, in conjunction with the preparation of the required survey programme.

5.2 *Conditions for survey*

5.2.1 The owner should provide the necessary facilities for a safe execution of the survey.

5.2.2 In order to enable the attending surveyors to carry out the survey, provisions for proper and safe access, should be agreed between the owner and the Administration.

5.2.3 Details of the means of access should be provided in the survey planning questionnaire.

5.2.4 In cases where the provisions of safety and required access are judged by the attending surveyors not to be adequate, the survey of the spaces involved should not proceed.

5.2.5 Cargo holds, tanks and spaces should be safe for access. Cargo holds, tanks and spaces should be gas free and properly ventilated. Prior to entering a tank, void or enclosed space, it should be verified that the atmosphere in the tank is free from hazardous gas and contains sufficient oxygen.

5.2.6 In preparation for survey and thickness measurements and to allow for a thorough examination, all spaces should be cleaned including removal from surfaces of all loose accumulated corrosion scale. Spaces should be sufficiently clean and free from water, scale, dirt, oil residues, etc., to reveal corrosion, deformation, fractures, damages or other structural deterioration as well as the condition of the coating. However, those areas of structure whose renewal has already been decided by the owner need only be cleaned and descaled to the extent necessary to determine the limits of the areas to be renewed.

5.2.7 Sufficient illumination should be provided to reveal corrosion, deformation, fractures, damages or other structural deterioration as well as the condition of the coating.

5.2.8 Where soft or semi-hard coatings have been applied, safe access should be provided for the surveyor to verify the effectiveness of the coating and to carry out an assessment of the conditions of internal structures which may include spot removal of the coating. When safe access cannot be provided, the soft or semi-hard coating should be removed.

5.2.9 The surveyor(s) should always be accompanied by, at least, one responsible person, assigned by the owner, experienced in tank and enclosed spaces inspection. In addition, a back-up team of at least two experienced persons should be stationed at the hatch opening of the tank or space that is being surveyed. The back-up team should continuously observe the work in the tank or space and should keep life-saving and evacuation equipment ready for use.

5.2.10 A communication system should be arranged between the survey party in the cargo hold, tank or space being examined, the responsible officer on deck and, as the case may be, the navigation bridge. The communication arrangements should be maintained throughout the survey.

5.3 *Access to structures*

5.3.1 For overall survey, means should be provided to enable the surveyor to examine the structure in a safe and practical way.

5.3.2 For close-up survey, one or more of the following means for access, acceptable to the surveyor, should be provided:

- .1 permanent staging and passages through structures;
- .2 temporary staging and passages through structures;
- .3 lifts and moveable platforms;
- .4 portable ladders;
- .5 boats or rafts; and
- .6 other equivalent means.

5.4 *Equipment for survey*

5.4.1 Thickness measurements should normally be carried out by means of ultrasonic test equipment. The accuracy of the equipment should be proven to the surveyor as required.

5.4.2 One or more of the following fracture detection procedures may be required if deemed necessary by the surveyor:

- .1 radiographic equipment;
- .2 ultrasonic equipment;
- .3 magnetic particle equipment; and
- .4 dye penetrant.

5.4.3 Explosimeter, oxygen-meter, breathing apparatus, lifelines, riding belts with rope and hook and whistles together with instructions and guidance on their use should be made available during the survey. A safety checklist should be provided.

5.4.4 Adequate and safe lighting should be provided for the safe and efficient conduct of the survey.

5.4.5 Adequate protective clothing should be made available and used (e.g. safety helmet, gloves, safety shoes, etc.) during the survey.

5.5 *Surveys at sea or at anchorage*

5.5.1 Surveys at sea or at anchorage may be accepted provided the surveyor is given the necessary assistance from the personnel on board. Necessary precautions and procedures for carrying out the survey should be in accordance with 5.1, 5.2, 5.3 and 5.4.

5.5.2 A communication system should be arranged between the survey party in the spaces under examination and the responsible officer on deck. This system should also include the personnel in charge of ballast pump handling if boats or rafts are used.

5.5.3 Surveys of tanks or applicable holds by means of boats or rafts may only be undertaken with the agreement of the surveyor, who should take into account the safety arrangements provided, including weather forecasting and ship response under foreseeable conditions and provided the expected rise of water within the tank does not exceed 0.25 m.

5.5.4 When rafts or boats will be used for close-up survey, the following conditions should be observed:

- .1 only rough duty, inflatable rafts or boats, having satisfactory residual buoyancy and stability even if one chamber is ruptured, should be used;
- .2 the boat or raft should be tethered to the access ladder and an additional person should be stationed down the access ladder with a clear view of the boat or raft;
- .3 appropriate lifejackets should be available for all participants;
- .4 the surface of water in the tank or hold should be calm (under all foreseeable conditions the expected rise of water within the tank should not exceed 0.25 m) and the water level stationary. On no account should the level of the water be rising while the boat or raft is in use;
- .5 the tank, hold or space should contain clean ballast water only. Even a thin sheen of oil on the water is not acceptable; and
- .6 at no time should the water level be allowed to be within 1 m of the deepest under deck web face flat so that the survey team is not isolated from a direct escape route to the tank hatch. Filling to levels above the deck transverses should only be contemplated if a deck access manhole is fitted and open in the bay being examined, so that an escape route for the survey party is available at all times. Other effective means of escape to the deck may be considered.

5.5.5 Rafts or boats alone may be allowed for inspection of the under deck areas for tanks or spaces, if the depth of the webs is 1.5 m or less.

5.5.6 If the depth of the webs is more than 1.5 m, rafts or boats alone may be allowed only:

- .1 when the coating of the under deck structure is in GOOD condition and there is no evidence of wastage; or
- .2 if a permanent means of access is provided in each bay to allow safe entry and exit. This means:
 - .1 access direct from the deck via a vertical ladder and a small platform fitted approximately 2 m below the deck in each bay; or
 - .2 access to deck from a longitudinal permanent platform having ladders to deck in each end of the tank. The platform should, for the full length of the tank, be arranged in level with, or above, the maximum water level needed for rafting of under deck structure. For this purpose, the ullage corresponding to the maximum water level should be assumed not more than 3 m from the deck plate measured at the midspan of deck transverses and in the middle length of the tank.

If neither of the above conditions are met, then staging or other equivalent means should be provided for the survey of the under-deck areas.

5.5.7 The use of rafts or boats alone in 5.5.5 and 5.5.6 does not preclude the use of boats or rafts to move about within a tank during a survey.

5.6 *Survey planning meeting*

5.6.1 The establishment of proper preparation and the close cooperation between the attending surveyor(s) and the owner's representatives on board prior to and during the survey are an essential part in the safe and efficient conduct of the survey. During the survey on board safety meetings should be held regularly.

5.6.2 Prior to commencement of any part of the renewal and intermediate survey, a survey planning meeting should be held between the attending surveyor(s), the owner's representative in attendance, the thickness measurement Company operator (as applicable) and the master of the ship or an appropriately qualified representative appointed by the master or Company for the purpose to ascertain that all the arrangements envisaged in the survey programme are in place, so as to ensure the safe and efficient conduct of the survey work to be carried out (see also 7.1.2).

5.6.3 The following is an indicative list of items that should be addressed in the meeting:

- .1 schedule of the ship (i.e. the voyage, docking and undocking manoeuvres, periods alongside, cargo and ballast operations, etc.);
- .2 provisions and arrangements for thickness measurements (i.e. access, cleaning/descaling, illumination, ventilation, personal safety);
- .3 extent of the thickness measurements;
- .4 acceptance criteria (refer to the list of minimum thicknesses);
- .5 extent of close-up survey and thickness measurement considering the coating condition and suspect areas/areas of substantial corrosion;
- .6 execution of thickness measurements;
- .7 taking representative readings in general and where uneven corrosion/pitting is found;
- .8 mapping of areas of substantial corrosion; and
- .9 communication between attending surveyor(s) the thickness measurement company operator(s) and owner's representative(s) concerning findings.

6 Documentation on board

6.1 *General*

6.1.1 The owner should obtain, supply and maintain on board documentation as specified in 6.2 and 6.3, which should be readily available for the surveyor. The condition evaluation report referred to in 6.2 should include a translation into English.

6.1.2 The documentation should be kept on board for the lifetime of the ship.

6.2 Survey report file

6.2.1 A survey report file should be a part of the documentation on board consisting of:

- .1 reports of structural surveys (annex 6);
- .2 condition evaluation report (annex 7); and
- .3 thickness measurement reports (annex 8).

6.2.2 The survey report file should be available also in the owner's and the Administration offices or in the office of the organization recognized by the Administration.

6.3 Supporting documents

6.3.1 The following additional documentation should be available on board:

- .1 survey programme, as required under 5.1 until such time as the renewal survey or intermediate survey, as applicable, has been completed;
- .2 main structural plans of cargo holds and ballast tanks;
- .3 previous repair history;
- .4 cargo and ballast history;
- .5 inspections by ship's personnel with reference to:
 - .1 structural deterioration in general;
 - .2 leakages in bulkheads and piping; and
 - .3 condition of coating or corrosion prevention system, if any. Guidance for reporting is shown in annex 3; and
- .6 any other information that would help to identify critical structural areas and/or suspect areas requiring inspection.

6.4 Review of documentation on board

Prior to survey, the surveyor should examine the completeness of the documentation on board, and its contents as a basis for the survey.

7 Procedures for thickness measurements**7.1 General**

7.1.1 The required thickness measurements, if not carried out by the recognized organization acting on behalf of the Administration itself, should be witnessed by a surveyor of the recognized organization. The surveyor should be on board to the extent necessary to control the process.

7.1.2 The thickness measurement company should be part of the survey planning meeting to be held prior to commencing the survey.

7.1.3 Thickness measurements of structures in areas where close-up surveys are required should be carried out simultaneously with close-up surveys.

7.1.4 In all cases the extent of the thickness measurements should be sufficient as to represent the actual average condition.

7.1.5 Procedural requirements for thickness measurements are set out in annex 12.

7.2 *Certification of thickness measurement company*

The thickness measurements should be carried out by a qualified company certified by an organization recognized by the Administration according to principles stated in annex 5.

7.3 *Reporting*

7.3.1 A thickness measurement report should be prepared and submitted to the Administration. The report should give the location of measurements, the thickness measured as well as corresponding original thickness. Furthermore, the report should give the date when the measurements were carried out, type of measuring equipment, names of personnel and their qualifications and be signed by the operator. The thickness measurement report should follow the principles as specified in the recommended procedures for thickness measurements set out in annex 8.

7.3.2 The surveyor should review the final thickness measurement reports and countersign the cover page.

8 **Reporting and evaluation of survey**

8.1 *Evaluation of survey report*

8.1.1 The data and information on the structural condition of the ship collected during the survey should be evaluated for acceptability and continued structural integrity of the ship.

8.1.2 The analysis of data should be carried out and endorsed by the Administration or recognized organization authorized by the Administration and the conclusions of the analysis should form a part of the condition evaluation report.

8.2 *Reporting*

8.2.1 Principles for survey reporting are shown in annex 6.

8.2.2 When a survey is split between different survey stations, a report should be made for each portion of the survey. A list of items examined and/or tested (pressure testing, thickness measurements, etc.) and an indication of whether the item has been credited, should be made available to the next attending surveyor(s), prior to continuing or completing the survey.

8.2.3 A condition evaluation report of the survey and results should be issued to the owner as shown in annex 7 and placed on board the ship for reference at future surveys. The condition evaluation report should be endorsed by the Administration or by the recognized organization on behalf of the Administration.

ANNEX 1

REQUIREMENTS FOR CLOSE-UP SURVEY AT RENEWAL SURVEYS

Appendix 1 — Minimum requirements for close-up survey at renewal survey of double-side skin bulk carriers excluding ore carriers

Age ≤ 5 years Renewal Survey No. 1	5 < Age ≤ 10 years Renewal Survey No. 2	10 < Age ≤ 15 years Renewal Survey No. 3	Age > 15 years Renewal Survey No. 4 and subsequent
One transverse web with associated plating and longitudinals in two representative water ballast tanks of each type. This is to include the foremost topside and double-side water ballast tanks on either side. (A) Two selected cargo hold transverse bulkheads, including internal structure of upper and lower stools, where fitted. (C) All cargo hold hatch covers and coaming (plating and stiffeners). (D)	One transverse web with associated plating and longitudinals as applicable in each water ballast tank. (A) Forward and aft transverse bulkheads including stiffening system in a transverse section including topside, hopper side and double-side ballast tanks. (A) 25% of ordinary transverse web frames in the foremost double-side tanks. (B) One transverse bulkhead in each cargo hold, including internal structure of upper and lower stools, where fitted. (C) All cargo hold hatch covers and coamings (plating and stiffeners). (D) All deck plating and under-deck structure inside line of hatch openings between all cargo hold hatches. (E)	All transverse webs with associated plating and longitudinals as applicable in each water ballast tank. (A) All transverse bulkheads including stiffening system in each water ballast tank. (A) 25% of ordinary transverse web frames in all double-side tanks. (B) All cargo hold transverse bulkheads including internal structure of upper and lower stools, where fitted. (C) All cargo hold hatch covers and coamings (plating and stiffeners). (D) All deck plating and under-deck structure inside line of hatch openings between all cargo hold hatches. (E)	All transverse webs with associated plating and longitudinals as applicable in each water ballast tank. (A) All transverse bulkheads including stiffening system in each water ballast tank. (A) All ordinary transverse frames in all double-side tanks. (B) Areas (C)–(E) as for column 3

- (A), (B), (C), (D) and (E) are areas to be subjected to close-up surveys and thickness measurements (see sketches in appendix 3 to annex 8)
- (A) Transverse web frame or watertight transverse bulkhead in topside, hopper side and double-side ballast tanks. In fore and aft peak tanks transverse web frame means a complete transverse web frame ring including adjacent structural members.
- (B) Ordinary transverse frame in double-side tanks.
- (C) Cargo hold transverse bulkhead, plating, stiffeners and girders.
- (D) Cargo hold hatch covers and coamings.
- (E) Deck plating and under-deck structure inside line of hatch openings between cargo hold hatches.

Note: Close-up survey of transverse bulkheads should be carried out at four levels:

- | | |
|-----------|---|
| Level (a) | Immediately above the inner bottom and immediately above the line of gussets (if fitted) and shedders for ships without lower stool. |
| Level (b) | Immediately above and below the lower stool shelf plate (for those ships fitted with lower stools), and immediately above the line of the shedder plates. |
| Level (c) | About mid-height of the bulkhead. |
| Level (d) | Immediately below the upper deck plating and immediately adjacent to the upper wing tank, and immediately below the upper stool shelf plate for those ships fitted with upper stools, or immediately below the topside tanks. |

Appendix 2**Minimum requirements for close-up survey at renewal survey for ore carriers**

Age < 5 years Renewal Survey No.1	5 < Age ≤ 10 years Renewal Survey No.2	age > 10 Renewal Survey No.3 and subsequent
One web frame ring complete including adjacent structural members in a ballast wing tank. (A) One transverse bulkhead lower part – including girder system and adjacent structural members – in a ballast tank. (A)	All web frame rings complete including adjacent structural members in a ballast wing tank. (A) One deck transverse including adjacent deck structural members in each remaining ballast tank. (A) Forward and aft transverse bulkheads complete – including girder system and adjacent structural members – in a ballast wing tank. One transverse bulkhead lower part – including girder system and adjacent structural members – in each remaining ballast tank. (A)	All web frame rings complete including adjacent structural members in each ballast tank. (A) All transverse bulkheads complete – including girder system and adjacent structural members – in each ballast tank. (A) One web frame ring complete including adjacent structural members in each wing void space. (A) Additional web frame rings in void spaces as deemed necessary by the Administration or organization recognized by the Administration. (A)
Two selected cargo hold transverse bulkheads, including internal structure of upper and lower stools, where fitted. (C)	One transverse bulkhead in each cargo hold, including internal structure of upper and lower stools, where fitted. (C)	All cargo hold transverse bulkheads, including internal structure of upper and lower stools, where fitted. (C)
All cargo hold hatch covers and coamings (plating and stiffeners). (D)	All cargo hold hatch covers and coamings (plating and stiffeners). (D)	All cargo hold hatch covers and coamings (plating and stiffeners). (D)
	All deck plating and under deck structure inside line of hatch openings between all cargo hold hatches. (E)	All deck plating and under deck structure inside line of hatch openings between all cargo hold hatches. (E)

(A), (C), (D) and (E) are areas to be subjected to close-up surveys and thickness measurements (see sketches in appendix 3 to annex 8)

- (A) Transverse web frame or watertight transverse bulkhead in ballast wing tanks and void spaces. In fore and aft peak tanks transverse web frame means a complete transverse web frame ring including adjacent structural members.
- (C) Cargo hold transverse bulkhead plating, stiffeners and girders.
- (D) Cargo hold hatch covers and coamings.

- (E) Deck plating and under deck structure inside line of hatch openings between cargo hold hatches.

Note: Close-up survey of transverse bulkheads should be carried out at four levels:

- | | |
|-----------|---|
| Level (a) | Immediately above the inner bottom and immediately above the line of gussets (if fitted) and shedders for ships without lower stool. |
| Level (b) | Immediately above and below the lower stool shelf plate (for those ships fitted with lower stools), and immediately above the line of the shedder plates. |
| Level (c) | About mid-height of the bulkhead. |
| Level (d) | Immediately below the upper deck plating and immediately adjacent to the upper wing tank, and immediately below the upper stool shelf plate for those ships fitted with upper stools, or immediately below the topside tanks. |

ANNEX 2

REQUIREMENTS FOR THICKNESS MEASUREMENTS AT RENEWAL SURVEYS

Age ≤ 5 years Renewal Survey No. 1	5 < Age ≤ 10 years Renewal Survey No. 2	10 < Age ≤ 15 years Renewal Survey No. 3	Age > 15 years Renewal Survey No. 4 and subsequent
1 Suspect areas	1 Suspect areas 2 Within the cargo length area: two transverse sections of deck plating outside line of cargo hatch openings 3 Measurement, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to annex 1 4 Wind and water strakes in way of the two transverse sections considered under point 2 above 5 Selected wind and water strakes outside the cargo length area	1 Suspect areas 2 Within the cargo length area: .1 each deck plate outside line of cargo hatch openings .2 two transverse sections, one of which should be in the amidship area, outside line of cargo hatch openings 3 Measurement, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to annex 1 4 All wind and water strakes within the cargo length area 5 Selected wind and water strakes outside the cargo length area	1 Suspect areas 2 Within the cargo length area: .1 each deck plate outside line of cargo hatch openings .2 three transverse sections, one of which should be in the amidship area, outside line of cargo hatch openings .3 each bottom plate 3 Point 3 referred to in column 3 4 All wind and water strakes, full length

ANNEX 3

OWNER'S INSPECTION REPORT

Structural condition

Ship's name:							
Owner's inspection report – Structural condition							
For tank/hold No:							
Grade of steel: deck: side:							
bottom: longitudinal bulkhead:							
Elements	Cracks	Buckles	Corrosion	Coating	Pitting	Modification/repair	Other condition
Deck:							
Bottom:							
Side:							
Side framing:							
Longitudinal bulkheads:							
Transverse bulkheads:							
Repairs carried out due to:							
Thickness measurements carried out (dates):							
Results in general:							
Overdue surveys:							
Outstanding conditions of class:							
Comments:							
Date of inspection:							
Inspected by:							
Signature:							

ANNEX 4A

SURVEY PROGRAMME

Basic information and particulars

Name of ship:
IMO number:
Flag State:
Port of registry:
Gross tonnage:
Deadweight (metric tonnes):
Length between perpendiculars (m):
Shipbuilder:
Hull number:
Recognized organization (RO):
RO ship identity:
Date of build of the ship:
Owner:
Thickness measurement company:

1 Preamble**1.1 Scope**

1.1.1 The present survey programme covers the minimum extent of overall surveys, close-up surveys, thickness measurements and pressure testing within the cargo length area, cargo holds, ballast tanks, including fore and aft peak tanks, required by the Code.

1.1.2 The arrangements and safety aspects of the survey should be acceptable to the attending surveyor(s).

1.2 Documentation

All documents used in the development of the survey programme should be available on board during the survey as required by section 6.

2 Arrangement of cargo holds, tanks and spaces

This section of the survey programme should provide information (either in the form of plans or text) on the arrangement of cargo holds, tanks and spaces that fall within the scope of the survey.

3 List of cargo holds, tanks and spaces with information on their use, extent of coatings and corrosion prevention system

This section of the survey programme should indicate any changes relating to (and should update) the information on the use of the holds and tanks of the ship, the extent of coatings and the corrosion prevention system provided in the survey planning questionnaire.

4 Conditions for survey

This section of the survey programme should provide information on the conditions for survey, e.g. information regarding cargo hold and tank cleaning, gas freeing, ventilation, lighting, etc.

5 Provisions and method of access to structures

This section of the survey programme should indicate any changes relating to (and should update) the information on the provisions and methods of access to structures provided in the survey planning questionnaire.

6 List of equipment for survey

This section of the survey programme should identify and list the equipment that will be made available for carrying out the survey and the required thickness measurements.

7 Survey requirements**7.1 Overall survey**

This section of the survey programme should identify and list the spaces that should undergo an overall survey for this ship in accordance with 2.5.1.

7.2 Close-up survey

This section of the survey programme should identify and list the hull structures that should undergo a close-up survey for this ship in accordance with 2.5.2.

8 Identification of tanks for tank testing

This section of the survey programme should identify and list the cargo holds and tanks that should undergo tank testing for this ship in accordance with 2.7.

9 Identification of areas and sections for thickness measurements

This section of the survey programme should identify and list the areas and sections where thickness measurements should be taken in accordance with 2.6.1.

10 Minimum thickness of hull structures

This section of the survey programme should specify the minimum thickness for hull structures of this ship that are subject to survey, according to .1 or .2:

- .1 Determined from the attached wastage allowance table and the original thickness to the hull structure plans of the ship;
- .2 Given in the following table(s):

Area or location	Original as-built thickness (mm)	Minimum thickness (mm)	Substantial corrosion thickness (mm)
Deck			
Plating			
Longitudinals			
Longitudinal girders			
Cross deck plating			
Cross deck stiffeners			
Bottom			
Plating			
Longitudinals			
Longitudinal girders			
Inner bottom			
Plating			
Longitudinals			
Longitudinal girders			
Floors			
Ship side in way of topside tanks			
Plating			
Longitudinals			
Ship side in way of hopper side tanks			
Plating			
Longitudinals			
Ship side in way of double-hull tanks (if applicable)			
Plating			
Longitudinals or ordinary transverse frames			
Longitudinal stringers			
Longitudinal bulkhead inner side (if applicable)			
Plating			
Longitudinals (if applicable)			
Longitudinals or ordinary transverse frames			
Longitudinal girders (if applicable)			
Transverse bulkheads			
Plating			
Stiffeners (if applicable)			
Upper stool plating			
Upper stool stiffeners			
Lower stool plating			
Lower stool stiffeners			
Transverse web frames in topside tanks			
Plating			
Flanges			
Stiffeners			

Area or location	Original as-built thickness (mm)	Minimum thickness (mm)	Substantial corrosion thickness (mm)
Transverse web frames in hopper tanks			
Plating			
Flanges			
Stiffeners			
Transverse web frames in double-side tanks			
Plating			
Flanges			
Stiffeners			
Hatch covers			
Plating			
Stiffeners			
Hatch coamings			
Plating			
Stiffeners			

Note: The wastage allowance tables should be attached to the survey programme.

11 Thickness measurement company

This section of the survey programme should identify changes, if any, relating to the information on the thickness measurement company provided in the survey planning questionnaire.

12 Damage experience related to the ship

This section of the survey programme should, using the tables provided below, provide details of the hull damages for at least the last three years in way of the cargo holds, ballast tanks and void spaces within the cargo length area. These damages are subject to survey.

Hull damages sorted by location for this ship

[illegible]

Hull damages for sister or similar ships (if available) in the case of design-related damage

Cargo hold, tank or space number or area	Possible cause, if known	Description of the damages	Location	Repair	Date of repair

13 Areas identified with substantial corrosion from previous surveys

This section of the survey programme should identify and list the areas of substantial corrosion from previous surveys.

14 Critical structural areas and suspect areas

This section of the survey programme should identify and list the critical structural areas and the suspect areas, when such information is available.

15 Other relevant comments and information

This section of the survey programme should provide any other comments and information relevant to the survey.

Appendices

Appendix 1 – List of plans

The provisions of 5.1.3.2 require that the main structural plans of cargo holds and ballast tanks (scantling drawings), including information regarding the use of high-tensile steel (HTS), should be available. This appendix of the survey programme should identify and list the main structural plans which form part of the survey programme.

Appendix 2 – Survey planning questionnaire

The survey planning questionnaire (annex 4B), which has been submitted by the owner, should be appended to the survey programme.

Appendix 3 – Other documentation

This part of the survey programme should identify and list any other documentation that forms part of the plan.

Prepared by the owner in cooperation with the Administration for compliance with 5.1.3.

Date:

(name and signature of authorized owner's representative)

Date:

(name and signature of authorized representative of the Administration)

ANNEX 4B

SURVEY PLANNING QUESTIONNAIRE

1 The following information will enable the owner, in cooperation with the Administration, to develop a survey programme complying with the requirements of the Code. It is essential that the owner provides, when completing the present questionnaire, up-to-date information. The present questionnaire, when completed, should provide all information and material required by the Code.

Particulars

Ship's name:

IMO number:

Flag State:

Port of registry:

Owner:

Recognized organization:

RO Ship identity:

Gross tonnage:

Deadweight (metric tonnes):

Date of build:

Information on access provision for close-up surveys and thickness measurement

2 The owner should indicate, in the table below, the means of access to the structures subject to close-up survey and thickness measurement. A close-up survey is an examination where the details of structural components are within the close visual inspection range of the attending surveyor, i.e. normally within reach of hand.

Hold/Tank No.	Structure	Temporary staging	Rafts	Ladders	Direct access	Other means (please specify)
F.P.	Fore peak					
A.P.	Aft peak					
Cargo holds	Hatch side coamings					
	Topside sloping plate					
	Upper stool plating					
	Cross deck					
	Double-side tank plating					
	Transverse bulkhead					
	Hopper tank plating					
	Lower stool plating					
	Tank top					
	Under-deck structure					
Topside tanks	Side shell and structure					
	Sloping plate and structure					
	Webs and bulkheads					
	Hopper sloping plate and structure					
Hopper tanks	Side shell and structure					
	Bottom structure					
	Webs and bulkheads					
	Side shell and structure					
Double-side tanks	Inner skin and structure					
	Webs and bulkheads					
	Double-bottom structure					
	Upper stool internal structure					
	Lower stool internal structure					

Hold/Tank No.	Structure	Temporary staging	Rafts	Ladders	Direct access	Other means (please specify)
Wing tanks of ore carriers	Underdeck and structure					
	Side shell and structure					
	Side shell vertical web and structure					
	Longitudinal bulkhead and structure					
	Longitudinal bulkhead web and structure					
	Bottom plating and structure					
	Cross ties/stringers					

History of bulk cargoes of a corrosive nature (e.g. high-sulphur content)

Owner's inspections

3 Using a format similar to that of the table below (which is given as an example), the owner should provide details of the results of their inspections, for the last three years in accordance with the Code on all CARGO holds and BALLAST tanks and VOID spaces within the cargo area.

Tank/Hold No.	Corrosion protection (1)	Coating extent (2)	Coating condition (3)	Structural deterioration (4)	Hold and tank history (5)
Cargo holds					
Topside tanks					
Hopper tanks					
Double-side skin tanks					
Double-bottom tanks					
Upper stools					
Lower stools					
Wing tanks (ore tankers)					
Fore peak					
Aft peak					
Miscellaneous other spaces:					

Note:

Indicate tanks which are used for oil/ballast.

- 1) HC = hard coating; SC = soft coating;
SH = semi-hard coating; NP = no protection
- 2) U = upper part; M = middle part;
L = lower part; C = complete
- 3) G = good; F = fair; P = poor;
RC = recoated (during the last three years)
- 4) N = no findings recorded; Y = findings recorded,
description of findings should be attached to this questionnaire
- 5) DR = damage & repair; L = leakages;
CV = conversion (description to be attached to this questionnaire)

Name of owner's representative:

.....

Signature:

Date:

ANNEX 5

PROCEDURES FOR CERTIFICATION OF A COMPANY ENGAGED IN THICKNESS MEASUREMENT OF HULL STRUCTURES**1 Application**

This guidance applies for certification of the company which intends to engage in the thickness measurement of hull structures of ships.

2 Procedures for certification*Submission of documents*

2.1 The following documents should be submitted to an organization recognized by the Administration for approval:

- .1 outline of the company, e.g. organization and management structure;
- .2 experience of the company on thickness measurement of hull structures of ships;
- .3 technicians' careers, i.e. experience of technicians as thickness measurement operators, technical knowledge and experience of hull structure, etc. Operators should be qualified according to a recognized industrial NDT Standard;
- .4 equipment used for thickness measurement such as ultrasonic testing machines and their maintenance/calibration procedures;
- .5 a guide for thickness measurement operators;
- .6 training programmes for technicians for thickness measurement;
- .7 measurement record format in accordance with recommended procedures for thickness measurements (see annex 8).

Auditing of the company

2.2 Upon reviewing the documents submitted with satisfactory results, the company should be audited in order to ascertain that the company is duly organized and managed in accordance with the documents submitted, and eventually is capable of conducting thickness measurement of the hull structure of ships.

2.3 Certification is conditional upon an on board demonstration of thickness measurement as well as satisfactory reporting.

3 Certification

3.1 Upon satisfactory results of both the audit of the company referred to in 2.2 and the demonstration tests referred to in 2.3, the Administration or organization recognized by the Administration should issue a certificate of approval as well as a notice to the effect that the thickness measurement operation system of the company has been certified.

3.2 Renewal/endorsement of the certificate should be made at intervals not exceeding three years by verification that original conditions are maintained.

4 Report of any alteration to the certified thickness measurement operation system

In cases where any alteration to the certified thickness measurement operation system of the company is made, such an alteration should be immediately reported to the organization recognized by the Administration. Re-audit should be made where deemed necessary by the organization recognized by the Administration.

5 Withdrawal of the certification

The certification may be withdrawn in the following cases:

- .1 where the measurements were improperly carried out or the results were improperly reported;
- .2 where the surveyor found any deficiencies in the approved thickness measurement operation systems of the company; and
- .3 where the company failed to report any alteration referred to in 4 to the organization recognized by the Administration as required.

ANNEX 6

SURVEY REPORTING PRINCIPLES

As a principle, for bulk carriers subject to the Code, the surveyor should include the following contents in his report for survey of hull structure and piping systems, as relevant for the survey.

1 General**1.1 A survey report should be generated in the following cases:**

- .1 in connection with commencement, continuation and/or completion of periodical hull surveys, i.e. annual, intermediate and renewal surveys, as relevant;
- .2 when structural damages/defects have been found;
- .3 when repairs, renewals or modifications have been carried out; and
- .4 when condition of class (recommendation) has been imposed or has been deleted.

1.2 The reporting should provide:

- .1 evidence that prescribed surveys have been carried out in accordance with applicable requirements;
- .2 documentation of surveys carried out with findings, repairs carried out and condition of class (recommendation) imposed or deleted;
- .3 survey records, including actions taken, which should form an auditable documentary trail. Survey reports should be kept in the survey report file required to be on board;
- .4 information for planning of future surveys; and
- .5 information which may be used as input for maintenance of classification rules and instructions.

1.3 When a survey is split between different survey stations, a report should be made for each portion of the survey. A list of items surveyed, relevant findings and an indication of whether the item has been credited, should be made available to the next attending surveyor, prior to continuing or completing the survey. Thickness measurement and tank testing carried out should also be listed for the next surveyor.

2 Extent of the survey**2.1 Identification of compartments where an overall survey has been carried out.**

2.2 Identification of locations, in each ballast tank and cargo hold including hatch covers and coamings, where a close-up survey has been carried out, together with information on the means of access used.

2.3 Identification of locations, in each ballast tank and cargo hold including hatch covers and coamings, where thickness measurement has been carried out.

Note: As a minimum, the identification of location of close-up survey and thickness measurement should include a confirmation with description of individual structural members corresponding to the extent of requirements stipulated in part B of annex A based on type of periodical survey and the ship's age.

Where only partial survey is required, e.g. one transverse web, two selected cargo hold transverse bulkheads, the identification should include location within each ballast tank and cargo hold by reference to frame numbers.

2.4 For areas in ballast tanks and cargo holds where protective coating is found to be in good condition and the extent of close-up survey and/or thickness measurement has been specially considered, structures subject to special consideration should be identified.

2.5 Identification of tanks subject to tank testing.

2.6 Identification of piping systems on deck and within cargo holds, ballast tanks, pipe tunnels, cofferdams and void spaces where:

- .1 examination including internal examination of piping with valves and fittings and thickness measurement, as relevant, has been carried out; and
- .2 operational test to working pressure has been carried out.

3 Result of the survey

3.1 Type, extent and condition of protective coating in each tank, as relevant (rated GOOD, FAIR or POOR).

3.2 Structural condition of each compartment with information on the following, as relevant:

- .1 identification of findings, such as:
 - .1 corrosion with description of location, type and extent;
 - .2 areas with substantial corrosion;
 - .3 cracks/fractures with description of location and extent;
 - .4 buckling with description of location and extent; and
 - .5 indents with description of location and extent;
- .2 identification of compartments where no structural damages/defects are found. The report may be supplemented by sketches/photos; and
- .3 thickness measurement report should be verified and signed by the surveyor controlling the measurements on board.

4 Actions taken with respect to findings

4.1 Whenever the attending surveyor is of the opinion that repairs are required, each item to be repaired should be identified in a numbered list. Whenever repairs are carried out, details of the repairs effected should be reported by making specific reference to relevant items in the numbered list.

4.2 Repairs carried out should be reported with identification of:

- .1 compartment;
- .2 structural member;
- .3 repair method (i.e. renewal or modification), including:
 - .1 steel grades and scantlings (if different from the original); and
 - .2 sketches/photos, as appropriate;
- .4 repair extent; and
- .5 non-destructive test (NDT)/tests.

4.3 For repairs not completed at the time of survey, condition of class/recommendation should be imposed with a specific time limit for the repairs. In order to provide correct and proper information to the surveyor attending for survey of the repairs, condition of class/recommendation should be sufficiently detailed with identification of each item to be repaired. For identification of extensive repairs, reference may be made to the survey report.

ANNEX 7

CONDITION EVALUATION REPORT

Issued upon completion of renewal survey

General particulars

Ship's name: Class/Administration identity number:
 Previous class/Administration identity number(s):
 IMO number:

Port of registry: National flag:
 Previous national flag(s):

Deadweight (metric tonnes): Gross tonnage:
 National:
 ITC (1969):

Date of build: Classification notation:

Date of major conversion:

Type of conversion: Owner:
 Previous owner(s):

1 The survey reports and documents listed below have been reviewed by the undersigned and found to be satisfactory.

2 A summary of the survey is attached herewith on sheet 2.

3 The renewal survey has been completed in accordance with the present Code on (date)

Condition evaluation report completed by	Name Signature	Title
Office	Date	
Condition evaluation report verified by	Name Signature	Title
Office	Date	

Attached reports and documents:

- 1)
- 2)
- 3)
- 4)
- 5)
- 6)

Contents of condition evaluation report

- | | | |
|--------|---|--|
| Part 1 | - General particulars: | - See front page |
| Part 2 | - Report review: | - Where and how survey was done |
| Part 3 | - Close-up survey: | - Extent (which tanks/holds) |
| Part 4 | - Thickness measurements: | - Reference to thickness measurement report |
| | | - Summary of where measured |
| | | - Separate form indicating the spaces with substantial corrosion, and corresponding: |
| | | - thickness diminution |
| | | - corrosion pattern |
| Part 5 | - Tank/hold corrosion prevention system: | - Separate form indicating: |
| | | - location of coating |
| | | - condition of coating (if applicable) |
| Part 6 | - Repairs: | - Identification of spaces/areas |
| Part 7 | - Condition of class/flag State requirements: | |
| Part 8 | - Memoranda: | - Acceptable defects |
| | | - Any points of attention for future surveys, e.g. for suspect areas |
| | | - Extended annual/intermediate survey due to coating breakdown |
| Part 9 | - Conclusion: | - Statement on evaluation/verification of survey report |

Extract of thickness measurements

Reference is made to the thickness measurement report:

Position of substantially corroded tanks/areas ¹ or areas with deep pitting ³	Thickness diminution [%]	Corrosion pattern ²	Remarks: (e.g. reference to attached sketches)

Notes:

- 1 Substantial corrosion, i.e. 75 to 100% of acceptable margins wasted.
- 2 P = Pitting
C = Corrosion in general
- 3 Any bottom plating with a pitting intensity of 20% or more, with wastage in the substantial corrosion range or having an average depth of pitting of $\frac{1}{3}$ or more of actual plate thickness should be noted.

Tank/hold corrosion prevention system

Tank/hold Nos. ¹	Tank/hold corrosion prevention system ²	Coating condition ³	Remarks

Notes:

1 All ballast tanks and cargo holds should be listed.

2 C = Coating NP = No protection

3 Coating condition according to the following standard:

GOOD condition with only minor spot rusting.

FAIR condition with local breakdown of coating at edges of stiffeners and weld connections and/or light rusting over 20% or more of areas under consideration, but less than as defined for POOR condition.

POOR condition with general breakdown of coating over 20% or more of areas or hard scale at 10% or more of areas under consideration.

If coating condition POOR is given, extended annual surveys should be introduced. This should be noted in part 8 of the contents of condition evaluation report.

ANNEX 8

RECOMMENDED PROCEDURES FOR THICKNESS MEASUREMENTS

- 1 This annex should be used for recording thickness measurements as required by part B of annex A.
- 2 Thickness measurement sheet forms TM1-DSBC, TM2-DSBC(i), TM2-DSBC(ii), TM3-DSBC, TM4-DSBC, TM5-DSBC and TM6-DSBC (appendix 2) should be used, as appropriate, for recording thickness measurements. The maximum allowable diminution should be stated. The maximum allowable diminution could be stated in an attached document.
- 3 Appendix 3 contains guidance diagrams and notes relating to the reporting forms and the procedure for the thickness measurements.

Appendix 1

THICKNESS MEASUREMENT REPORT GENERAL PARTICULARS

Ship's name:
 IMO number:
 Class/Administration identity number:
 Port of registry:
 Gross tonnage:
 Deadweight:
 Date of build:
 Classification society:

Name of company performing thickness measurement:
 Thickness measurement company certified by:
 Certificate number:
 Certificate valid from: to
 Place of measurement:
 First date of measurement:
 Last date of measurement:
 Renewal survey/intermediate survey due:
 Details of measurement equipment:
 Qualification of operator:

Report number: consisting of pages
 Name of operator: Name of surveyor:
 Signature of operator: Signature of surveyor:
 Company official stamp: Administration:

Official stamp

Appendix 2

Report on thickness measurement of all deck plating, bottom shell plating and side shell plating (TM1-DSBC)

Ship's name.....		Class Identity No.....		Report No.....		IMO number.....				
STRAKE POSITION	No. or letter	Orig. thk. (mm)	Gauged		Forward reading		Aft reading		Mean diminution	
PLATE POSITION			P	S	Diminution P	Diminution S	Diminution P	Diminution S	P	S
12th forward					mm	%	mm	%	mm	%
11th										
10th										
9th										
8th										
7th										
6th										
5th										
4th										
3rd										
2nd										
1st										
Amidships										
1st aft										
2nd										
3rd										
4th										
5th										
6th										
7th										
8th										
9th										
10th										
11th										
12th										
Operator's signature.....										
Notes — see following page										

Notes to report TM1-DSBC:

- 1 This report should be used for recording the thickness measurement of:
 - .1 all strength deck plating within cargo length area;
 - .2 all keel, bottom shell plating and bilge plating within the cargo length area;
 - .3 side shell plating including selected wind and water strakes outside cargo length area; and
 - .4 all wind and water strakes within cargo length area.
- 2 The strake position should be cleared as follows:
 - .1 for strength deck indicate the number of the strake of plating inboard from the stringer plate;
 - .2 for bottom plating indicate the number of the strake of plating outboard from the keel plate; and
 - .3 for side shell plating give number of the strake of plating below sheerstrake and letter as shown on shell expansion.
- 3 Only the deck plating strakes outside line of openings are to be recorded.
- 4 Measurements should be taken at the forward and aft areas of all plates and where plates cross ballast/cargo tank boundaries separate measurements for the area of plating in way of each type of tank should be recorded.
- 5 The single measurements recorded should represent the average of multiple measurements.
- 6 The maximum allowable diminution could be stated in an attached document.

Report on thickness measurement of shell and deck plating at transverse sections (one, two or three transverse sections)
(TM2-DSBC(i))

Ship's name..... Class Identity No..... Report No..... IMO number.....

STRENGTH DECK AND SHEER STRAKE PLATING

SECOND TRANSVERSE SECTION AT FRAME NUMBER.....

THIRD TRANSVERSE SECTION AT FRAME NUMBER.....

STRAKE POSITION	FIRST TRANSVERSE SECTION AT FRAME NUMBER.....						SECOND TRANSVERSE SECTION AT FRAME NUMBER.....						THIRD TRANSVERSE SECTION AT FRAME NUMBER.....									
	No. or letter	Orig. thk (mm)	Max allow. dimin. (mm)	Gauged P	S	Diminution P mm %	Diminution S mm %	No. or letter	Orig. thk (mm)	Max allow. dimin. (mm)	Gauged P	S	Diminution P mm %	Diminution S mm %	No. or letter	Orig. thk (mm)	Max allow. dimin. (mm)	Gauged P	S	Diminution P mm %	Diminution S mm %	
Stringer plate																						
1st strake inboard																						
2nd																						
3rd																						
4th																						
5th																						
6th																						
7th																						
8th																						
9th																						
10th																						
11th																						
12th																						
13th																						
14th																						
centre strake																						
sheerstrake																						
TOPSIDE																						
TOTAL																						

Operator's signature.....

Notes — see following page

Notes to report TM2-DSBC(i):

- 1 This report should be used for recording the thickness measurement of:
Strength deck plating and sheerstrake plating transverse sections:
One, two or three sections within the cargo length area, comprising structural items (1), (2) and (3) as shown on the diagrams of typical transverse sections (appendix 3).
- 2 Only the deck plating strakes outside line of hatch openings should be recorded.
- 3 The top side area comprises deck plating, stringer plate and sheerstrake (including rounded gunwales).
- 4 The exact frame station of measurement should be stated.
- 5 The single measurements recorded should represent the average of multiple measurements.
- 6 The maximum allowable diminution could be stated in an attached document.

Report on thickness measurement of shell and deck plating at transverse sections (one, two or three transverse sections)
(TM2-DSBC(ii))

Ship's name..... Class Identity No..... Report No..... IMO number..... SHELL PLATING

STRAKE POSITION	FIRST TRANSVERSE SECTION AT FRAME NUMBER.....						SECOND TRANSVERSE SECTION AT FRAME NUMBER.....						THIRD TRANSVERSE SECTION AT FRAME NUMBER.....									
	No. or letter	Orig. thk (mm)	Max allow. dimin. (mm)	Gauged		Diminution P mm	Diminution S mm	No. or letter	Orig. thk (mm)	Max allow. dimin. (mm)	Gauged		Diminution P mm	Diminution S mm	No. or letter	Orig. thk (mm)	Max allow. dimin. (mm)	Gauged		Diminution P mm	Diminution S mm	
				P	S						P	S						P	S			P
1st below sheerstrake																						
2nd																						
3rd																						
4th																						
5th																						
6th																						
7th																						
8th																						
9th																						
10th																						
11th																						
12th																						
13th																						
14th																						
15th																						
16th																						
17th																						
18th																						
19th																						
20th																						
Keel																						
strake																						
BOTTOM																						
TOTAL																						

Operator's signature..... Notes - see following page

Notes to report TM2-DSBC(ii):

- 1 This report should be used for recording the thickness measurement of:

Shell plating at transverse sections:

One, two or three sections within the cargo length area, comprising structural items (3), (4), (5) and (6) as shown on the diagrams of typical transverse sections in appendix 3.
- 2 The bottom area comprises keel, bottom and bilge plating.
- 3 The exact frame station of measurement should be stated.
- 4 The single measurements recorded should represent the average of multiple measurements.
- 5 The maximum allowable diminution could be stated in an attached document.

Notes to report TM3-DSBC:

- 1 This report should be used for recording the thickness measurement of:
Longitudinal members at transverse sections:
Two, or three sections within the cargo length area comprising the appropriate structural items (10) to (25) as shown on diagrams of typical transverse sections in appendix 3.
- 2 The exact frame station of measurement should be stated.
- 3 The single measurements recorded should represent the average of multiple measurements.
- 4 The maximum allowable diminution could be stated in an attached document.

Notes to report TM4-DSBC:

- 1 This report should be used for recording the thickness measurement of:
Transverse structural members, comprising the appropriate structural items (30) to (34) as shown on diagrams of typical transverse sections illustrated in appendix 3.
- 2 Guidance for areas of measurements is indicated in appendix 3.
- 3 The single measurements recorded should represent the average of multiple measurements.
- 4 The maximum allowable diminution could be stated in an attached document.

Notes to report TM5-DSBC:

- 1 This report should be used for recording the thickness measurement of:
Watertight transverse bulkheads in cargo holds.
- 2 Guidance for areas of measurements is indicated in appendix 3.
- 3 The single measurements recorded should represent the average of multiple measurements.
- 4 The maximum allowable diminution could be stated in an attached document.

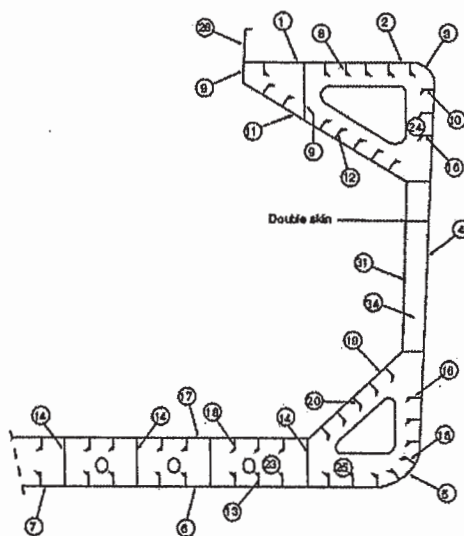
Notes to report TM6-DSBC:

- 1 This report should be used for recording the thickness measurement of:
Miscellaneous structural members including structural items (40), (41) and (42) as shown on diagrams of typical transverse sections illustrated in appendix 3.
- 2 Guidance for areas of measurements is indicated in appendix 3.
- 3 The single measurements recorded should represent the average of multiple measurements.
- 4 The maximum allowable diminution could be stated in an attached document.

Appendix 3

THICKNESS MEASUREMENT – DOUBLE-SIDE SKIN CONSTRUCTION SHIPS
 THICKNESS MEASUREMENT – DOUBLE-SIDE SKIN BULK CARRIER

Typical transverse section of a double-side skin bulk carrier with indication of longitudinal and transverse members.



REPORT ON TM3-DSRC) and (B)	
1	Strength deck plating
2	Stiver plate
3	Shearweb
4	Side shell plating
5	Bilge plating
6	Bottom shell plating
7	Keel plate

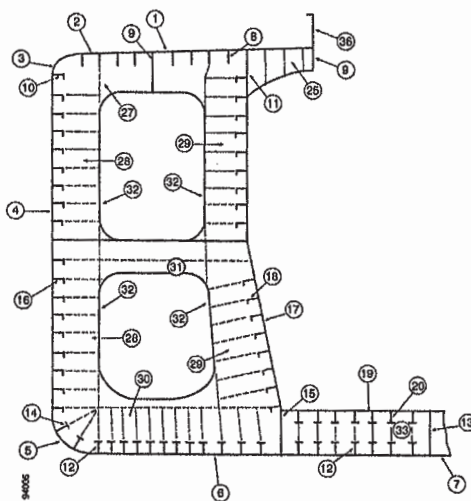
REPORT ON TM3-DSRC	
8	Deck longitudinal
9	Deck girder
10	Shearweb longitudinally
11	Topside tank sloping plating
12	Topside tank sloping plating longitudinally
13	Bottom longitudinal
14	Bottom girder
15	Bilge longitudinal
16	Side shell longitudinal, many
17	Inner bottom plating
18	Inner bottom longitudinal
19	Stopper plating
20	Stopper longitudinal
21	Inner side plating
22	Inner side longitudinal, many
23	Hatch coaming
24	Deck plating between hatches
25	Hatch covers

REPORT ON TM4-DSRC	
26	Double-bottom tank flange
27	Stopper side tank transverse
28	Transverse web frame
29	Topside tank transverse

REPORT ON TM6-DSRC	
30	Hatch coaming
31	Deck plating between hatches
32	Hatch covers

THICKNESS MEASUREMENT – ORE CARRIERS

Typical transverse section of an ore carrier with indication of longitudinal and transverse members.



REPORT ON TM3-D58C (b) and (d)	
1	Strength deck plating
2	Stringer plate
3	Sheerstrake
4	Side shell plating
5	Bilge plating
6	Bottom shell plating
7	Keel plate

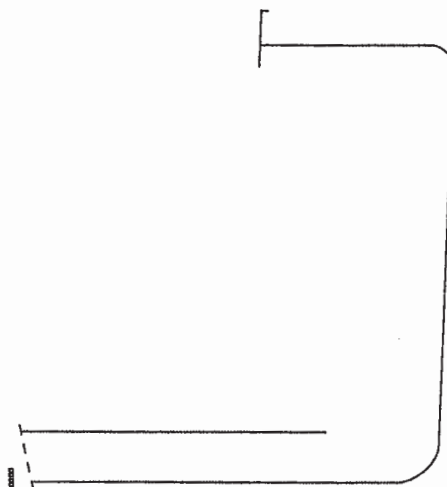
REPORT ON TM6-D58C	
16	Hatch coamings
17	Deck plating between hatches
18	Hatch covers
19	
20	

REPORT ON TM3-D58C	
8	Deck longitudinal
9	Deck girders
10	Sheerstrake longitudinal
11	Longitudinal bulkhead top strake
12	Bottom longitudinal
13	Bottom girders
14	Bilge longitudinal
15	Longitudinal bulkhead lower strake
16	Side shell longitudinal
17	Longitudinal bulkhead plating (remainder)
18	Longitudinal bulkhead longitudinal
19	Inner bottom plating
20	Inner bottom longitudinal
21	
22	
23	
24	

REPORT ON TM4-D58C	
25	Deck transverse centre tank
26	Bottom transverse centre tank
27	Deck transverse wing tank
28	Side shell vertical web
29	Longitudinal bulkhead vertical web
30	Bottom transverse wing tank
31	Stirrs
32	Transverse web face plate
33	Double bottom floor
34	
35	

THICKNESS MEASUREMENT – DOUBLE-SIDE SKIN BULK CARRIER

Transverse section outline: the diagram may be used for those ships where the typical transverse sections are not suitable.



REPORT ON TM2-DSBC(i) and (ii)	
①	Strength deck plating
②	Stringer plate
③	Sheerstrake
④	Side shell plating
⑤	Bilge plating
⑥	Bottom shell plating
⑦	Keel plate

REPORT ON TM3-DSBC	
⑧ Deck longitudinals	⑩ Side shell longitudinals, if any
⑨ Deck girders	⑪ Inner bottom plating
⑩ Sheerstrake longitudinals	⑫ Inner bottom longitudinals
⑪ Topside tank sloping plating	⑬ Hopper plating
⑫ Topside tank sloping plating longitudinals	⑭ Hopper longitudinals
⑬ Bottom longitudinals	⑮ Inner side plating
⑭ Bottom girders	⑯ Inner side longitudinals, if any
⑮ Bilge longitudinals	⑰ Horizontal girders in wing ballast tanks

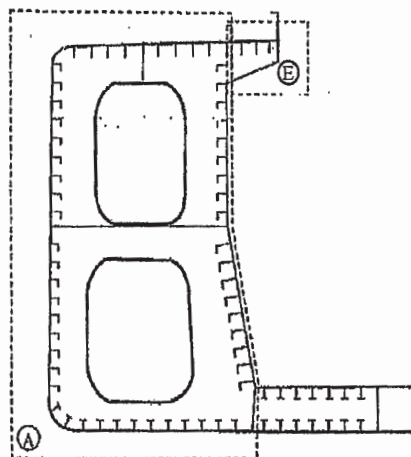
REPORT ON TM4-DSBC	
⑲	Double-bottom tank floors
⑳	Hopper side tank transverses
㉑	Transverse web frame
	– Topside tank transverses

REPORT ON TM6-DSBC	
㉒	Hatch coamings
	– Deck plating between hatches
	– Hatch covers

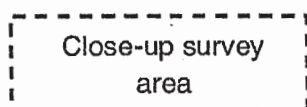
THICKNESS MEASUREMENT – ORE CARRIERS

Areas subject to close-up survey and thickness measurements – areas (A), (C), (D) and (E) as defined in annex 1 of part B – Thickness to be reported on TM3-DSBC, TM4-DSBC, TM5-DSBC and TM6-DSBC as appropriate

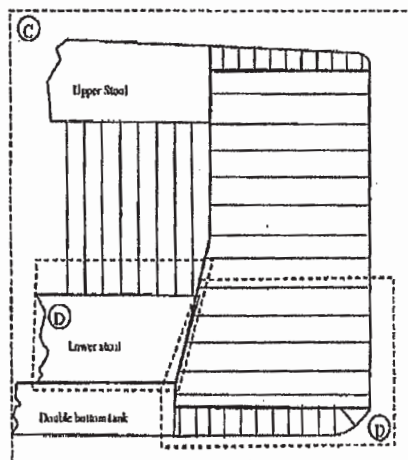
Typical transverse section close-up survey



Thickness to be reported on TM3-DSBC and TM4-DSBC as appropriate



Typical transverse bulkhead



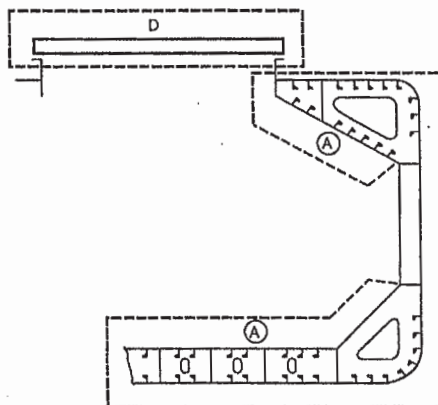
Thickness to be reported on TM5-DSBC

THICKNESS MEASUREMENTS – DOUBLE-SIDE SKIN BULK CARRIER

Areas subject to close-up survey and thickness measurements – areas (A) to (E) as defined in annex 1 of part B – Thickness to be reported on TM3-DSBC, TM4-DSBC, TM5-DSBC and TM6-DSBC as appropriate.

Typical transverse section

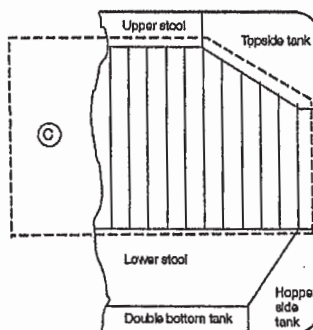
Areas (A) and (D)



Thickness to be reported on TM3-DSBC, TM4-DSBC, and TM6-DSBC, as appropriate

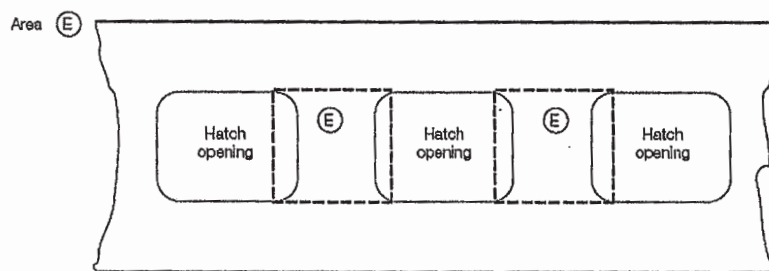
A cargo hold, transverse bulkhead

Area (C)



Thickness to be reported on TM5-DSBC

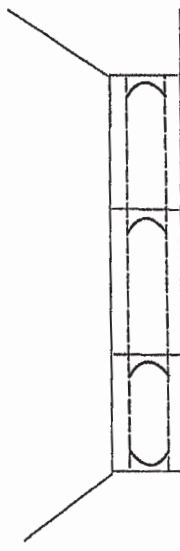
**Typical areas of deck plating and underdeck structure inside line
of hatch openings between cargo hold hatches**



Thickness to be reported on TM1-DSBC

Ordinary transverse frame in double-side skin tank

Area (B)



Thickness to be reported on TM4-DSBC

ANNEX 9

**GUIDELINES FOR TECHNICAL ASSESSMENT IN CONJUNCTION WITH
PLANNING FOR ENHANCED SURVEYS OF DOUBLE-SIDE SKIN
BULK CARRIERS – RENEWAL SURVEY HULL****1 Introduction**

These guidelines contain information and suggestions concerning technical assessments, which may be of use in conjunction with the planning of enhanced renewal surveys of double-side skin bulk carriers. As indicated in 5.1.5, the guidelines are a recommended tool which may be invoked at the discretion of the Administration, when considered necessary and appropriate, in conjunction with the preparation of the required survey programme.

2 Purpose and principles**2.1 Purpose**

2.1.1 The purpose of the technical assessments described in these guidelines is to assist in identifying critical structural areas, nominating suspect areas and in focusing attention on structural elements or areas of structural elements which may be particularly susceptible to, or evidence a history of, wastage or damage. This information may be useful in nominating locations, areas holds and tanks for thickness measurement, close-up survey and tank testing.

2.1.2 Critical structural areas are locations which have been identified from calculations to require monitoring or from the service history of the subject ship or from similar or sister ships (if available) to be sensitive to cracking, buckling or corrosion which would impair the structural integrity of the ship.

2.2 Minimum requirements

However, these guidelines may not be used to reduce the requirements pertaining to thickness measurement, close-up survey and tank testing contained in annexes 1 and 2 of part B and in 2.7, respectively, which, in all cases, should be complied with as a minimum.

2.3 Timing

As with other aspects of survey planning, the technical assessments described in these guidelines should be worked out by the owner or operator in cooperation with the Administration well in advance of the commencement of the renewal survey, i.e. prior to commencing the survey and normally at least 12 to 15 months before the survey's completion due date.

2.4 Aspects to be considered

2.4.1 Technical assessments, which may include quantitative or qualitative evaluation of relative risks of possible deterioration, of the following aspects of a particular ship may be used as a basis for the nomination of holds, tanks and areas for survey:

- .1 design features such as stress levels on various structural elements, design details and extent of use of high-tensile steel;
- .2 former history with respect to corrosion, cracking, buckling, indents and repairs for the particular ship as well as similar vessels, where available; and

- .3 information with respect to types of cargo carried, use of different holds/tanks for cargo/ballast, protection of holds and tanks and condition of coating, if any.

2.4.2 Technical assessments of the relative risks of susceptibility to damage or deterioration of various structural elements and areas should be judged and decided on the basis of recognized principles and practices, such as may be found in references 2, 3 and 4.

3 Technical assessment

3.1 General

3.1.1 There are three basic types of possible failure, which may be the subject of technical assessment in connection with planning of surveys; corrosion, cracks and buckling. Contact damages are not normally covered by the survey planning since indents are usually noted in memoranda and assumed to be dealt with as a normal routine by surveyors.

3.1.2 Technical assessments performed in conjunction with the survey planning process should, in principle, be as shown schematically in figure 1.

The approach is basically an evaluation of the risk in the following aspects based on the knowledge and experience related to:

- .1 design; and
- .2 corrosion.

3.1.3 The design should be considered with respect to structural details, which may be susceptible to buckling or cracking as a result of vibration, high stress levels or fatigue.

3.1.4 Corrosion is related to the ageing process, and is closely connected with the quality of corrosion prevention systems fitted at new building, and subsequent maintenance during the service life. Corrosion may also lead to cracking and/or buckling.

3.2 Methods

3.2.1 Design details

3.2.1.1 Damage experience related to the ship in question and sister and/or similar ships, where available, is the main source of information to be used in the process of planning. In addition, a selection of structural details from the design drawings should be included.

3.2.1.2 Typical damage experience to be considered will consist of:

- .1 number, extent, location and frequency of cracks; and
- .2 location of buckles.

3.2.1.3 This information may be found in the survey reports and/or the owner's files, including the results of the owner's own inspections. The defects should be analysed, noted and marked on sketches.

3.2.1.4 In addition, general experience should be utilized. Also, reference should be made to reference 2, which contains a catalogue of typical damages and proposed repair methods for various structural details on single-skin bulk carriers. Reference should also be made to

reference 3, which contains catalogues of typical damages and proposed repair methods for double-hull oil tanker structural details which may to some extent be similar to structural details in double-side skin bulk carriers. Such figures should be used together with a review of the main drawings, in order to compare with the actual structure and search for similar details that may be susceptible to damage. In particular, chapter 3 of reference 3 deals with various aspects specific to double-hull tankers, such as stress concentration locations, misalignment during construction, corrosion trends, fatigue considerations and areas requiring special attention, while chapter 4 of reference 3 addresses experience gained on structural defects in double-hulls (chemical tankers, OBO carriers, ore/oil carriers, gas carriers), which should also be considered in working out the survey planning.

3.2.1.5 The review of the main structural drawings, in addition to using the above-mentioned figures, should include checking for typical design details where cracking has been experienced. The factors contributing to damage should be carefully considered.

3.2.1.6 The use of high-tensile steel (HTS) is an important factor. Details showing good service experience where ordinary, mild steel has been used may be more susceptible to damage when HTS, and its higher associated stresses, are utilized. There is extensive and, in general, good experience, with the use of HTS for longitudinal material in deck and bottom structures. Experience in other locations, where the dynamic stresses may be higher, is less favourable, e.g. side structures.

3.2.1.7 In this respect, stress calculations of typical and important components and details, in accordance with relevant methods, may prove useful and should be considered.

3.2.1.8 The selected areas of the structure identified during this process should be recorded and marked on the structural drawings to be included in the survey programme.

3.2.2 *Corrosion*

3.2.2.1 In order to evaluate relative corrosion risks, the following information should generally be considered:

- .1 usage of tanks, holds and spaces;
- .2 condition of coatings;
- .3 cleaning procedures;
- .4 previous corrosion damage;
- .5 ballast use and time for cargo holds;
- .6 risk of corrosion in cargo holds and ballast tanks; and
- .7 location of ballast tanks adjacent to heated fuel oil tanks.

3.2.2.2 Reference 4 gives definitive examples which can be used for judging and describing coating condition, using typical pictures of conditions.

3.2.2.3 The evaluation of corrosion risks should be based on information in both reference 2 and reference 4, as far as applicable to double-side skin construction, together with relevant information on the anticipated condition of the ship as derived from the information collected in order to prepare the survey programme and the age of the ship. The various holds, tanks and spaces should be listed with the corrosion risks nominated accordingly.

3.2.3 *Locations for close-up survey and thickness measurement*

3.2.3.1 On the basis of the table of corrosion risks and the evaluation of design experience, the locations for initial close-up survey and thickness measurement (areas and sections) may be nominated.

3.2.3.2 The sections subject to thickness measurement should normally be nominated in tanks, holds and spaces where corrosion risk is judged to be the highest.

3.2.3.3 The nomination of tanks, holds and spaces for close-up survey should initially be based on highest corrosion risk, and should always include ballast tanks. The principle for the selection should be that the extent is increased by age or where information is insufficient or unreliable.

References

- 1 IACS, Unified Requirement Z10.5, Hull Surveys of Double Skin Bulk Carriers
- 2 IACS, Bulk Carriers: Guidelines for Surveys, Assessment and Repair of Hull Structures, January 2007
- 3 TSCF, Guidelines for the Inspection and Maintenance of Double Hull Tanker Structures, 1995
- 4 TSCF, Guidance Manual for Tanker Structures, 1997

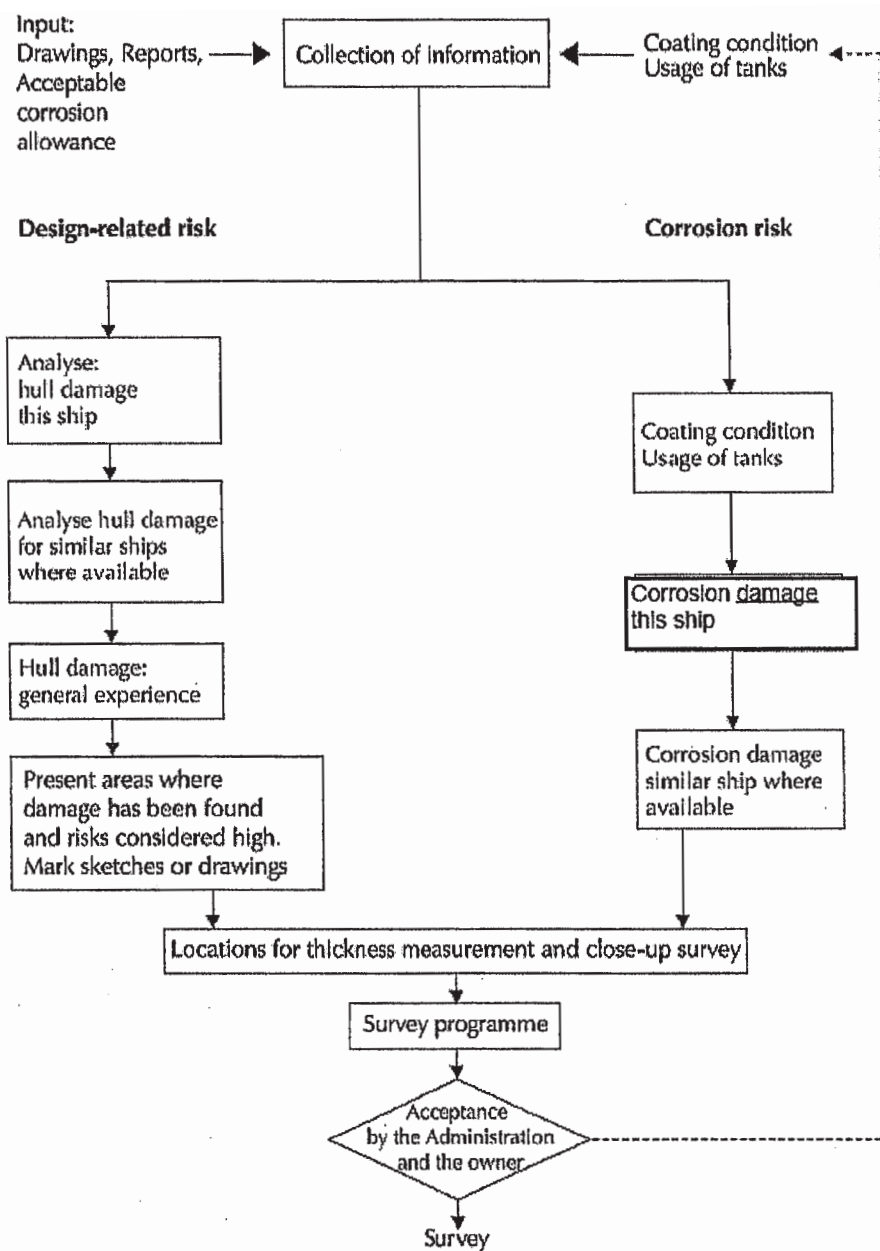


Figure 1 – Technical assessment and the survey planning process

ANNEX 10

**REQUIREMENTS FOR EXTENT OF THICKNESS MEASUREMENTS AT THOSE AREAS
OF SUBSTANTIAL CORROSION OF BULK CARRIERS WITH DOUBLE-SIDE SKIN
CONSTRUCTION WITHIN THE CARGO LENGTH AREA**

Table 1 – Bottom, inner bottom and hopper structure

Structural member	Extent of measurement	Pattern of measurement
Bottom, inner bottom and hopper structure plating	Minimum of three bays across double-bottom tank, including aft bay Measurements around and under all suction bell mouths	Five-point pattern for each panel between longitudinals and floors
Bottom, inner bottom and hopper structure longitudinals	Minimum of three longitudinals in each bay where bottom plating measured	Three measurements in line across flange and three measurements on the vertical web
Bottom girders, including the watertight ones	At fore and aft watertight floors and in centre of tanks	Vertical line of single measurements on girder plating with one measurement between each panel stiffener, or a minimum of three measurements
Bottom floors, including the watertight ones	Three floors in the bays where bottom plating measured, with measurements at both ends and middle	Five-point pattern over 2 m ² area
Hopper structure web frame ring	Three floors in bays where bottom plating measured	Five-point pattern over 1 m ² of plating Single measurements on flange
Hopper structure transverse watertight bulkhead or swash bulkhead	– lower ½ of bulkhead	five-point pattern over 1 m ² of plating
	– upper ½ of bulkhead	five-point pattern over 2 m ² of plating
	– stiffeners (minimum of three)	For web, five-point pattern over span (two measurements across web at each end and one at centre of span). For flange, single measurements at each end and centre of span
Panel stiffening	Where applicable	Single measurements

Table 2 – Deck structure including cross strips, main cargo hatchways, hatch covers, coamings and topside tanks

Structural member	Extent of measurement	Pattern of measurement
Cross deck strip plating	Suspect cross deck strip plating	Five-point pattern between under deck stiffeners over 1 m length
Under deck stiffeners	Transverse members Longitudinal member	Five-point pattern at each end and mid span Five-point pattern on both web and flange
Hatch covers	Side and end skirts, each three locations Three longitudinal bands, outboard strakes (2) and centerline strake (1)	Five-point pattern at each location Five-point measurement each band
Hatch coamings	Each side and end of coaming, one band lower ¼, one band upper ¾ of coaming	Five-point measurement each band, i.e. end or side coaming
Topside ballast tanks	a) watertight transverse bulkheads: – Lower ¼ of bulkhead – Upper ¾ of bulkhead – Stiffeners	Five-point pattern over 1 m ² of plating Five-point pattern over 1 m ² of plating Five-point pattern over 1 m length
Topside ballast tanks	b) two representative swash transverse bulkheads: – Lower ¼ of bulkhead – Upper ¾ of bulkhead – Stiffeners	Five-point pattern over 1 m ² of plating Five-point pattern over 1 m ² of plating Five-point pattern over 1 m length
Topside ballast tanks	c) three representative bays of slope plating: – Lower ¼ of tank – Upper ¾ of tank	Five-point pattern over 1 m ² of plating Five point pattern over 1 m ² of plating

Structural member	Extent of measurement	Pattern of measurement
Topside ballast tanks	d) Longitudinals, suspect and adjacent	Five point pattern on both web and flange over 1 m length
Main deck plating	Suspect plates and adjacent (4)	Five-point pattern over 1 m ² of plating
Main deck longitudinals	Suspect plates	Five point pattern on both web and flange over 1 m length
Web frames/transverses	Suspect plates	Five-point pattern over 1 m ² of plating

Table 3 – Structure in double-side spaces of double-side skin bulk carriers including wing void spaces of ore carriers

Structural member	Extent of measurement	Pattern of measurement
Side shell and inner plating: – Upper strake and strakes in way of horizontal girders – All other strakes	– Plating between each pair of transverse frames/longitudinals in a minimum of three bays (along the tank) – Plating between every third pair of longitudinals in same three bays	– Single measurement – Single measurement
Side shell and inner side transverse frames/ longitudinals on: – upper strake – all other strakes	– Each transverse frame/ longitudinal in same three bays – Every third transverse frame/longitudinal in same three bays	– Three measurements across web and one measurement on flange – Three measurements across web and one measurement on flange
Transverse frames/ longitudinals: – brackets	Minimum of three at top, middle and bottom of tank in same three bays	Five-point pattern over area of bracket
Vertical web and transverse bulkheads: – strakes in a way of horizontal girders – other strakes	– Minimum of two webs and both transverse bulkheads – Minimum of two webs and both transverse bulkheads	– Five-point pattern over approximately 2 m ² area – Two measurements between each pair of vertical stiffeners
Horizontal girders	Plating on each girder in a minimum of three bays	Two measurements between each pair of longitudinal girder stiffeners
Panel stiffening	Where applicable	Single measurements

Table 4 – Transverse bulkheads in cargo holds

Structural member	Extent of measurement	Pattern of measurement
Lower stool, where fitted	– Transverse band within 25 mm of welded connection to inner bottom – Transverse bands within 25 mm of welded connection to shelf plate	– Five-point pattern between stiffeners over 1 m length – Five-point pattern between stiffeners over 1 m length
Transverse bulkheads	– Transverse band at approximately mid height – Transverse band at part of bulkhead adjacent to upper deck or below upper stool shelf plate (for those ships fitted with upper stools)	– Five-point pattern over 1 m ² of plating – Five-point pattern over 1 m ² of plating

ANNEX 11

STRENGTH OF CARGO HATCH COVER SECURING ARRANGEMENTS
FOR BULK CARRIERS

1 Securing devices

The strength of securing devices should comply with the following requirements:

- .1 Panel hatch covers should be secured by appropriate devices (bolts, wedges or similar) suitably spaced alongside the coamings and between cover elements. Arrangement and spacing should be determined with due attention to the effectiveness for weathertightness, depending upon the type and the size of the hatch cover, as well as on the stiffness of the cover edges between the securing devices.

- .2 The net sectional area of each securing device should not be less than:

$$A = 1.4 a/f \text{ (cm}^2\text{)}$$

where:

- a = spacing between securing devices not to be taken less than 2 m
- f = $(\sigma_Y / 235)^e$
- σ_Y = specified minimum upper yield stress in N/mm² of the steel used for fabrication, not to be taken greater than 70% of the ultimate tensile strength
- e = 0.75 for $\sigma_Y > 235$
= 1.0 for $\sigma_Y \leq 235$

Rods or bolts should have a net diameter not less than 19 mm for hatchways exceeding 5 m² in area.

- .3 Between cover and coaming and at cross-joints, a packing line pressure sufficient to obtain weathertightness should be maintained by the securing devices. For packing line pressures exceeding 5 N/mm, the cross section area should be increased in direct proportion. The packing line pressure should be specified.

- .4 The cover edge stiffness should be sufficient to maintain adequate sealing pressure between securing devices. The moment of inertia, I , of edge elements should not be less than:

$$I = 6 p a^4 \text{ (cm}^4\text{)}$$

where:

- p = packing line pressure in N/mm, minimum 5 N/mm
- a = spacing in metres of securing devices.

- .5 Securing devices should be of reliable construction and securely attached to the hatchway coamings, decks or covers. Individual securing devices on each cover should have approximately the same stiffness characteristics.

- .6 Where rod cleats are fitted, resilient washers or cushions should be incorporated.
- .7 Where hydraulic cleating is adopted, a positive means should be provided to ensure that it remains mechanically locked in the closed position in the event of failure of the hydraulic system.

2 Stoppers

- 2.1 Nos. 1 and 2 hatch covers should be effectively secured, by means of stoppers, against the transverse forces arising from a pressure of 175 kN/m².
- 2.2 No.2 hatch covers should be effectively secured, by means of stoppers, against the longitudinal forces acting on the forward end arising from a pressure of 175 kN/m².
- 2.3 No.1 hatch cover should be effectively secured, by means of stoppers, against the longitudinal forces acting on the forward end arising from a pressure of 230 kN/m². This pressure may be reduced to 175 kN/m² if a forecastle is fitted.
- 2.4 The equivalent stress in stoppers and their supporting structures and calculated in the throat of the stopper welds is not to exceed the allowable value of 0.8 σ_y .

3 Materials and welding

Where stoppers or securing devices are fitted to comply with this annex, they should be manufactured of materials, including welding electrodes, to the satisfaction of the Administration.

ANNEX 12

PROCEDURAL REQUIREMENTS FOR THICKNESS MEASUREMENTS

1 General

Thickness measurements required in the context of hull structural surveys, if not carried out by the society itself should be witnessed by a surveyor. The attendance of the surveyor should be recorded. This also applies to thickness measurements taken during voyages.

2 Survey meeting

2.1 Prior to commencement of the renewal or intermediate survey, a meeting should be held between the attending surveyor(s), the owner's representative(s) in attendance and the thickness measurement firm's representative(s) so as to ensure the safe and efficient execution of the surveys and thickness measurements to be carried out on board.

2.2 Communication with the thickness measurement operator(s) and owner's representative(s) should be agreed during the meeting, with respect to the following:

- .1 reporting of thickness measurements on a regular basis;
- .2 prompt notification to the surveyor in case of findings such as:
 - .1 excessive and/or extensive corrosion or pitting/grooving of any significance;
 - .2 structural defects like buckling, fractures and deformed structures;
 - .3 detached and/or holed structure; and
 - .4 corrosion of welds.

2.3 The survey report should indicate where and when the meeting took place and who attended (the name of the surveyor(s), the owner's representative(s) and the thickness measurement firm's representative(s)).

3 Monitoring of the thickness measurement process on board

3.1 The surveyor should decide final extent and location of thickness measurements after overall survey of representative spaces on board.

3.2 In case the owner prefers to commence the thickness measurements prior to the overall survey, then the surveyor should advise that the planned extent and locations of thickness measurements are subject to confirmation during the overall survey. Based on findings, the surveyor may require additional thickness measurements to be taken.

3.3 The surveyor should direct the gauging operation by selecting locations such that readings taken represent, on average, the condition of the structure for that area.

3.4 Thickness measurements taken mainly to evaluate the extent of corrosion, which may affect the hull girder strength, should be carried out in a systematic manner such that all longitudinal structural members are gauged, as required.

3.5 Where thickness measurements indicate substantial corrosion or wastage in excess of allowable diminution, the surveyor should direct locations for additional thickness measurements in order to delineate areas of substantial corrosion and to identify structural members for repairs/renewals.

3.6 Thickness measurements of structures in areas where close-up surveys are required should be carried out simultaneously with close-up survey.

4 Review and verification

4.1 Upon completion of the thickness measurements, the surveyor should confirm that no further gaugings are needed, or specify additional gaugings.

4.2 Where these guidelines allow the extent of thickness measurements to be reduced after special considerations by the surveyor, these special considerations should be reported, where appropriate.

4.3 In case thickness measurements are partly carried out, the extent of remaining thickness measurements should be reported for the use of the next surveyor.

ANNEX B

CODE ON THE ENHANCED PROGRAMME OF INSPECTIONS
DURING SURVEYS OF OIL TANKERS

Part A

CODE ON THE ENHANCED PROGRAMME OF INSPECTIONS
DURING SURVEYS OF DOUBLE-HULL OIL TANKERS**1 General****1.1 Application.**

1.1.1 The Code should apply to all self-propelled double-hull oil tankers of 500 gross tonnage and above.

1.1.2 The Code should apply to surveys of hull structure and piping systems in way of cargo tanks, pump-rooms, cofferdams, pipe tunnels, void spaces within the cargo area and all ballast tanks.

1.1.3 The Code contains the minimum extent of examination, thickness measurements and tank testing. The survey should be extended when substantial corrosion and/or structural defects are found and include additional close-up survey when necessary.

1.1.4 The surveys should be carried out during the surveys prescribed by regulation I/10 of the Convention.

1.2 Definitions

1.2.1 *Double-hull oil tanker* is a ship which is constructed primarily for the carriage of oil in bulk, which has the cargo tanks protected by a double-hull which extends for the entire length of the cargo area, consisting of double sides and double-bottom spaces for the carriage of water ballast or void spaces.

1.2.2 *Ballast tank* is a tank which is used solely for the carriage of salt water ballast.

1.2.3 *Combined cargo/ballast tank*, if referred to within the Code, is a tank which is used for the carriage of cargo or ballast water as a routine part of the vessel's operation and will be treated as a Ballast Tank. Cargo tanks in which water ballast might be carried only in exceptional cases per MARPOL regulation I/18.3 are to be treated as cargo tanks.

1.2.4 *Overall survey* is a survey intended to report on the overall condition of the hull structure and determine the extent of additional close-up surveys.

1.2.5 *Close-up survey* is a survey where the details of structural components are within the close visual inspection range of the surveyor, i.e. normally within reach of hand.

1.2.6 *Transverse section* is the cross section of the hull perpendicular to the ship's centerline and includes all longitudinal members such as plating, longitudinals and girders at the deck, sides, bottom, inner bottom and longitudinal bulkheads.

1.2.7 *Representative tanks* are those which are expected to reflect the condition of other tanks of similar type and service and with similar corrosion prevention systems. When selecting representative tanks, account should be taken of the service and repair history on board and identifiable critical and/or suspect areas.

1.2.8 *Suspect areas* are locations showing substantial corrosion and/or are considered by the surveyor to be prone to rapid wastage.

1.2.9 *Substantial corrosion* is an extent of corrosion such that assessment of corrosion pattern indicates a wastage in excess of 75% of allowable margins, but within acceptable limits. For ships built under the IACS Common Structural Rules, substantial corrosion is an extent of corrosion such that the assessment of the corrosion pattern indicates a gauged (or measured) thickness between $t_{net} + 0.5\text{mm}$ and t_{net} .

1.2.10 *Corrosion prevention system* is normally considered a full hard coating. Hard protective coating should usually be epoxy coating or equivalent. Other coating systems, which are neither soft nor semi-hard coatings, may be considered acceptable as alternatives provided that they are applied and maintained in compliance with the manufacturer's specification.

1.2.11 *Coating condition* is defined as follows:

GOOD condition with only minor spot rusting;

FAIR condition with local breakdown of coating at edges of stiffeners and weld connections and/or light rusting over 20% or more of areas under consideration, but less than as defined for POOR condition; and

POOR condition with general breakdown of coating over 20% or more of areas or hard scale at 10% or more of areas under consideration.

1.2.12 *Critical structural areas* are locations which have been identified from calculations to require monitoring or from the service history of the subject ship or from similar or sister ships to be sensitive to cracking, buckling or corrosion which would impair the structural integrity of the ship.

1.2.13 *Cargo area* is that part of the ship which contains cargo tanks, slop tanks and cargo/ballast pump-rooms, cofferdams, ballast tanks and 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.

1.2.14 *Intermediate survey* is a survey carried out either at the second or the third annual survey.

1.2.15 *Prompt and thorough repair* is a permanent repair completed at the time of survey to the satisfaction of the surveyor, therein removing the need for the imposition of any associated condition of classification or recommendation.

1.2.16 *Specially considered* (in connection with close-up surveys and thickness measurements) means sufficient close-up inspection and thickness measurements are taken to confirm the actual average condition of the structure under coating.

1.3 Repairs

1.3.1 Any damage in association with wastage over the allowable limits (including buckling, grooving, detachment or fracture), or extensive areas of wastage over the allowable limits, which affects or, in the opinion of the Administration, will affect the ship's structural, watertight or weathertight integrity, should be promptly and thoroughly (see 1.2.15) repaired. Areas to be considered include:

- .1 bottom structure and bottom plating;
- .2 side structure and side plating;
- .3 deck structure and deck plating;
- .4 watertight or oiltight bulkheads; and
- .5 hatch covers and hatch coamings, where fitted.

For locations where adequate repair facilities are not available, the Administration may allow the ship to proceed directly to a repair facility. This may require discharging the cargo and/or temporary repairs for the intended voyage.

1.3.2 Additionally, when a survey results in the identification of corrosion or structural defects, either of which, in the opinion of the Administration, will impair the ship's fitness for continued service, remedial measures should be implemented before the ship continues in service.

1.4 Surveyors

For tankers of 20,000 tons deadweight and above, two surveyors should jointly carry out the first scheduled renewal survey after the tanker passes 10 years of age (i.e. third renewal survey), and all subsequent renewal surveys and intermediate surveys. If the surveys are carried out by a recognized organization, the surveyors should be exclusively employed by such recognized organizations.

1.5 Thickness measurements and close-up surveys

In any kind of survey, i.e. renewal, intermediate, annual or other surveys having the scope of the foregoing ones, thickness measurements of structures in areas where close-up surveys are required should be carried out simultaneously with close-up surveys.

2 Renewal survey

2.1 General

2.1.1 The renewal survey may be commenced at the fourth annual survey and be progressed during the succeeding year with a view to completion by the fifth anniversary date.

2.1.2 As part of the preparation for the renewal survey the survey programme should be dealt with in advance of the renewal survey. The thickness measurement should not be carried out before the fourth annual survey.

2.1.3 The survey should include, in addition to the requirements of the annual survey, examination, tests and checks of sufficient extent to ensure that the hull and related piping as required in 2.1.5 is in a satisfactory condition and is fit for its intended purpose for the new period of validity of the Cargo Ship Safety Construction Certificate, subject to proper maintenance and operation and to periodical surveys being carried out at the due dates.

2.1.4 All cargo tanks, ballast tanks, and any other tanks in double-hull spaces, pump-rooms, pipe tunnels, cofferdams and void spaces bounding cargo tanks, decks and outer hull should be examined, and this examination should be supplemented by thickness measurement and testing as required in 2.5 and 2.6, to ensure that the structural integrity remains effective. The aim of the examination is to discover substantial corrosion, significant deformation, fractures, damages or other structural deterioration that may be present.

2.1.5 Cargo piping on deck, including crude oil washing (COW) piping, and cargo and ballast piping within the above tanks and spaces should be examined and operationally tested to working pressure to attending surveyor's satisfaction to ensure that tightness and condition remain satisfactory. Special attention should be given to any ballast piping in cargo tanks and any cargo piping in ballast tanks and void spaces, and surveyors should be advised on all occasions when this piping, including valves and fittings, are open during repair periods and can be examined internally.

2.2 *Dry-dock survey*

2.2.1 A survey in dry-dock should be a part of the renewal survey. There should be a minimum of two inspections of the outside of the ship's bottom during the five-year period of the Safety Construction Certificate. In all cases, the maximum interval between bottom inspections should not exceed 36 months.

2.2.2 For ships of 15 years of age and over, inspection of the outside of the ship's bottom should be carried out with the ship in dry-dock. For ships of less than 15 years of age, alternate inspections of the ship's bottom not conducted in conjunction with the renewal survey may be carried out with the ship afloat. Inspection of the ship afloat should only be carried out when the conditions are satisfactory and the proper equipment and suitably qualified staff is available.

2.2.3 If a survey in dry-dock is not completed in conjunction with the renewal survey or if the 36 month maximum interval referred to in 2.2.1 is not complied with, the Cargo Ship Safety Construction Certificate should cease to be valid until a survey in dry-dock is completed.

2.2.4 The overall and close-up surveys and thickness measurements, as applicable, of the lower portions of the cargo tanks and ballast tanks should be carried out in accordance with the applicable requirements for renewal surveys, if not already performed.

Note: Lower portions of the cargo and ballast tanks are considered to be the parts below light ballast water line.

2.3 *Tank corrosion prevention system*

Where provided, the condition of the corrosion prevention system of cargo tanks should be examined. A ballast tank should be examined at subsequent annual intervals where:

- .1 a hard protective coating has not been applied from the time of construction; or
- .2 a soft or semi-hard coating has been applied; or
- .3 substantial corrosion is found within the tank; or

- .4 the hard protective coating is found to be in less than GOOD condition and the hard protective coating is not repaired to the satisfaction of the surveyor.

Thickness measurement should be carried out as deemed necessary by the surveyor.

2.4 *Extent of overall and close-up surveys*

2.4.1 An overall survey of all tanks and spaces should be carried out at the renewal survey. Suspect areas identified at previous surveys should be examined.

2.4.2 The minimum requirements for close-up surveys at the renewal survey are given in annex 1.

2.4.3 The surveyor may extend the scope of the close-up survey as deemed necessary taking into account the maintenance of the tanks under survey, the condition of the corrosion prevention system and also in the following cases:

- .1 in particular, tanks having structural arrangements or details which have suffered defects in similar tanks or on similar ships according to available information; and
- .2 in tanks which have structures with reduced scantlings in association with a corrosion prevention system approved by the Administration.

2.4.4 For areas in tanks where hard protective coatings are found to be in GOOD condition as defined in 1.2.11, the extent of close-up surveys according to annex 1 may be specially considered by the Administration.

2.5 *Extent of thickness measurements*

2.5.1 The minimum requirements for thickness measurements at the renewal survey are given in annex 2.

2.5.2 Provisions for extended measurements for areas with substantial corrosion are given in annex 4, and may be additionally specified in the survey programme as required in 5.1. These extended thickness measurements should be carried out before the survey is credited as completed. Suspect areas identified at previous surveys should have thickness measurements taken.

2.5.3 The surveyor may further extend the thickness measurements as deemed necessary.

2.5.4 For areas in tanks where hard protective coatings are found to be in GOOD condition as defined in 1.2.11, the extent of thickness measurements according to annex 2 may be specially considered by the Administration.

2.5.5 Transverse sections should be chosen where the largest reductions are suspected to occur or are revealed from deck plating measurements.

2.5.6 In cases where two or three sections are to be measured, at least one should include a ballast tank within 0.5L amidships. In case of oil tankers of 130 m in length and upwards (as defined in the International Convention on Load Lines in force) and more than 10 years of age, for the evaluation of the ship's longitudinal strength as required in 8.2, the sampling method of thickness measurements is given in annex 12.

2.6 *Extent of tank pressure testing*

2.6.1 The minimum requirements for tank pressure testing at the renewal survey are given in annex 3.

2.6.2 The surveyor may extend the tank pressure testing as deemed necessary.

2.6.3 Boundaries of ballast tanks should be tested with a head of liquid to the top of air pipes.

2.6.4 Boundaries of cargo tanks should be tested to the highest point that liquid will rise under service conditions.

2.6.5 The testing of double-bottom tanks and other spaces not designed for the carriage of liquid may be omitted, provided a satisfactory internal examination together with an examination of the tanktop is carried out.

3 **Annual survey**

3.1 *General*

The annual survey should consist of an examination for the purpose of ensuring, as far as practicable, that the hull and piping are maintained in a satisfactory condition and should take into account the service history, condition and extent of the corrosion prevention system of ballast tanks and areas identified in the survey report file.

3.2 *Examination of the hull*

3.2.1 Examination of the hull plating and its closing appliances should be carried out as far as can be seen.

3.2.2 Examination of watertight penetrations should be carried out as far as practicable.

3.3 *Examination of weather decks*

3.3.1 Examination of cargo tank openings including gaskets, covers, coamings and flame screens.

3.3.2 Examination of cargo tank pressure/vacuum valves and flame screens.

3.3.3 Examination of flame screens on vents to all bunker tanks.

3.3.4 Examination of cargo, crude oil washing, bunker and vent piping systems, including vent masts and headers.

3.4 *Examination of cargo pump-rooms and pipe tunnels if fitted*

3.4.1 Examination of all pump-room bulkheads for signs of oil leakage or fractures and, in particular, the sealing arrangements of all penetrations of pump-room bulkheads.

3.4.2 Examination of the condition of all piping systems and pipe tunnels.

3.5 *Examination of ballast tanks*

3.5.1 Examination of ballast tanks should be carried out when required as a consequence of the results of the renewal survey and intermediate survey. When considered necessary by the Administration or when extensive corrosion is found, thickness measurements should be carried out.

3.5.2 Where substantial corrosion as defined in 1.2.9 is found, the extent of thickness measurements should be increased in accordance with the requirements in annex 4. These extended thickness measurements should be carried out before the survey is credited as completed. Suspect areas identified at previous surveys should be examined. Areas of substantial corrosion identified at previous surveys should have thickness measurements taken.

4 *Intermediate survey*

4.1 *General*

4.1.1 Items that are additional to the requirements of the annual survey may be surveyed either at the second or third annual survey or between these surveys.

4.1.2 The survey extent of cargo and ballast tanks dependent on the age of the ship is specified in 4.2, 4.3 and 4.4.

4.1.3 For weather decks, an examination as far as applicable of cargo, crude oil washing, bunker, ballast, steam and vent piping systems as well as vent masts and headers should be carried out. If upon examination there is any doubt as to the condition of the piping, the piping may be required to be pressure tested, thickness measured or both.

4.1.4 Concurrent crediting to both intermediate survey and renewal survey for surveys and thickness measurements of spaces should not be acceptable.

4.2 *Oil tankers 5 to 10 years of age*

4.2.1 The requirements of 4.1.3 apply.

4.2.2.1 For tanks used for salt-water ballast, an overall survey of representative tanks selected by the surveyor should be carried out. If the overall survey of salt water ballast tanks reveals no visible structural defects, the examination may be limited to verification that the protective coatings remain in GOOD condition.

4.2.3 A ballast tank should be examined at subsequent annual intervals where:

- .1 a hard protective coating has not been applied from the time of construction;
or
- .2 a soft or semi-hard coating has been applied; or
- .3 substantial corrosion is found within the tank; or
- .4 the hard protective coating is found to be in less than GOOD condition and the hard protective coating is not repaired to the satisfaction of the surveyor.

4.3 *Oil tankers 10 to 15 years of age*

4.3.1 The requirements of the intermediate survey should be to the same extent as the previous renewal survey as required in 2 and 5.1. However, pressure testing of cargo and ballast tanks and the requirements for longitudinal strength evaluation of hull girder as required in 8.1.2 are not required unless deemed necessary by the Administration.

4.3.2 In application of 4.3.1, the intermediate survey may be commenced at the second annual survey and be progressed during the succeeding year with a view to completion at the third annual survey in lieu of application of 2.1.1.

4.3.3 In application of 4.3.1., an underwater survey may be considered in lieu of the requirements of 2.2.

4.4 *Oil tankers exceeding 15 years of age*

4.4.1 The requirements of the intermediate survey should be to the same extent as the previous renewal survey as required in 2 and 5.1. However, pressure testing of cargo and ballast tanks and the requirements for longitudinal strength evaluation of hull girder as required in 8.1.2 are not required unless deemed necessary by the Administration.

4.4.2 In application of 4.4.1, the intermediate survey may be commenced at the second annual survey and be progressed during the succeeding year with a view to completion at the third annual survey in lieu of the application of 2.1.1.

4.4.3 In application of 4.4.1, a survey in dry-dock should be part of the intermediate survey. The overall and close-up surveys and thickness measurements, as applicable, of the lower portions of the cargo tanks and water ballast tanks should be carried out in accordance with the applicable requirements for intermediate surveys, if not already carried out.

Note: Lower portions of the cargo and ballast tanks are considered to be the parts below light ballast water line.

5 **Preparations for survey**

5.1 *Survey programme*

5.1.1 The owner in cooperation with the Administration or organization recognized by the Administration should work out a specific survey programme prior to the commencement of any part of:

- .1 the renewal survey; and
- .2 the intermediate survey for oil tanker over 10 years of age.

The survey programme at intermediate survey may consist of the survey programme at the previous renewal survey supplemented by the condition evaluation report of that renewal survey and later relevant survey reports. The survey programme should be worked out taking into account any amendments to the survey requirements implemented after the last renewal survey carried out. The survey programme should be in a written format based on the information in annex 6A. The survey should not commence until the survey programme has been agreed.

5.1.1.1 Prior to the development of the survey programme, the survey planning questionnaire should be completed by the owner, based on the information set out in annex 6B, and forwarded to the Administration.

5.1.2 In developing the survey programme, the following documentation should be collected and consulted with a view to selecting tanks, areas, and structural elements to be examined:

- .1 survey status and basic ship information;
- .2 documentation on board, as described in 6.2 and 6.3;
- .3 main structural plans of cargo and ballast tanks (scantlings drawings), including information regarding use of high-tensile steels (HTS);
- .4 Condition Evaluation Report, according to annex 9;
- .5 relevant previous damage and repair history;
- .6 relevant previous survey and inspection reports from both the recognized organization and the owner;
- .7 cargo and ballast history for the last three years, including carriage of cargo under heated conditions;
- .8 details of the inert gas plant and tank cleaning procedures;
- .9 Information and other relevant data regarding conversion or modification of the ship's cargo and ballast tanks since the time of construction;
- .10 description and history of the coating and corrosion protection system (including anodes and previous class notations), if any;
- .11 inspections of the owner's personnel during the last three years with reference to structural deterioration in general, leakages in tank boundaries and piping and condition of the coating and corrosion protection system (including anodes) if any. Guidance for reporting is shown in annex 5;
- .12 information regarding the relevant maintenance level during operation including port State control reports of inspection containing hull related deficiencies, safety management system non-conformities relating to hull maintenance, including the associated corrective action(s); and
- .13 any other information that will help identify suspect areas and critical structural areas.

5.1.3 The submitted survey programme should account for and comply, as a minimum, with the requirements of 2.6 and annexes 1, 2 and 3 for close-up survey, thickness measurement and tank testing, respectively, and should include relevant information including at least:

- .1 basic ship information and particulars;
- .2 main structural plans of cargo and ballast tanks (scantling drawings), including information regarding use of high tensile steels (HTS);
- .3 plan of tanks;
- .4 list of tanks with information on their use, corrosion prevention system and condition of coating;

- .5 conditions for survey (e.g. information regarding tank cleaning, gas freeing, ventilation, lighting, etc.);
- .6 provisions and methods for access to structures;
- .7 equipment for surveys;
- .8 identification of tanks and areas for close-up survey (see 2.4);
- .9 identification of areas and sections for thickness measurement (see 2.5);
- .10 identification of tanks for tank testing (see 2.6);
- .11 identification of the thickness measurement company;
- .12 damage experience related to the ship in question; and
- .13 critical structural areas and suspect areas, where relevant.

5.1.4 The Administration will advise the owner of the maximum acceptable structural corrosion diminution levels applicable to the ship.

5.1.5 Use may also be made of the Guidelines for technical assessment in conjunction with the planning of enhanced surveys for tankers, contained in annex 11. These Guidelines are a recommended tool which may be invoked at the discretion of the Administration, when considered necessary and appropriate, in conjunction with the preparation of the required survey programme.

5.2 *Conditions for survey*

5.2.1 The owner should provide the necessary facilities for a safe execution of the survey.

5.2.1.1 In order to enable the attending surveyors to carry out the survey, provisions for proper and safe access should be agreed between the owner and the Administration.

5.2.1.2 Details of the means of access should be provided in the survey planning questionnaire.

5.2.1.3 In cases where the provisions of safety and required access are judged by the attending surveyors not to be adequate, the survey of the spaces involved should not proceed.

5.2.2 Tanks and spaces should be safe for access. Tanks and spaces should be gas free and properly ventilated. Prior to entering a tank, void or enclosed space, it should be verified that the atmosphere in that space is free from hazardous gas and contains sufficient oxygen.

5.2.3 In preparation for survey and thickness measurements and to allow for a thorough examination, all spaces should be cleaned including removal from surfaces of all loose accumulated corrosion scale. Spaces should be sufficiently clean and free from water, scale, dirt, oil residues, etc., to reveal corrosion, deformation, fractures, damages or other structural deterioration as well as the condition of the coating. However, those areas of structure whose renewal has already been decided by the owner need only be cleaned and descaled to the extent necessary to determine the limits of the areas to be renewed.

5.2.4 Sufficient illumination should be provided to reveal corrosion, deformation, fractures, damages or other structural deterioration as well as the condition of the coating.

5.2.5 Where soft or semi-hard coatings have been applied, safe access should be provided for the surveyor to verify the effectiveness of the coating and to carry out an assessment of the conditions of internal structures which may include spot removal of the coating. When safe access cannot be provided, the soft or semi-hard coating should be removed.

5.2.6 The surveyor(s) should always be accompanied by at least one responsible person, assigned by the owner, experienced in tank and enclosed spaces inspection. In addition a backup team of at least two experienced persons should be stationed at the hatch opening of the tank or space that is being surveyed. The back-up team should continuously observe the work in the tank or space and should keep lifesaving and evacuation equipment ready for use.

5.2.7 A communication system should be arranged between the survey party in the tank or space being examined, the responsible officer on deck and, as the case may be, the navigation bridge. The communication arrangements should be maintained throughout the survey.

5.3 *Access to structures*

5.3.1 For overall surveys, means should be provided to enable the surveyor to examine the structure in a safe and practical way.

5.3.2 For close-up surveys, one or more of the following means for access, acceptable to the surveyor, should be provided:

- .1 permanent staging and passages through structures;
- .2 temporary staging and passages through structures;
- .3 lifts and moveable platforms;
- .4 boats or rafts;
- .5 portable ladders; and
- .6 other equivalent means.

5.4 *Equipment for survey*

5.4.1 Thickness measurement should normally be carried out by means of ultrasonic test equipment. The accuracy of the equipment should be proven to the surveyor as required.

5.4.2 One or more of the following fracture detection procedures may be required if deemed necessary by the surveyor:

- .1 radiographic equipment;
- .2 ultrasonic equipment;
- .3 magnetic particle equipment;
- .4 dye penetrant; and
- .5 other equivalent means.

5.4.3 Explosimeter, oxygen-meter, breathing apparatus, lifelines, riding belts with rope and hook and whistles together with instructions and guidance on their use should be made available during the survey. A safety checklist should be provided.

5.4.4 Adequate and safe lighting should be provided for the safe and efficient conduct of the survey.

5.4.5 Adequate protective clothing should be made available and used during the survey (e.g. safety helmet, gloves, safety shoes, etc.).

5.5 *Surveys at sea or at anchorage*

5.5.1 Surveys at sea or at anchorage may be accepted provided the surveyor(s) is given the necessary assistance from the personnel on board. Necessary precautions and procedures for carrying out the survey should be in accordance with 5.1, 5.2, 5.3 and 5.4.

5.5.2 A communication system should be arranged between the survey party in the tank and the responsible officer on deck. This system should also include the personnel in charge of ballast pump handling if boats or rafts are used.

5.5.3 Surveys of tanks by means of boats or rafts may only be undertaken with the agreement of the surveyor, who should take into account the safety arrangements provided, including weather forecasting and ship response under foreseeable conditions and provided the expected rise of water within the tank does not exceed 0.25 m.

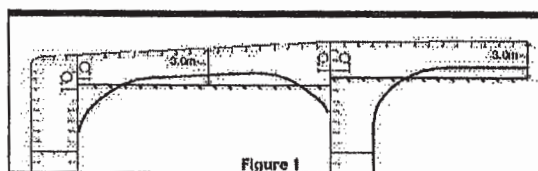
5.5.4 When rafts or boats are used for close-up surveys, the following conditions should be observed:

- .1 only rough duty, inflatable rafts or boats, having satisfactory residual buoyancy and stability even if one chamber is ruptured, should be used;
- .2 the boat or raft should be tethered to the access ladder and an additional person should be stationed down the access ladder with a clear view of the boat or raft;
- .3 appropriate lifejackets should be available for all participants;
- .4 the surface of water in the tank should be calm (under all foreseeable conditions the expected rise of water within the tank should not exceed 0.25 m) and the water level stationary. On no account should the level of the water be rising while the boat or raft is in use;
- .5 the tank or space must contain clean ballast water only. Even a thin sheen of oil on the water is not acceptable;
- .6 at no time should the water level be allowed to be within 1 m of the deepest under-deck web face flat so that the survey team is not isolated from a direct escape route to the tank hatch. Filling to levels above the deck transverses should only be contemplated if a deck access manhole is fitted and open in the bay being examined, so that an escape route for the survey party is available at all times. Other effective means of escape to the deck may be considered; and
- .7 if the tanks (or spaces) are connected by a common venting system, or inert gas system, the tank in which the boat or raft should be used should be isolated to prevent a transfer of gas from other tanks (or spaces).

5.5.5 Rafts or boats alone may be allowed for inspection of the under deck areas of tanks or spaces if the depth of the webs is 1.5 m or less.

5.5.6 If the depth of the webs is more than 1.5 m, rafts or boats alone may be allowed only:

- .1 when the coating of the under-deck structure is in GOOD condition and there is no evidence of wastage; or
- .2 if a permanent means of access is provided in each bay to allow safe entry and exit. This means:
 - .1 access direct from the deck via a vertical ladder with a small platform fitted approximately 2 m below the deck in each bay; or
 - .2 access to deck from a longitudinal permanent platform having ladders to deck in each end of the tank. The platform should, for the full length of the tank, be arranged in level with, or above, the maximum water level needed for rafting of under deck structure. For this purpose, the ullage corresponding to the maximum water level should be assumed not more than 3 m from the deck plate measured at the midspan of deck transverse and in the middle length of the tank (see figure 1).



If neither of the above conditions are met, then staging or other equivalent means should be provided for the survey of the under-deck areas.

5.5.7 The use of rafts or boats alone in 5.5.5 and 5.5.6 does not preclude the use of boats or rafts to move about within a tank during a survey.

5.6 Survey planning meeting

5.6.1 Proper preparation and close cooperation between the attending surveyor(s) and the owner's representatives on board prior to and during the survey are an essential part in the safe and efficient conduct of the survey. During the survey on board safety meetings should be held regularly.

5.6.2 Prior to commencement of any part of the renewal and intermediate survey, a survey planning meeting should be held between the attending surveyor(s), the owner's representative in attendance, the thickness measurement company operator (as applicable) and the master of the ship or an appropriately qualified representative nominated by the master or company for the purpose of ascertaining that all the arrangements envisaged in the survey programme are in place, so as to ensure the safe and efficient conduct of the survey work to be carried out.

5.6.3 The following is an indicative list of items that should be addressed in the meeting:

- .1 schedule of the vessel (i.e. the voyage, docking and undocking manoeuvres, periods alongside, cargo and ballast operations, etc.);

- .2 provisions and arrangements for thickness measurements (i.e. access, cleaning/descaling, illumination, ventilation, personal safety);
- .3 extent of the thickness measurements;
- .4 acceptance criteria (refer to the list of minimum thicknesses);
- .5 extent of close-up survey and thickness measurement considering the coating condition and suspect areas/areas of substantial corrosion;
- .6 execution of thickness measurements;
- .7 taking representative readings in general and where uneven corrosion/pitting is found;
- .8 mapping of areas of substantial corrosion; and
- .9 communication between attending surveyor(s) the thickness measurement company operator(s) and owner representative(s) concerning findings.

6 Documentation on board

6.1 General

6.1.1 The owner should obtain, supply and maintain on board the ship, documentation as specified in 6.2 and 6.3 which should be readily available for the surveyor. The condition evaluation report referred to in 6.2 should include a translation into English.

6.1.2 The documentation should be kept on board for the lifetime of the ship.

6.2 Survey report file

6.2.1 A survey report file should be a part of the documentation on board consisting of:

- .1 reports of structural surveys (annex 8);
- .2 condition evaluation report (annex 9); and
- .3 thickness measurement reports (annex 10).

6.2.2 The survey report file should be available also in the owner's and the Administration's offices, or in the office of the organization recognized by the Administration.

6.3 Supporting documents

The following additional documentation should be available on board:

- .1 survey programme as required by 5.1 until such time as the renewal survey or intermediate survey, as applicable, has been completed;
- .2 main structural plans of cargo and ballast tanks;
- .3 previous repair history;
- .4 cargo and ballast history;

- .5 extent of use of inert gas plant and tank cleaning procedures;
 - .6 inspections by ship's personnel with reference to:
 - .1 structural deterioration in general;
 - .2 leakage in bulkheads and piping; and
 - .3 condition of coating or corrosion prevention system, if any; and
 - .7 any other information that would help to identify critical structural areas and/or suspect areas requiring inspection.
- 6.4 *Review of documentation on board*

Prior to survey, the surveyor should examine the completeness of the documentation on board and its contents as a basis for the survey.

7 Procedures for thickness measurements

7.1 General

7.1.1 The required thickness measurements, if not carried out by the recognized organization acting on behalf of the Administration, should be witnessed by a surveyor of the recognized organization. The surveyor should be on board to the extent necessary to control the process.

7.1.2 The thickness measurement company should be part of the survey planning meeting to be held prior to commencing the survey.

7.1.3 Thickness measurements of structures in areas where close-up surveys are required should be carried out simultaneously with close-up surveys.

7.1.4 In all cases the extent of the thickness measurements should be sufficient as to represent the actual average condition.

7.2 Certification of thickness measurement company

The thickness measurements should be carried out by a qualified company certified by an organization recognized by the Administration according to principles stated in annex 7.

7.3 Reporting

7.3.1 A thickness measurement report should be prepared and submitted to the Administration. The report should give the location of measurements, the thickness measured as well as corresponding original thickness. Furthermore, the report should give the date when the measurements were carried out, type of measuring equipment, names of personnel and their qualifications and be signed by the operator. The thickness measurement report should follow the principles as specified in the recommended procedures for thickness measurements set out in annex 10.

7.3.2 The surveyor should review the final thickness measurement report and countersign the cover page.

8 Reporting and evaluation of survey

8.1 Evaluation of survey report

8.1.1 The data and information on the structural condition of the ship collected during the survey should be evaluated for acceptability and continued structural integrity of the ship.

8.1.2 In case of oil tankers of 130 m in length and upwards (as defined in the International Convention on Load Lines in force), the ship's longitudinal strength should be evaluated by using the thickness of structural members measured, renewed and reinforced, as appropriate, during the renewal survey of safety construction carried out after the ship reached 10 years of age, in accordance with the criteria for longitudinal strength of the ship's hull girder for oil tankers specified in annex 12.

8.1.3 The analysis of data should be carried out and endorsed by the Administration or recognized organization authorized by the Administration and the conclusions of the analysis should form a part of the condition evaluation report.

8.1.4 The final result of the evaluation of the ship's longitudinal strength required in 8.1.2, after renewal or reinforcement work of structural members, if carried out as a result of initial evaluation, should be reported as a part of the condition evaluation report.

8.2 Reporting

8.2.1 Principles for survey reporting are shown in annex 8.

8.2.2 When a survey is split between different survey stations, a report should be made for each portion of the survey. A list of items examined and/or tested (pressure testing, thickness measurements, etc.) and an indication of whether the item has been credited, should be made available to the next attending surveyor(s), prior to continuing or completing the survey.

8.2.3 A condition evaluation report of the survey and results should be issued to the owner as shown in annex 9 and placed on board the ship for reference at future surveys. The condition evaluation report should be endorsed by the Administration or recognized organization authorized by the Administration.

ANNEX 1

MINIMUM REQUIREMENTS FOR CLOSE-UP SURVEY AT RENEWAL SURVEY OF DOUBLE-HULL OIL TANKERS

Age ≤ 5 years Renewal Survey No. 1	5 < Age ≤ 10 years Renewal Survey No. 2	10 < Age ≤ 15 years Renewal Survey No. 3	Age > 15 years Renewal Survey No. 4 and subsequent
One web frame (1), in a complete ballast tank (see Note 1)	All web frames (1), in a complete ballast tank (see Note 1) The knuckle area and the upper part (5 m approximately) of one web frame in each remaining ballast tank (6)	All web frames (1), in all ballast tanks	As for ships referred to in column 3 Additional transverse areas as deemed necessary by the Administration
One deck transverse, in a cargo oil tank (2)	One deck transverse, in two cargo oil tanks (2)	All web frames (7), including deck transverse and cross ties, if fitted, in a cargo oil tank	
One transverse bulkhead (4), in a complete ballast tank (see Note 1)	One transverse bulkhead (4), in each complete ballast tank (see Note 1)	One web frame (7), including deck transverse and cross ties, if fitted, in each remaining cargo oil tank	
One transverse bulkhead (5) in a cargo oil centre tank	One transverse bulkhead (5), in two cargo oil centre tanks	All transverse bulkheads, in all cargo oil (3) and ballast (4) tanks	
One transverse bulkhead (5), in a cargo oil wing tank (see Note 2)	One transverse bulkhead (5), in a cargo oil wing tank (see Note 2)		

Notes:

(1), (2), (3), (4), (5), (6) and (7) are areas to be subjected to close-up surveys and thickness measurements (see appendix 3 of annex 10).

- (1) Web frame in a ballast tank means vertical web in side tank, hopper web in hopper tank, floor in double-bottom tank and deck transverse in double-deck tank (where fitted), including adjacent structural members. In fore and aft peak tanks web frame means a complete transverse web frame ring including adjacent structural members.
- (2) Deck transverse, including adjacent deck structural members (or external structure on deck in way of the tank, where applicable).
- (3) Transverse bulkhead complete in cargo tanks, including girder system, adjacent structural members (such as longitudinal bulkheads) and internal structure of lower and upper stools, where fitted.
- (4) Transverse bulkhead complete in ballast tanks, including girder system and adjacent structural members, such as longitudinal bulkheads, girders in double-bottom tanks, inner bottom plating, hopper side, connecting brackets.
- (5) Transverse bulkhead lower part in cargo tank, including girder system, adjacent structural members (such as longitudinal bulkheads) and internal structure of lower stool, where fitted.
- (6) The knuckle area and the upper part (5 m approximately), including adjacent structural members. Knuckle area is the area of the web frame around the connections of the slope hopper plating to the inner hull bulkhead and the inner bottom plating, up to 2 m from the corners both on the bulkhead and the double bottom.
- (7) Web frame in a cargo oil tank means deck transverse, longitudinal bulkhead vertical girder and cross ties, where fitted, including adjacent structural members.

Note 1: Complete ballast tank: means double-bottom tank plus double-side tank plus double-deck tank, as applicable, even if these tanks are separate.

Note 2: Where no centre cargo tanks are fitted (as in the case of centre longitudinal bulkhead), transverse bulkheads in wing tanks should be surveyed.

ANNEX 2

MINIMUM REQUIREMENTS FOR THICKNESS MEASUREMENTS AT RENEWAL SURVEY OF DOUBLE-HULL OIL TANKERS

Age ≤ 5 years 1	5 < Age ≤ 10 years 2	10 < Age ≤ 15 years 3	Age > 15 years 4
One section of deck plating for the full beam of the ship within the cargo area	Within the cargo area: - each deck plate - one transverse section	Within the cargo area: - each deck plate - two transverse sections (1) - all wind and water strakes	Within the cargo area: - each deck plate - three transverse sections (1) - each bottom plate
	Selected wind and water strakes outside the cargo area	Selected wind and water strakes outside the cargo area	All wind and water strakes in full length
Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to annex 1	Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to annex 1	Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to annex 1	Measurements, for general assessment and recording of corrosion pattern, of those structural members subject to close-up survey according to annex 1
Suspect areas	Suspect areas	Suspect areas	Suspect areas

(1): at least one section should be within 0.5L amidships.

ANNEX 3
MINIMUM REQUIREMENTS FOR TANK TESTING AT RENEWAL SURVEY OF DOUBLE-HULL OIL TANKERS

Age ≤ 5 years 1	Age > 5 years 2	Age > 10 years 3
All ballast tank boundaries Cargo tank boundaries facing ballast tanks, void spaces, pipe tunnels, representative fuel oil tanks, pump-rooms or cofferdams	All ballast tank boundaries Cargo tank boundaries facing ballast tanks, void spaces, pipe tunnels, representative fuel oil tanks, pump-rooms or cofferdams All cargo tank bulkheads which form the boundaries of segregated cargoes	All ballast tank boundaries Cargo tank boundaries facing ballast tanks, void spaces, pipe tunnels, representative fuel oil tanks, pump-rooms or cofferdams All remaining cargo tank bulkheads

ANNEX 4/SHEET 1

**REQUIREMENTS FOR EXTENT OF THICKNESS MEASUREMENTS AT AREAS OF
SUBSTANTIAL CORROSION OF DOUBLE-HULL OIL TANKERS**

Renewal survey of double-hull oil tankers

Bottom, inner bottom and hopper structure		
Structural member	Extent of measurement	Pattern of measurement
Bottom, inner bottom and hopper structure plating	Minimum of three bays across double-bottom tank, including aft bay Measurements around and under all suction bell mouths	Five-point pattern for each panel between longitudinals and floors
Bottom, inner bottom and hopper structure longitudinals	Minimum of three longitudinals in each bay where bottom plating measured	Three measurements in line across flange and three measurements on vertical web
Bottom girders, including the watertight ones	At fore and aft watertight floors and in centre of tanks	Vertical line of single measurements on girder plating with one measurement between each panel stiffener, or a minimum of three measurements
Bottom floors, including the watertight ones	Three floors in bays where bottom plating measured, with measurements at both ends and middle	Five-point pattern over 2 m ² area
Hopper structure web frame ring	Three floors in bays where bottom plating measured	Five-point pattern over 1 m ² of plating. Single measurements on flange
Hopper structure transverse watertight bulkhead or swash bulkhead	- lower ½ of bulkhead	Five-point pattern over 1 m ² of plating
	- upper ¾ of bulkhead	Five-point pattern over 2 m ² of plating
	- stiffeners (minimum of three)	For web, five-point pattern over span (two measurements across web at each end and one at centre of span). For flange, single measurements at each end and centre of span
Panel stiffening	Where applicable	Single measurements

ANNEX 4/SHEET 2

**REQUIREMENTS FOR EXTENT OF THICKNESS MEASUREMENTS AT AREAS OF
SUBSTANTIAL CORROSION OF DOUBLE-HULL OIL TANKERS**

Renewal survey of double-hull oil tankers within the cargo area length

Deck structure		
Structural member	Extent of measurement	Pattern of measurement
Deck plating	Two transverse bands across tank	Minimum of three measurements per plate per band
Deck longitudinals	Every third longitudinal in each of two bands with a minimum of one longitudinal	Three measurements in line vertically on webs and two measurements on flange (if fitted)
Deck girders and brackets (usually in cargo tanks only)	At fore and aft transverse bulkhead, bracket toes and in centre of tanks	Vertical line of single measurements on web plating with one measurement between each panel stiffener, or a minimum of three measurements. Two measurements across flange. Five-point pattern on girder/bulkhead brackets
Deck transverse webs	Minimum of two webs, with measurements at both ends and middle of span	Five-point pattern over 1 m ² area. Single measurements on flange
Vertical web and transverse bulkhead in wing ballast tank (2 m from deck)	Minimum of two webs, and both transverse bulkheads	Five-point pattern over 1 m ² area
Panel stiffening	Where applicable	Single measurements

ANNEX 4/SHEET 3

**REQUIREMENTS FOR EXTENT OF THICKNESS MEASUREMENTS AT AREAS OF
SUBSTANTIAL CORROSION OF DOUBLE-HULL OIL TANKERS**

Renewal survey of double-hull oil tankers within the cargo area length

Structure in wing ballast tanks		
Structural member	Extent of measurement	Pattern of measurement
Side shell and longitudinal bulkhead plating: - upper strake and strakes in way of horizontal girders - all other strakes	Plating between each pair of longitudinals in a minimum of three bays (along the tank) Plating between every third pair of longitudinals in same three bays	Single measurement Single measurement
Side shell and longitudinal bulkhead longitudinals on: - upper strake - all other strakes	Each longitudinal in same three bays Every third longitudinal in same three bays	Three measurements across web and one measurement on flange Three measurements across web and one measurement on flange
Longitudinals brackets	Minimum of three at top, middle and bottom of tank in same three bays	Five-point pattern over area of bracket
Vertical web and transverse bulkheads (excluding deckhead area): - strakes in way of horizontal girders - other strakes	Minimum of two webs and both transverse bulkheads Minimum of two webs and both transverse bulkheads	Five-point pattern over approximately 2 m ² area Two measurements between each pair of vertical stiffeners
Horizontal girders	Plating on each girder in a minimum of three bays	Two measurements between each pair of longitudinal girder stiffeners
Panel stiffening	Where applicable	Single measurements

ANNEX 4/SHEET 4

**REQUIREMENTS FOR EXTENT OF THICKNESS MEASUREMENTS AT AREAS OF
SUBSTANTIAL CORROSION OF DOUBLE-HULL OIL TANKERS**

Renewal survey of double-hull oil tankers within the cargo area length

Longitudinal bulkheads in cargo tanks		
Structural member	Extent of measurement	Pattern of measurement
Deckhead and bottom strakes, and strakes in way of the horizontal stringers of transverse bulkheads	Plating between each pair of longitudinals in a minimum of three bays	Single measurement
All other strakes	Plating between every third pair of longitudinals in same three bays	Single measurement
Longitudinals on deckhead and bottom strakes	Each longitudinal in same three bays	Three measurements across web and one measurement on flange
All other longitudinals	Every third longitudinal in same three bays	Three measurements across web and one measurement on flange
Longitudinals brackets	Minimum of three at top, middle and bottom of tank in same three bays	Five-point pattern over area of bracket
Web frames and cross ties	Three webs with minimum of three locations on each web, including in way of cross tie connections	Five-point pattern over approximately 2 m ² area of webs, plus single measurements on flanges of web frame and cross ties
Lower end brackets (opposite side of web frame)	Minimum of three brackets	Five-point pattern over approximately 2 m ² area of brackets, plus single measurements on bracket flanges

ANNEX 4/SHEET 5

**REQUIREMENTS FOR EXTENT OF THICKNESS MEASUREMENTS AT AREAS OF
SUBSTANTIAL CORROSION OF DOUBLE-HULL OIL TANKERS**

Renewal survey of double-hull oil tankers within the cargo area length

Transverse watertight and swash bulkheads in cargo tanks		
Structural member	Extent of measurement	Pattern of measurement
Upper and lower stool, where fitted	Transverse band within 25 mm of welded connection to inner bottom/deck plating Transverse band within 25 mm of welded connection to shelf plate	Five-point pattern between stiffeners over 1 m length
Deckhead and bottom strakes, and strakes in way of horizontal stringers	Plating between pair of stiffeners at three locations: approximately $\frac{1}{4}$, $\frac{1}{2}$ and $\frac{3}{4}$ width of tank	Five-point pattern between stiffeners over 1 m length
All other strakes	Plating between pair of stiffeners at middle location	Single measurement
Strakes in corrugated bulkheads	Plating for each change of scantling at centre of panel and at flange of fabricated connection	Five-point pattern over approximately 1 m ² of plating
Stiffeners	Minimum of three typical stiffeners	For web, five-point pattern over span between bracket connections (two measurements across web at each bracket connection and one at centre of span) For flange, single measurements at each bracket toe and at centre of span
Brackets	Minimum of three at top, middle and bottom of tank	Five-point pattern over area of bracket
Horizontal stringers	All stringers with measurements at both ends and middle	Five-point pattern over 1 m ² area, plus single measurements near bracket toes and on flanges

ANNEX 5

OWNER'S INSPECTION REPORT

Structural condition

Ship's name:							
For tank No:							
Grade of steel: deck: side:							
bottom: longitudinal bulkhead:							
Elements	Cracks	Buckles	Corrosion	Coating	Pitting	Modification/repair	Other
	condition						
Deck:							
Bottom:							
Side:							
Longitudinal bulkhead:							
Transverse bulkhead:							
Repairs carried out due to:							
Thickness measurements carried out (dates):							
Results in general:							
Overdue surveys:							
Outstanding conditions of class:							
Comments:							
Date of inspection:							
Inspected by:							
Signature:							

ANNEX 6A

SURVEY PROGRAMME

Basic information and particulars

Name of ship:
IMO number:
Flag State:
Port of registry:
Gross tonnage:
Deadweight (metric tonnes):
Length between perpendiculars (m):
Shipbuilder:
Hull number:
Recognized organization (RO):
RO ship identity:
Date of delivery of the ship:
Owner:
Thickness measurement company:

1 Preamble**1.1 Scope**

1.1.1 The present survey programme covers the minimum extent of overall surveys, close-up surveys, thickness measurements and pressure testing within the cargo area, ballast tanks, including fore and aft peak tanks, required by the Code.

1.1.2 The arrangements and safety aspects of the survey should be acceptable to the attending surveyor(s).

1.2 Documentation

All documents used in the development of the survey programme should be available on board during the survey as required by section 6.

2 Arrangement of tanks and spaces

This section of the survey programme should provide information (either in the form of plans or text) on the arrangement of tanks and spaces that fall within the scope of the survey.

3 List of tanks and spaces with information on their use, extent of coatings and corrosion prevention system

This section of the survey programme should indicate any changes relating to (and should update) the information on the use of the tanks of the ship, the extent of coatings and the corrosion protective system provided in the survey planning questionnaire.

4 Conditions for survey

This section of the survey programme should provide information on the conditions for survey, e.g. information regarding cargo hold and tank cleaning, gas freeing, ventilation, lighting, etc.

5 Provisions and method of access to structures

This section of the survey programme should indicate any changes relating to (and should update) the information on the provisions and methods of access to structures provided in the survey planning questionnaire.

6 List of equipment for survey

This section of the survey programme should identify and list the equipment that will be made available for carrying out the survey and the required thickness measurements.

7 Survey requirements

7.1 Overall survey

This section of the survey programme should identify and list the spaces that should undergo an overall survey for the ship in accordance with 2.4.1.

7.2 Close-up survey

This section of the survey programme should identify and list the hull structures that should undergo a close-up survey for the ship in accordance with 2.4.2.

8 Identification of tanks for tank testing

This section of the survey programme should identify and list the tanks that should undergo tank testing for the ship in accordance with 2.6.

9 Identification of areas and sections for thickness measurements

This section of the survey programme should identify and list the areas and sections where thickness measurements should be taken in accordance with 2.5.1.

10 Minimum thickness of hull structures

This section of the survey programme should specify the minimum thickness for hull structures of the ship that are subject to the Code (indicate either (a) or preferably (b), if such information is available):

- (a) Determined from the attached wastage allowance table and the original thickness to the hull structure plans of the ship;
- (b) Given in the following table(s):

Area or location	Original as-built thickness (mm)	Minimum thickness (mm)	Substantial corrosion thickness (mm)
Deck			
Plating			
Longitudinals			
Longitudinal girders			
Bottom			
Plating			
Longitudinals			
Longitudinal girders			
Ship side			
Plating			
Longitudinals			
Longitudinal girders			
Longitudinal bulkhead			
Plating			
Longitudinals			
Longitudinal girders			
Inner bottom			
Plating			
Longitudinals			
Longitudinal girders			
Transverse bulkheads			
Plating			
Stiffeners			
Transverse web frames, floors and stringers			
Plating			
Flanges			
Stiffeners			
Cross ties			
Flanges			
Webs			

Note: The wastage allowance tables should be attached to the survey programme.

11 Thickness measurement company

This section of the survey programme should identify changes, if any, relating to the information on the thickness measurement company provided in the survey planning questionnaire.

12 Damage experience related to the ship

This section of the survey programme should, using the tables provided below, provide details of the hull damages for at least the last three years in way of the cargo and ballast tanks and void spaces within the cargo area. These damages are subject to survey.

Hull damages sorted by location for this ship

Tank or space number or area	Possible cause, if known	Description of the damages	Location	Repair	Date of repair

**Hull damages for sister or similar ships
(if available) in the case of design related damage**

Tank or space number or area	Possible cause, if known	Description of the damages	Location	Repair	Date of repair

13 Areas identified with substantial corrosion from previous surveys

This section of the survey programme should identify and list the areas of substantial corrosion from previous surveys.

14 Critical structural areas and suspect areas

This section of the survey programme should identify and list the critical structural areas and the suspect areas, if such information is available.

15 Other relevant comments and information

This section of the survey programme should provide any other comments and information relevant to the survey.

Appendices

Appendix 1 – List of plans

Paragraph 5.1.3.2 requires that main structural plans of cargo and ballast tanks (scantling drawings), including information on regarding use of high tensile steel (HTS), to be available. This appendix of the survey programme should identify and list the main structural plans which form part of the survey programme.

Appendix 2 – Survey planning questionnaire

The survey planning questionnaire (annex 6B), which has been submitted by the owner, should be appended to the survey programme.

Appendix 3 – Other documentation

This part of the survey programme should identify and list any other documentation that forms part of the plan.

Prepared by the owner in cooperation with the Administration for compliance with 5.1.3.

Date:

(name and signature of authorized owner's representative)

Date:

(name and signature of authorized representative of the Administration)

ANNEX 6B

SURVEY PLANNING QUESTIONNAIRE

The following information will enable the owner in cooperation with the Administration to develop a survey programme complying with the requirements of the Code. It is essential that the owner provides, when completing the present questionnaire, up-to-date information. The present questionnaire, when completed, should provide all information and material required by the resolution.

Particulars

Ship's name:

IMO number:

Flag State:

Port of registry:

Owner:

Recognized organization (RO):

Gross tonnage:

Deadweight (metric tonnes):

Date of delivery:

Information on access provision for close-up surveys and thickness measurement

The owner should indicate, in the table below, the means of access to the structures subject to close-up survey and thickness measurement. A close-up survey is an examination where the details of structural components are within the close visual inspection range of the attending surveyor, i.e. normally within reach of hand.

Tank No.	Structure	C (Cargo)/B (Ballast)	Temporary staging	Rafts	Ladders	Direct access	Other means (please specify)
F.P.	Fore peak						
A.P.	Aft peak						
Wing tanks	Underdeck						
	Side shell						
	Bottom transverse						
	Longitudinal						
Centre tanks	Transverse						
	Under deck						
	Bottom transverse						
	Transverse						

History of cargo with H₂S content or heated cargo for the last three years together with indication as to whether cargo was heated and, where available, Material Safety Data Sheets (MSDS)

Owner's inspections

Using a format similar to that of the table below (which is given as an example), the owner should provide details of the results of their inspections for the last three years on all cargo and ballast tanks and void spaces within the cargo area, including peak tanks.

Tank No.	Corrosion protection (1)	Coating extent (2)	Coating condition (3)	Structural deterioration (4)	Tank damage history (5)
Cargo centre tanks					
Cargo wing tanks					
Slop					
Ballast tanks					
Aft peak					
Fore peak					
Miscellaneous spaces					

Note:

Indicate tanks which are used for oil/ballast.

- 1) HC = hard coating; SC = soft coating;
A = anodes; NP = no protection
- 2) U = upper part; M = middle part;
L = lower part; C = complete
- 3) G = good; F = fair; P = poor;
RC = recoated (during the last three years)
- 4) N = no findings recorded; Y = findings recorded,
description of findings should be attached to this questionnaire
- 5) DR = Damage & Repair; L = Leakages;
CV = Conversion (description to be attached to this questionnaire)

Name of owner's representative:

.....

Signature:

Date:

List the reports of port State control inspections containing hull structural related deficiencies and relevant information on rectification of the deficiencies:

List non-conformities related to hull maintenance, including the associated corrective actions:

[illegible]

ANNEX 7

PROCEDURES FOR CERTIFICATION OF A COMPANY ENGAGED IN THICKNESS MEASUREMENT OF HULL STRUCTURES**1 Application**

This guidance applies for certification of the company which intends to engage in the thickness measurement of hull structures of ships.

2 Procedures for certification*Submission of documents*

2.1 The following documents should be submitted to an organization recognized by the Administration for approval:

- .1 outline of the company, e.g. organization and management structure;
- .2 experience of the company in thickness measurement of hull structures of ships;
- .3 technicians' careers, i.e. experience of technicians as thickness measurement operators, technical knowledge and experience of hull structure, etc. Operators should be qualified according to a recognized industrial non-destructive test (NDT) standard;
- .4 equipment used for thickness measurement such as ultrasonic testing machines and their maintenance/calibration procedures;
- .5 a guide for thickness measurement operators;
- .6 training programmes for technicians for thickness measurement; and
- .7 measurement record format in accordance with recommended procedures for thickness measurements (see annex 10). Recommended procedures for thickness measurements of double-hull oil tankers are contained in annex 2.

Auditing of the company

2.2 Upon satisfactory review of the documents submitted, the company should be audited in order to ascertain that the company is duly organized and managed in accordance with the documents submitted and is capable of conducting thickness measurement of the hull structure of ships.

2.3 Certification is conditional upon an on board demonstration of thickness measurement as well as satisfactory reporting.

3 Certification

3.1 Upon satisfactory results of both the audit of the company referred to in 2.2 and the demonstration tests referred to in 2.3, the Administration or organization recognized by the Administration should issue a certificate of approval as well as a notice to the effect that the thickness measurement operation system of the company has been certified.

3.2 Renewal/endorsement of the certificate should be carried out at intervals not exceeding three years by verification that original conditions are maintained.

4 Report of any alteration to the certified thickness measurement operation system

In case any alteration to the certified thickness measurement operation system of the company is made, such alteration should be immediately reported to the organization recognized by the Administration. A re-audit should be carried out where deemed necessary by the organization recognized by the Administration.

5 Withdrawal of certification

The certification may be withdrawn in the following cases:

- .1 where the measurements were improperly carried out or the results were improperly reported;
- .2 where the surveyor found any deficiencies in the approved thickness measurement operation system of the company; and
- .3 where the company failed to report any alteration referred to in 4 to the organization recognized by the Administration as required.

ANNEX 8

SURVEY REPORTING PRINCIPLES

As a principle, for oil tankers subject to the Code, the surveyor should include the following contents in his report for survey of hull structure and piping systems, as relevant for the survey.

1 General**1.1** A survey report should be generated in the following cases:

- .1 in connection with commencement, continuation and/or completion of periodical hull surveys, i.e. annual, intermediate and renewal surveys, as relevant;
- .2 when structural damages/defects have been found;
- .3 when repairs, renewals or modifications have been carried out; and
- .4 when condition of class (recommendation) has been imposed or deleted.

1.2 The reporting should provide:

- .1 evidence that prescribed surveys have been carried out in accordance with applicable requirements;
- .2 documentation of surveys carried out with findings, repairs carried out and condition of class (recommendation) imposed or deleted;
- .3 survey records, including actions taken, which should form an auditable documentary trail. Survey reports should be kept in the survey report file required to be on board;
- .4 information for planning of future surveys; and
- .5 information which may be used as input for maintenance of classification rules and instructions.

1.3 When a survey is split between different survey stations, a report should be made for each portion of the survey. A list of items surveyed, relevant findings and an indication of whether the item has been credited, should be made available to the next attending surveyor, prior to continuing or completing the survey. Thickness measurement and tank testing carried out should also be listed for the next surveyor.

2 Extent of the survey**2.1** Identification of compartments where an overall survey has been carried out.

2.2 Identification of locations, in each tank, where a close-up survey has been carried out, together with information of the means of access used.

2.3 Identification of locations, in each tank, where thickness measurement has been carried out.

Note: As a minimum, the identification of location of close-up survey and thickness measurement should include a confirmation with description of individual structural members corresponding to the extent of requirements stipulated in this part of annex B based on type of periodical survey and the ship's age.

Where only partial survey is required, i.e. one web frame ring/one deck transverse, the identification should include location within each ballast tank and cargo hold by reference to frame numbers.

2.4 For areas in tanks where protective coating is found to be in good condition and the extent of close-up survey and/or thickness measurement has been specially considered, structures subject to special consideration should be identified.

2.5 Identification of tanks subject to tank testing.

2.6 Identification of piping systems on deck, including crude oil washing (COW) piping, and ballast piping within cargo and ballast tanks, pipe tunnels, cofferdams and void spaces where:

- .1 examination including internal examination of piping with valves and fittings and thickness measurement, as relevant, has been carried out; and
- .2 operational test to working pressure has been carried out.

3 Result of survey

3.1 Type, extent and condition of protective coating in each tank, as relevant (rated GOOD, FAIR or POOR), including identification of tanks fitted with anodes.

3.2 Structural condition of each compartment with information on the following, as relevant:

- .1 Identification of findings, such as:
 - .1 corrosion with description of location, type and extent;
 - .2 areas with substantial corrosion;
 - .3 cracks/fractures with description of location and extent;
 - .4 buckling with description of location and extent; and
 - .5 indents with description of location and extent.
- .2 Identification of compartments where no structural damage/defects are found. The report may be supplemented by sketches/photographs.
- .3 Thickness measurement report should be verified and signed by the surveyor controlling the measurements on board.

- .4 Evaluation result of longitudinal strength of the hull girder of oil tankers of 130 m in length and upwards and over 10 years of age. The following data should be included, as relevant:
 - .1 measured and as-built transverse sectional areas of deck and bottom flanges;
 - .2 diminution of transverse sectional areas of deck and bottom flanges; and
 - .3 details of renewals or reinforcements carried out, as relevant (see 4.2).

4 Actions taken with respect to findings

4.1 Whenever the attending surveyor is of the opinion that repairs are required, each item to be repaired should be identified in a numbered list. Whenever repairs are carried out, details of the repairs effected should be reported by making specific reference to relevant items in the numbered list.

4.2 Repairs carried out should be reported with identification of:

- .1 compartment;
- .2 structural member;
- .3 repair method (i.e. renewal or modification), including:
 - .1 steel grades and scantlings (if different from the original); and
 - .2 sketches/photographs, as appropriate;
- .4 repair extent; and
- .5 non-destructive tests (NDT).

4.3 For repairs not completed at the time of survey, condition of class/recommendation should be imposed with a specific time limit for the repairs. In order to provide correct and proper information to the surveyor attending for survey of the repairs, condition of class/recommendation should be sufficiently detailed with identification of each item to be repaired. For identification of extensive repairs, reference may be given to the survey report.

ANNEX 9

CONDITION EVALUATION REPORT

Issued upon completion of renewal survey

General particulars

Ship's name:	Class/Administration identity number:
	Previous class/Administration identity number(s):
	IMO number:
Port of registry:	National flag:
	Previous national flag(s):
Deadweight (metric tonnes):	Gross tonnage:
	National:
	ITC (1969):
Date of build:	Classification notation:
Date of major conversion:	
Type of conversion:	Owner:
	Previous owner(s):

1 The survey reports and documents listed below have been reviewed by the undersigned and found to be satisfactory.

2 A summary of the survey is attached herewith on sheet 2.

3 The renewal survey has been completed in accordance with the present Code on (date)

Condition evaluation report completed by	Name Signature	Title
Office	Date	
Condition evaluation report verified by	Name Signature	Title
Office	Date	

Attached reports and documents:

- 1)
- 2)
- 3)
- 4)
- 5)
- 6)

Contents of condition evaluation report

- | | | |
|---------|--|--|
| Part 1 | — General particulars: | - See front page |
| Part 2 | — Report review: | - Where and how survey was done |
| Part 3 | — Close-up survey: | - Extent (which tanks) |
| Part 4 | — Cargo and ballast piping system: | - Examined |
| | | - Operationally tested |
| Part 5 | — Thickness measurements: | - Reference to thickness measurement report |
| | | - Summary of where measured |
| | | - Separate form indicating the spaces with substantial corrosion, and corresponding: |
| | | - thickness diminution |
| | | - corrosion pattern |
| Part 6 | — Tank corrosion prevention system: | - Separate form indicating: |
| | | - location of coating/anodes |
| | | - condition of coating (if applicable) |
| Part 7 | — Repairs: | - Identification of tanks/areas |
| Part 8 | — Condition of class/flag State requirements: | |
| Part 9 | — Memoranda: | - Acceptable defects |
| | | - Any points of attention for future surveys, e.g. for suspect areas |
| | | - Extended annual/intermediate survey due to coating breakdown |
| Part 10 | — Evaluation results of the ship's longitudinal strength (for oil tankers of 130 m in length and upwards and over 10 years of age) | |
| Part 11 | — Conclusion: | - Statement on evaluation/ verification of survey report |

Extract of thickness measurements

Reference is made to the thickness measurement report:

Position of substantially corroded tanks/areas ¹ or areas with deep pitting ³	Thickness diminution [%]	Corrosion pattern ²	Remarks: (e.g. reference to attached sketches)

Notes:

- 1 Substantial corrosion, i.e. 75 to 100% of acceptable margins wasted.
- 2 P = Pitting
C = Corrosion in general
- 3 Any bottom plating with a pitting intensity of 20% or more, with wastage in the substantial corrosion range or having an average depth of pitting of 1/4 or more of actual plate thickness should be noted.

Tank corrosion prevention system

Tank Nos. ¹	Tank corrosion prevention system ²	Coating condition ³	Remarks

Notes:

- 1 All segregated ballast tanks and combined cargo/ballast tanks should be listed.
- 2 C = Coating
NP = No protection
- 3 Coating condition according to the following standard:

 GOOD condition with only minor spot rusting.

 FAIR condition with local breakdown of coating at edges of stiffeners and weld connections and/or light rusting over 20% or more of areas under consideration, but less than as defined for POOR condition.

 POOR condition with general breakdown of coating over 20% or more of areas or hard scale at 10% or more of areas under consideration.

If coating condition less than GOOD is given, extended annual surveys should be introduced. This should be noted in part 9 of the Contents of condition evaluation report.

Evaluation result of longitudinal strength of the hull girder of oil tankers of 130 m in length and upwards and of over 10 years of age
(of sections 1, 2 and 3 below, only one applicable section should be completed)

- 1 This section applies to ships regardless of the date of construction: Transverse sectional areas of deck flange (deck plating and deck longitudinals) and bottom flange (bottom shell plating and bottom longitudinals) of the ship's hull girder have been calculated by using the thickness measured, renewed or reinforced, as appropriate, during the renewal survey of the Cargo Ship Safety Construction Certificate or the Cargo Ship Safety Certificate (SC renewal survey) most recently conducted after the ship reached 10 years of age, and found that the diminution of the transverse sectional area does not exceed 10% of the as-built area, as shown in the following table:

Table 1 – Transverse sectional area of hull girder flange

		Measured	As-built	Diminution
Transverse section 1	Deck flange	cm ²	cm ²	cm ² (%)
	Bottom flange	cm ²	cm ²	cm ² (%)
Transverse section 2	Deck flange	cm ²	cm ²	cm ² (%)
	Bottom flange	cm ²	cm ²	cm ² (%)
Transverse section 3	Deck flange	cm ²	cm ²	cm ² (%)
	Bottom flange	cm ²	cm ²	cm ² (%)

2 This section applies to ships constructed on or after 1 July 2002: Section moduli of transverse section of the ship's hull girder have been calculated by using the thickness of structural members measured, renewed or reinforced, as appropriate, during the SC renewal survey most recently conducted after the ship reached 10 years of age in accordance with the provisions of paragraph 2.2.1.1 of annex 12, and are found to be within their diminution limits determined by the Administration, taking into account the recommendations adopted by the Organization, as shown in the following table:

Table 2 – Transverse section modulus of hull girder

		$Z_{act} (cm^3)^1$	$Z_{req} (cm^3)^2$	Remarks
Transverse section 1	Upper deck			
	Bottom			
Transverse section 2	Upper deck			
	Bottom			
Transverse section 3	Upper deck			
	Bottom			

Notes:

- 1 Z_{act} means the actual section moduli of the transverse section of the ship's hull girder calculated by using the thickness of structural members measured, renewed or reinforced, as appropriate, during the SC renewal survey, in accordance with the provisions of paragraph 2.2.1.1 of annex 12.
- 2 Z_{req} means the diminution limit of the longitudinal bending strength of ships, as calculated in accordance with the provisions of paragraph 2.2.1.1 of annex 12.

The calculation sheets for Z_{act} should be attached to this report.

3 This section applies to ships constructed before 1 July 2002: Section moduli of transverse sections of the ship's hull girder have been calculated by using the thickness of structural members measured, renewed or reinforced, as appropriate, during the SC renewal survey most recently conducted after the ship reached 10 years of age in accordance with the provisions of paragraph 2.2.1.2 of annex 12, and found to meet the criteria required by the Administration or the recognized classification society and that Z_{act} is not less than Z_{me} (defined in note 2 below) as specified in appendix 2 to annex 12, as shown in the following table.

Describe the criteria for acceptance of the minimum section moduli of the ship's hull girder for ships in service required by the Administration or the recognized classification society.

Table 3 – Transverse section modulus of hull girder

		$Z_{act} (cm^3)^1$	$Z_{mc} (cm^3)^2$	Remarks
Transverse section 1	Upper deck			
	Bottom			
Transverse section 2	Upper deck			
	Bottom			
Transverse section 3	Upper deck			
	Bottom			

Notes:

- 1 As defined in note 1 of table 2.
- 2 Z_{mc} means the diminution limit of minimum section modulus calculated in accordance with the provisions of paragraph 2.2.1.2 of annex 12.

ANNEX 10

**RECOMMENDED PROCEDURES FOR THICKNESS MEASUREMENTS OF
DOUBLE-HULL OIL TANKERS****General**

1 These procedures should be used for recording thickness measurements as required by annexes 2 and 4.

2 Reporting forms TM1-DHT, TM2-DHT(i), TM2-DHT(ii), TM3-DHT, TM4-DHT, TM5-DHT and TM6-DHT, set out in appendix 2, should be used for recording thickness measurements and the maximum allowable diminution should be stated. The maximum allowable diminution could be stated in an attached document.

3 Appendix 3 contains guidance diagrams and notes relating to the reporting forms and the requirements for thickness measurement.

4 The reporting forms should, where appropriate, be supplemented by data presented on structural sketches.

Appendix 1

GENERAL PARTICULARS

Ship's name:
 IMO number:
 Class/Administration identity number:.....
 Port of registry:
 Gross tonnage:
 Deadweight:
 Date of build:
 Classification society:

Name of company performing thickness measurement:
 Thickness measurement company certified by:
 Certificate number:
 Certificate valid from: to
 Place of measurement:
 First date of measurement:
 Last date of measurement:
 Renewal survey/intermediate survey due:
 Details of measurement equipment:
 Qualification of operator:
 Report number: consisting of pages
 Name of operator: Name of surveyor:
 Signature of operator: Signature of surveyor:
 Company official stamp: Administration:

Official stamp

Appendix 2

Report on thickness measurement of all deck plating, all bottom shell plating or side shell plating* (TM1-DHT)

Ship's name.....	Class Identity No.....	Report No.....	IMO number.....
STRAKE			
POSITION			
PLATE	No. or letter	Orig. thk. mm	
POSITION			
12 th forward			
11th			
10th			
9th			
8th			
7th			
6th			
5th			
4th			
3rd			
2nd			
1st			
Amidships			
1st aft			
2nd			
3rd			
4th			
5th			
6th			
7th			
8th			
9th			
10th			
11th			
12th			
Operator's signature.....			

Notes – see following page (* – delete as appropriate)

Notes to the report TM1-DHT:

- 1 This report should be used for recording the thickness measurement of:
 - .1 All strength deck plating within the cargo area.
 - .2 All keel, bottom shell plating and bilge plating within the cargo area.
 - .3 Side shell plating including selected wind and water strakes outside cargo area.
 - .4 All wind and water strakes within cargo area.
- 2 The strake position should be clearly indicated as follows:
 - .1 For strength deck indicate the number of the strake of plating inboard from the stringer plate.
 - .2 For bottom plating indicate the number of the strake of plating outboard from the keel plate.
 - .3 For side shell plating give number of the strake of plating below sheerstrake and letter as shown on shell expansion.
- 3 Measurements should be taken at the forward and aft areas of all and where plates cross ballast/cargo tank boundaries separate measurements for the area of plating in way of each type of tank should be recorded.
- 4 The single measurements recorded should represent the average of multiple measurements.
- 5 The maximum allowable diminution could be stated in an attached document.

Report on thickness measurement of shell and deck plating (one, two or three transverse sections) (TM2-DHT(ii))

Ship's name..... Class Identity No..... Report No..... IMO number.....

STRAKE POSITION	FIRST TRANSVERSE SECTION AT FRAME NUMBER.....					SECOND TRANSVERSE SECTION AT FRAME NUMBER.....					THIRD TRANSVERSE SECTION AT FRAME NUMBER.....				
	No. or letter	Orig. thk. mm	Max allow. dimin. mm	Gauged P S	Diminution P mm S mm %	No. or letter	Orig. thk. mm	Max allow. dimin. mm	Gauged P S	Diminution P mm S mm %	No. or letter	Orig. thk. mm	Max allow. dimin. mm	Gauged P S	Diminution P mm S mm %
Stringer plate															
1st strake inboard															
2nd															
3rd															
4th															
5th															
6th															
7th															
8th															
9th															
10th															
11th															
12th															
13th															
14th															
centre strake															
sheerstrake															
TOTAL															

Operator's signature.....

Notes — see following page

Notes to the report TM2-DHT(I):

- 1 This report form should be used for recording the thickness measurements of strength deck plating and sheerstrake plating transverse sections:

One, two or three sections within the cargo area comprising structural items (0), (1) and (2) as shown on the diagrams of typical transverse sections illustrated in appendix 3.
- 2 The topside area comprises deck plating, stringer plate and sheerstrake (including rounded gunwales).
- 3 The exact frame station of measurement should be stated.
- 4 The single measurements recorded should represent the average of multiple measurements.
- 5 The maximum allowable diminution could be stated in an attached document.

Report on thickness measurement of shell and deck plating (one, two or three transverse sections) (TM2-DHT(iii))

Ship's name..... Class Identity No..... Report No..... IMO number..... SHELL PLATING

STRAKE POSITION	FIRST TRANSVERSE SECTION AT FRAME NUMBER.....						SECOND TRANSVERSE SECTION AT FRAME NUMBER.....						THIRD TRANSVERSE SECTION AT FRAME NUMBER.....					
	No. or letter	Orig. thk. mm	Max allow. dimin. mm	Gauged P	Diminution S mm	Diminution P %	No. or letter	Orig. thk. mm	Max allow. dimin. mm	Gauged P	Diminution S mm	Diminution P %	No. or letter	Orig. thk. mm	Max allow. dimin. mm	Gauged P	Diminution S mm	Diminution P %
1st below sheerstrake																		
2nd																		
3rd																		
4th																		
5th																		
6th																		
7th																		
8th																		
9th																		
10th																		
11th																		
12th																		
13th																		
14th																		
15th																		
16th																		
17th																		
18th																		
19th																		
20th																		
keel																		
strake																		
BOTTOM																		
TOTAL																		

Operator's signature..... Notes – see following page

Notes to the report TM2-DHT(II):

- 1 This report form should be used for recording the thickness measurements of shell plating transverse sections:

One, two or three sections within the cargo area comprising structural items (3), (4) and (5) and (6) as shown on the diagrams of typical transverse sections illustrated in appendix 3.
- 2 The bottom area comprises keel, bottom and bilge plating.
- 3 The exact frame station of measurement should be stated.
- 4 The single measurements recorded should represent the average of multiple measurements.
- 5 The maximum allowable diminution could be stated in an attached document.

Notes to the report TM3-DHT:

- 1 This report should be used for recording the thickness measurements of longitudinal members at transverse sections:

One, two or three sections within the cargo area comprising appropriate structural items (10) to (29) as shown on the diagrams of typical transverse sections illustrated in appendix 3.
- 2 The exact frame station of measurement should be stated.
- 3 The single measurements recorded should represent the average of multiple measurements.
- 4 The maximum allowable diminution could be stated in an attached document.

Notes to the report TM4-DHT:

- 1 This report should be used for recording the thickness measurements of transverse structural members, comprising appropriate structural items (30) to (36) as shown on diagrams of typical transverse sections illustrated in appendix 3.
- 2 Guidance for areas of measurement is indicated in appendix 3. The single measurements recorded should represent the average of multiple measurements.
- 3 The maximum allowable diminution could be stated in an attached document.

Notes to the report TM5-DHT:

- 1 This report should be used for recording the thickness measurement of W.T./O.T. transverse bulkheads.
- 2 Guidance for areas of measurement is indicated in appendix 3.
- 3 The single measurements recorded should represent the average of multiple measurements.
- 4 The maximum allowable diminution could be stated in an attached document.

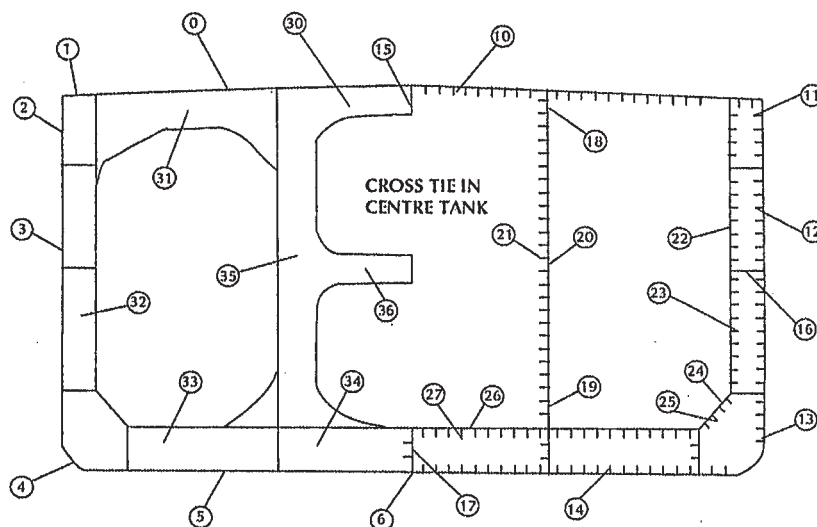
Notes to the report TM6-DHT:

- 1 This report should be used for recording the thickness measurement of miscellaneous structural members.
- 2 The single measurements recorded should represent the average of multiple measurements.
- 3 The maximum allowable diminution could be stated in an attached document.

Appendix 3

THICKNESS MEASUREMENT – DOUBLE-HULL OIL TANKERS

Typical transverse section of a double-hull oil tanker above 150,000 dwt with indication of longitudinal and transverse members.



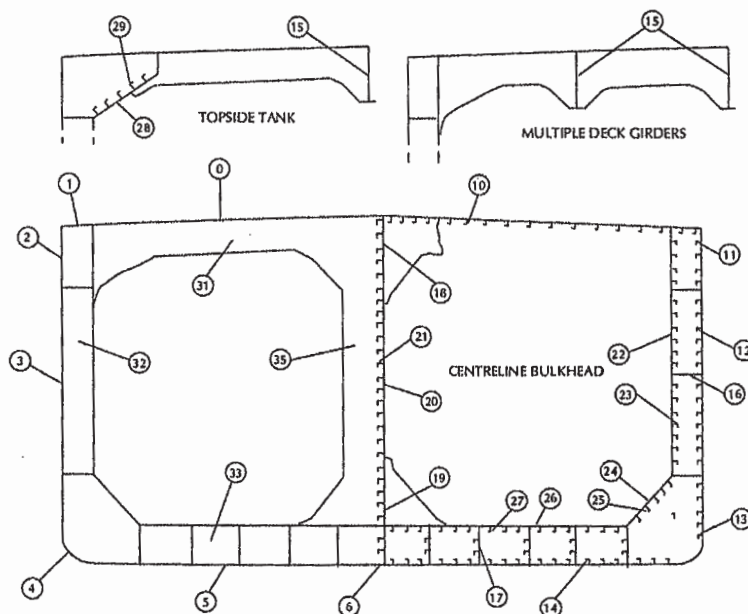
REPORT ON TM2-DHT(I) and (II)	
①	Stringer plate
②	Sheerstrake
③	Side shell plating
④	Bilge plating
⑤	Bottom shell plating
⑥	Keel plate

REPORT ON TM3-DHT	
⑩	Deck longitudinals
⑪	Sheerstrake longitudinals
⑫	Side shell longitudinals
⑬	Bilge longitudinals
⑭	Bottom longitudinals
⑮	Deck girders
⑯	Horizontal girders in wing ballast tanks
⑰	Bottom girders
⑱	Longitudinal bulkhead top strake
⑲	Longitudinal bulkhead bottom strake
⑳	Longitudinal bulkhead plating (remainder)
㉑	Longitudinal bulkhead longitudinals
㉒	Inner side plating
㉓	Inner side longitudinals
㉔	Hopper plating
㉕	Hopper longitudinals
㉖	Inner bottom plating
㉗	Inner bottom longitudinals
㉘	Topside tank plating
㉙	Topside tank longitudinals

REPORT ON TM4-DHT	
⑳	Deck transverse – centre tank
㉑	Deck transverse – wing tank
㉒	Vertical web in wing ballast tank
㉓	Double bottom floor – wing tank
㉔	Double bottom floor – centre tank
㉕	Longitudinal bulkhead vertical web
㉖	Cross ties

THICKNESS MEASUREMENT – DOUBLE-HULL OIL TANKERS

Typical transverse section of a double-hull oil tanker up to 150,000 dwt with indication of longitudinal and transverse members.



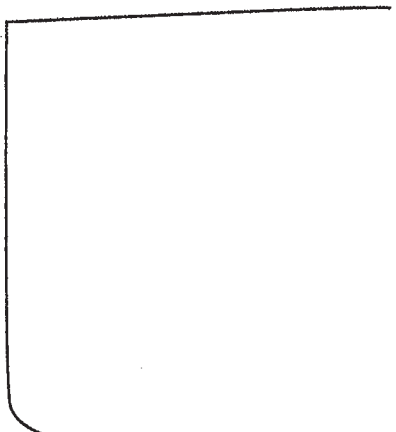
REPORT ON TM2-DHT(I) and (II)	
0	Strength deck plating
1	Stringer plate
2	Sheerstrake
3	Side shell plating
4	Bilge plating
5	Bottom shell plating
6	Keel plate

REPORT ON TM3-DHT	
10 Deck longitudinals	20 Longitudinal bulkhead plating (remainder)
11 Sheerstrake longitudinals	21 Longitudinal bulkhead longitudinals
12 Side shell longitudinals	22 Inner side plating
13 Bilge longitudinals	23 Inner side longitudinals
14 Bottom longitudinals	24 Hopper plating
15 Deck girders	25 Hopper longitudinals
16 Horizontal girders in wing ballast tanks	26 Inner bottom plating
17 Bottom girders	27 Inner bottom longitudinals
18 Longitudinal bulkhead top strake	28 Topside tank plating
19 Longitudinal bulkhead bottom strake	29 Topside tank longitudinals

REPORT ON TM4-DHT	
30	Deck transverse – centre tank
31	Deck transverse – wing tank
32	Vertical web in wing ballast tank
33	Double bottom floor – wing tank
34	Double bottom floor – centre tank
35	Longitudinal bulkhead vertical web
36	Cross ties

THICKNESS MEASUREMENT – DOUBLE-HULL OIL TANKERS

Transverse section outline. The diagram may be used for those ships where typical sections are not applicable



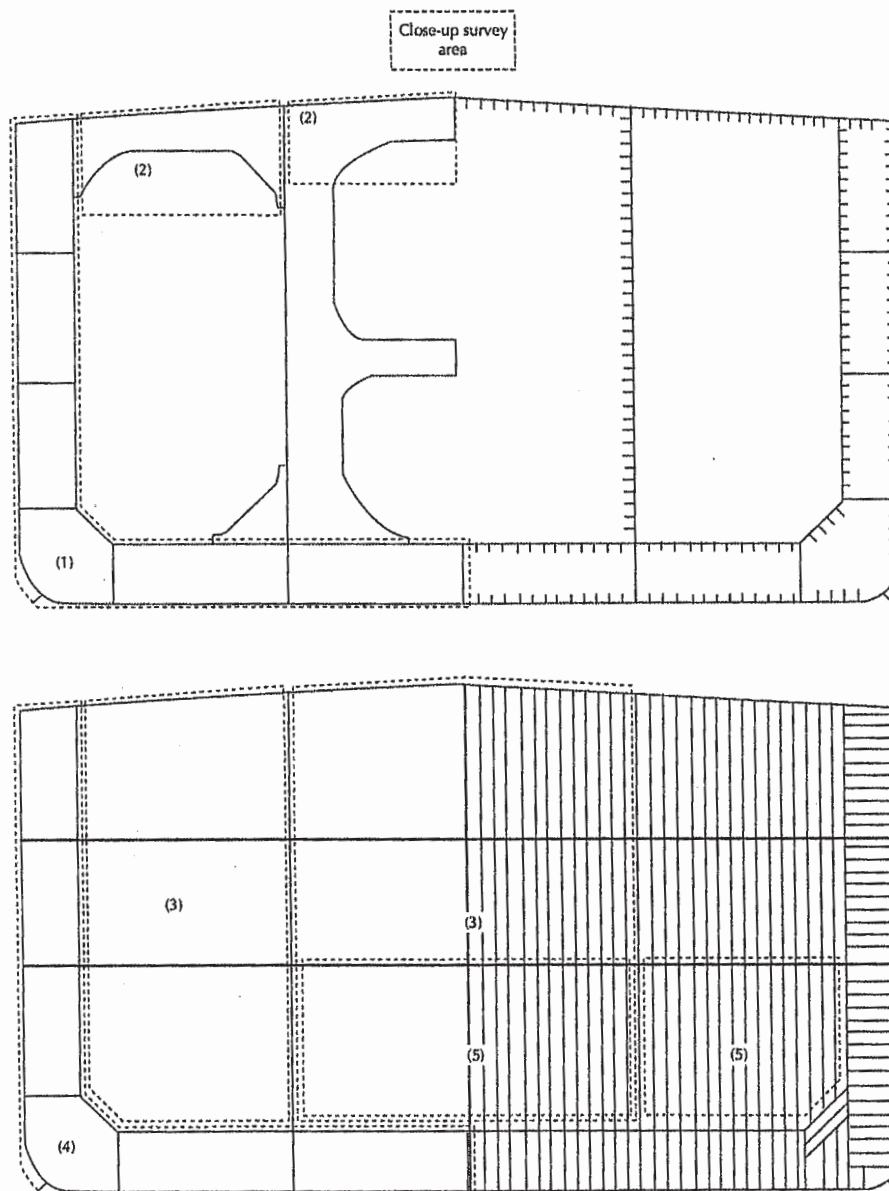
REPORT ON TM2-DHT(I) and (II)	
①	Strength deck plating
②	Stringer plate
③	Sheerstrake
④	Side shell plating
⑤	Bilge plating
⑥	Bottom shell plating
⑦	Keel plate

REPORT ON TM3-DHT	
⑩ Deck longitudinals	⑳ Longitudinal bulkhead plating (remainder)
⑪ Sheerstrake longitudinals	㉑ Longitudinal bulkhead longitudinals
⑫ Side shell longitudinals	㉒ Inner side plating
⑬ Bilge longitudinals	㉓ Inner side longitudinals
⑭ Bottom longitudinals	㉔ Hopper plating
⑮ Deck girders	㉕ Hopper longitudinals
⑯ Horizontal girders in wing ballast tanks	㉖ Inner bottom plating
⑰ Bottom girders	㉗ Inner bottom longitudinals
⑱ Longitudinal bulkhead top strake	㉘ Topside tank plating
⑲ Longitudinal bulkhead bottom strake	㉙ Topside tank longitudinals

REPORT ON TM4-DHT	
㉚	Deck transverse – centre tank
㉛	Deck transverse – wing tank
㉜	Vertical web in wing ballast tank
㉝	Double bottom floor – wing tank
㉞	Double bottom floor – centre tank
㉟	Longitudinal bulkhead vertical web
㊱	Cross ties

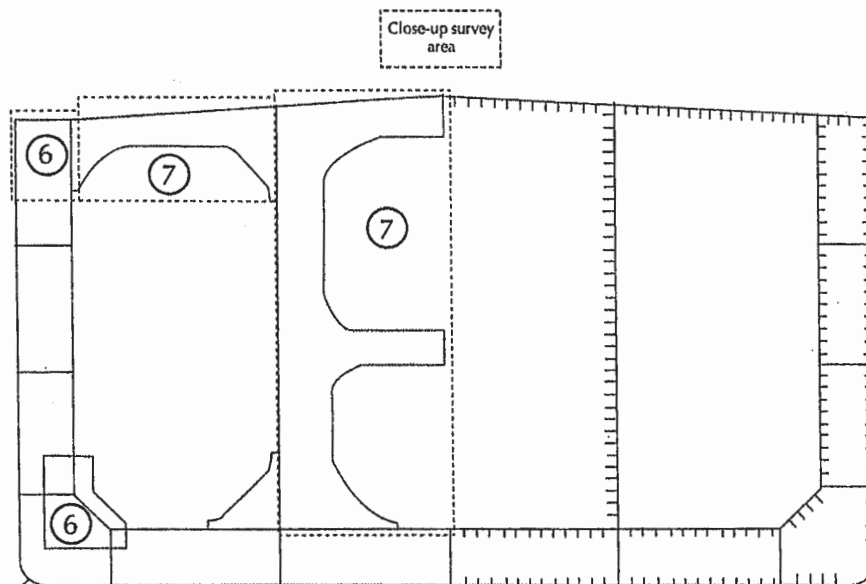
THICKNESS MEASUREMENT – DOUBLE-HULL OIL TANKERS

Areas subject to close-up survey and thickness measurements – areas (1) to (5) as defined in annex 1 – Thickness to be reported on TM3-DHT, TM4-DHT and TM5-DHT as appropriate.



THICKNESS MEASUREMENT – DOUBLE-HULL OIL TANKERS

Areas subject to close-up survey and thickness measurements – areas (6) to (7) as defined in annex 1 – Thickness to be reported on TM3-DHT and TM4-DHT as appropriate.



ANNEX 11

**GUIDELINES FOR TECHNICAL ASSESSMENT IN CONJUNCTION WITH
THE PLANNING OF ENHANCED SURVEYS FOR OIL TANKERS****Renewal survey****1 Introduction**

These Guidelines contain information and suggestions concerning technical assessments which may be of use in conjunction with the planning of renewal surveys of oil tankers. As indicated in 5.1.5, these Guidelines are a recommended tool which may be invoked at the discretion of an Administration, when considered necessary and appropriate, in conjunction with the preparation of the required survey programme.

2 Purpose and principles**2.1 Purpose**

The technical assessments described in these Guidelines should assist in identifying critical structural areas, nominating suspect areas and in focusing attention on structural elements or areas of structural elements which may be particularly susceptible to, or evidence a history of, wastage or damage. This information may be useful in nominating locations, areas and tanks for thickness measurement, close-up survey and tank testing.

2.2 Minimum requirements

These Guidelines may not be used to reduce the requirements of annexes 1, 2 and 3 for close-up survey, thickness measurement and tank testing, respectively, which are, in all cases, to be complied with as a minimum.

2.3 Timing

As with other aspects of survey planning, the technical assessments described in these Guidelines should be carried out by the owner or operator in cooperation with the Administration well in advance of the commencement of the renewal survey, i.e. prior to commencing the survey and normally at least 12 to 15 months before the survey's completion due date.

2.4 Aspects to be considered

Technical assessments, which may include quantitative or qualitative evaluation of relative risks of possible deterioration, of the following aspects of a particular ship may be used as a basis for the nomination of tanks and areas for survey of:

- .1 design features such as stress levels on various structural elements, design details and extent of use of high-tensile steel (HTS);
- .2 former history with respect to corrosion, cracking, buckling, indents and repairs for the particular ship as well as similar vessels, where available; and
- .3 information with respect to types of cargo carried, use of different tanks for cargo/ballast, protection of tanks and condition of coating, if any.

Technical assessments of the relative risks of susceptibility to damage or deterioration of various structural elements and areas should be judged and decided on the basis of recognized principles and practices, such as may be found in references 1 and 2.

3 Technical assessment

3.1 General

3.1.1 There are three basic types of possible failure which may be the subject of a technical assessment in connection with the planning of surveys: corrosion, cracks and buckling. Contact damages are not normally covered by the survey plan since indents are usually noted in memoranda and assumed to be dealt with as normal routine by surveyors.

3.1.2 Technical assessments performed in conjunction with the survey planning process should, in principle, be as shown schematically in figure 1 which depicts how technical assessments can be carried out in conjunction with the survey planning process. The approach is basically an evaluation of the risk, based on the knowledge and experience related to design and corrosion.

3.1.3 The design should be considered with respect to structural details which may be susceptible to buckling or cracking as a result of vibration, high stress levels or fatigue.

3.1.4 Corrosion is related to the ageing process and is closely connected with the quality of corrosion protection at newbuilding and subsequent maintenance during the service life. Corrosion may also lead to cracking and/or buckling.

3.2 Methods

3.2.1 Design details

3.2.1.1 Damage experience related to the ship in question and similar ships, where available, are the main source of information to be used in the process of planning. In addition, a selection of structural details from the design drawings should be included. Typical damage experience to be considered will consist of:

- .1 number, extent, location and frequency of cracks; and
- .2 location of buckles.

3.2.1.2 This information may be found in the survey reports and/or the owner's files, including the results of the owner's own inspections. The defects should be analysed, noted and marked on sketches.

3.2.1.3 In addition, general experience should be utilized. For example, reference should be made to reference 1, which contains a catalogue of typical damages and proposed repair methods for various tanker structural details.

3.2.1.4 Such figures should be used together with a review of the main drawings, in order to compare with the actual structure and search for similar details which may be susceptible to damage. An example is shown in figure 2. In particular, chapter 3 of reference 1 deals with various aspects specific to double-hull tankers, such as stress concentration locations, misalignment during construction, corrosion trends, fatigue considerations and areas requiring special attention, which should be considered in working out the survey planning.

3.2.1.5 The review of the main structural drawings, in addition to using the above-mentioned figures, should include checking for typical design details where cracking has been experienced. The factors contributing to damage should be carefully considered.

3.2.1.6 The use of HTS is an important factor. Details showing good service experience where ordinary, mild steel has been used may be more susceptible to damage when HTS, and its higher associated stresses, are utilized. There is extensive and, in general, good experience, with the use of HTS for longitudinal material in deck and bottom structures. Experience in other locations, where the dynamic stresses may be higher, is less favourable, e.g. side structures.

3.2.1.7 In this respect, stress calculations of typical and important components and details, in accordance with relevant methods, may prove useful and should be considered.

3.2.1.8 The selected areas of the structure identified during this process should be recorded and marked on the structural drawings to be included in the survey programme.

3.2.2 Corrosion

3.2.2.1 In order to evaluate relative corrosion risks, the following information is generally to be considered:

- .1 usage of tanks and spaces;
- .2 condition of coatings;
- .3 condition of anodes;
- .4 cleaning procedures;
- .5 previous corrosion damage;
- .6 ballast use and time for cargo tanks;
- .7 corrosion risk scheme (see reference 2, table 2.1); and
- .8 location of heated tanks.

3.2.2.2 Reference 2 gives definitive examples which can be used for judging and describing coating condition, using typical pictures of conditions.

3.2.2.3 The evaluation of corrosion risks should be based on information in reference 2, together with the age of the ship and relevant information on the anticipated condition as derived from the information collected in order to prepare the survey programme.

3.2.2.4 The various tanks and spaces should be listed with the corrosion risks nominated accordingly. Special attention should be given to the areas where the double-hull tanker is particularly exposed to corrosion. To this end, the specific aspects addressing corrosion in double-hull tankers indicated in 3.4 (Corrosion trends) of reference 1 should be taken into account.

3.2.3 *Locations for close-up survey and thickness measurement*

3.2.3.1 On the basis of the table of corrosion risks and the evaluation of design experience, the locations for initial close-up survey and thickness measurement (sections) may be nominated.

3.2.3.2 The sections subject to thickness measurement should normally be nominated in tanks and spaces where corrosion risk is judged to be the highest.

3.2.3.3 The nomination of tanks and spaces for close-up survey should, initially, be based on highest corrosion risk and should always include ballast tanks. The principle for the selection should be that the extent is increased by age or where information is insufficient or unreliable.

References

- 1 TSCF, Guidelines for the Inspection and Maintenance of Double Hull Tanker Structures, 1995.
- 2 TSCF, Guidance Manual for Tanker Structures, 1997.

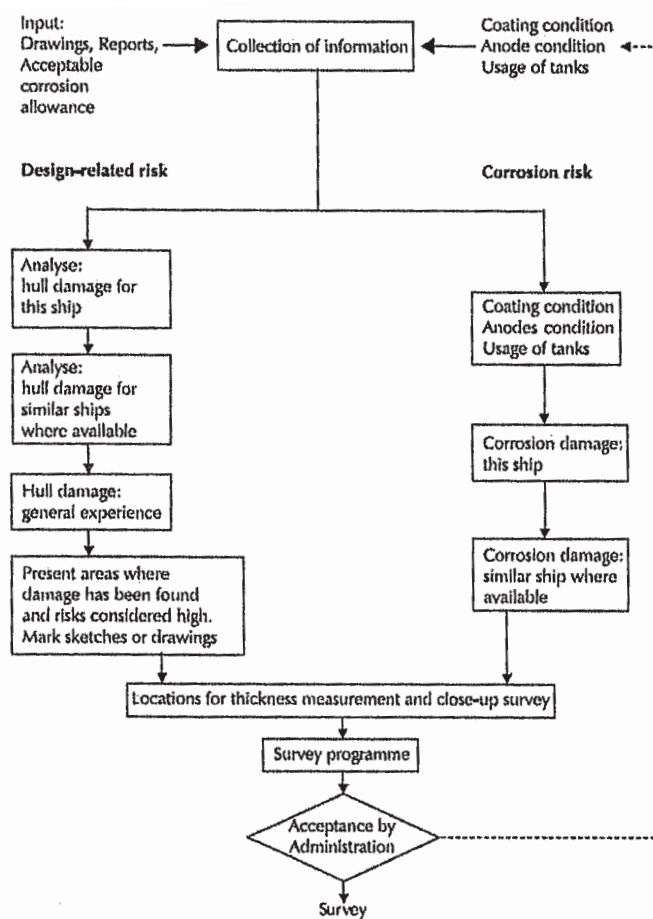


Figure 1 – Technical assessment and the survey planning process

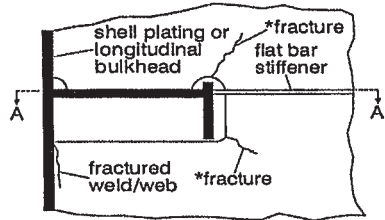
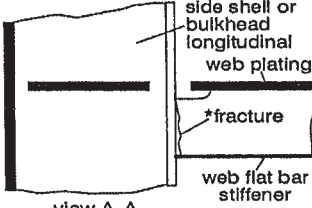
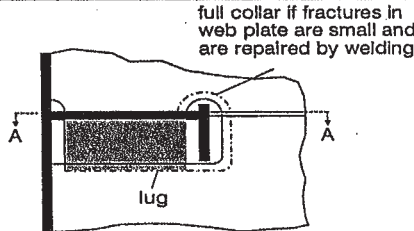
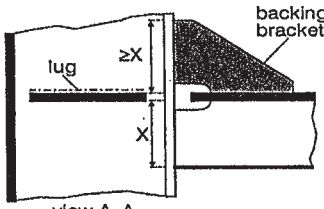
LOCATION: Connection of longitudinals to transverse webs		
EXAMPLE NO. 1 Web and flat bar fractures at cut-outs for longitudinal stiffener connections		
TYPICAL DAMAGE		PROPOSED REPAIR
  view A-A		  view A-A <i>web and flat bar cropped and part renewed or alternatively welded</i>
Note* one or more fractures may occur		
FACTORS CONTRIBUTING TO DAMAGE		
1 Asymmetrical connection of flat bar stiffener resulting in high peak stresses at the heel of the stiffener under fatigue loading. 2 Insufficient area of connection of longitudinal to web plate. 3 Defective weld at return around the plate thickness. 4 High localized corrosion at areas of stress concentration such as flat bar stiffener connections, corners of cut-out for the longitudinal and connection of web to shell at cut-outs. 5 High shear stress in the web of the transverse. 6 Dynamic seaway loads/ship motions.		
FIGURE 1	TANKER STRUCTURE CO-OPERATIVE FORUM	
	SUBJECT: CATALOGUE OF STRUCTURAL DETAILS	
	FIGURE 1	

Figure 2 – Typical damage and repair example (reproduced from reference 2)

ANNEX 12

CRITERIA FOR LONGITUDINAL STRENGTH OF HULL GIRDER FOR OIL TANKERS**1 General**

1.1 These criteria should be used for the evaluation of the longitudinal strength of the ship's hull girder as required by 8.1.2.

1.2 In order that the ship's longitudinal strength to be evaluated can be recognized as valid, fillet welding between longitudinal internal members and hull envelopes should be in sound condition so as to keep the integrity of longitudinal internal members with hull envelopes.

2 Evaluation of longitudinal strength

On oil tankers of 130 m in length and upwards and over 10 years of age, the longitudinal strength of the ship's hull girder should be evaluated in compliance with the requirements of this annex on the basis of the thickness measured, renewed or reinforced, as appropriate, during the renewal survey of the Cargo Ship Safety Construction Certificate or Cargo Ship Safety Certificate (SC renewal survey). The condition of the hull girder for longitudinal strength evaluation should be determined in accordance with the methods specified in appendix 3.

2.1 Calculation of transverse sectional areas of deck and bottom flanges of hull girder

2.1.1 The transverse sectional areas of deck flange (deck plating and deck longitudinals) and bottom flange (bottom shell plating and bottom longitudinals) of the ship's hull girder should be calculated by using the thickness measured, renewed or reinforced, as appropriate, during the SC renewal survey.

2.1.2 If the diminution of sectional areas of either deck or bottom flange exceeds 10% of their respective as-built area (i.e. original sectional area when the ship was built), either one of the following measures should be taken:

- .1 to renew or reinforce the deck or bottom flanges so that the actual sectional area is not less than 90% of the as-built area; or
- .2 to calculate the actual section of moduli (Z_{act}) of transverse section of the ship's hull girder by applying the calculation method specified in appendix 1, by using the thickness measured, renewed or reinforced, as appropriate, during the SC renewal survey.

2.2 Requirements for transverse section modulus of hull girder

2.2.1 The actual section moduli of the transverse section of the ship's hull girder, calculated in accordance with 2.1.2.2, should satisfy either of the following provisions, as applicable:

- .1 for ships constructed on or after 1 July 2002, the actual section moduli (Z_{act}) of the transverse section of the ship's hull girder calculated in accordance with the requirements of paragraph 2.1.2.2 should be not less than the diminution limits determined by the Administration, taking into account the recommendations adopted by the Organization; or
- .2 for ships constructed before 1 July 2002, the actual section moduli (Z_{act}) of the transverse section of the ship's hull girder calculated in accordance with the requirements of 2.1.2.2 should meet the criteria for minimum section modulus for ships in service required by the Administration or recognized classification society, provided that in no case Z_{act} should be less than the diminution limit of the minimum section modulus (Z_{mc}) as specified in appendix 2.

Appendix 1

CALCULATION CRITERIA OF SECTION MODULI
OF MIDSHIP SECTION OF HULL GIRDER

- 1 When calculating the transverse section modulus of the ship's hull girder, the sectional area of all continuous longitudinal strength members should be taken into account.
- 2 Large openings, i.e. openings exceeding 2.5 m in length or 1.2 m in breadth, and scallops, where scallop welding is applied, are always to be deducted from the sectional areas used in the section modulus calculation.
- 3 Smaller openings (manholes, lightening holes, single scallops in way of seams, etc.) need not be deducted, provided that the sum of their breadths or shadow area breadths in one transverse section does not reduce the section modulus at deck or bottom by more than 3% and provided that the height of lightening holes, draining holes and single scallops in longitudinals or longitudinal girders does not exceed 25% of the web depth, for scallops maximum 75 mm.
- 4 A deduction-free sum of smaller opening breadths in one transverse section in the bottom or deck area of $0.06(B - \Sigma b)$ (where B = breadth of ship, Σb = total breadth of large openings) may be considered equivalent to the above reduction in sectional modulus.
- 5 The shadow area will be obtained by drawing two tangent lines with an opening angle of 30°.
- 6 The deck modulus is related to the moulded deck line at side.
- 7 The bottom modulus is related to the base line.
- 8 Continuous trunks and longitudinal hatch coamings should be included in the longitudinal sectional area provided they are effectively supported by longitudinal bulkheads or deep girders. The deck modulus is then to be calculated by dividing the moment of inertia by the following distance, provided this is greater than the distance to the deck line at side:

$$y_t = y \left(0.9 + 0.2 \frac{x}{y} \right)$$
 where:
 y = distance from neutral axis to top of continuous strength member;
 x = distance from top of continuous strength member to centerline of the ship;
 x and y to be measured to the point giving the largest value of y_t .
- 9 Longitudinal girders between multi-hatchways will be considered by special calculations.

Appendix 2

DIMINUTION LIMIT OF MINIMUM LONGITUDINAL STRENGTH OF SHIPS IN SERVICE

1 The diminution limit of the minimum section modulus (Z_{mc}) of oil tankers in service is given by the following formula:

$$Z_{mc} = cL^2B(C_b + 0.7)k \text{ (cm}^3\text{)}$$

where:

L = Length of ships. L is the distance, in metres, on the summer load waterline from the fore-side of stem to the after side of the rudder post, or the centre of the rudder stock if there is no rudder post. L is not to be less than 96%, and need not be greater than 97%, of the extreme length on the summer load waterline. In ships with unusual stern and bow arrangement, the length L may be specially considered.

B = Greatest moulded breadth in metres.

C_b = Moulded block coefficient at draught d corresponding to summer load waterline, based on L and B . C_b is not to be taken less than 0.6.

$$C_b = \frac{\text{moulded displacement (m}^3\text{) at draught } d}{LBd}$$

$$c = 0.9c_n$$

$$c_n = 10.75 - \left(\frac{300-L}{100}\right)^{1.5} \text{ for } 130 \text{ m} \leq L \leq 300 \text{ m}$$

$$c_n = 10.75 \text{ for } 300 \text{ m} \leq L \leq 350 \text{ m}$$

$$c_n = 10.75 - \left(\frac{L-350}{150}\right)^{1.5} \text{ for } 350 \text{ m} \leq L \leq 500 \text{ m}$$

k = material factor, e.g.

k = 1.0 for mild steel with yield stress of 235 N/mm² and over

k = 0.78 for high-tensile steel with yield stress of 315 N/mm² and over

k = 0.72 for high-tensile steel with yield stress of 355 N/mm² and over.

2 Scantlings of all continuous longitudinal members of the ship's hull girder based on the section modulus requirement in 1 above are to be maintained within 0.4 L amidships. However, in special cases, based on consideration of type of ship, hull form and loading conditions, the scantlings may be gradually reduced towards the end of 0.4 L part, bearing in mind the desire not to inhibit the ship's loading flexibility.

3 However, the above standard may not be applicable to ships of unusual type or design, e.g. for ships of unusual main proportions and/or weight distributions.

Appendix 3

SAMPLING METHOD OF THICKNESS MEASUREMENTS FOR LONGITUDINAL STRENGTH EVALUATION AND REPAIR METHODS

1 Extent of longitudinal strength evaluation

Longitudinal strength should be evaluated within $0.4L$ amidships for the extent of the hull girder length that contains tanks therein and within $0.5L$ amidships for adjacent tanks which may extend beyond $0.4L$ amidships, where tanks means ballast tanks and cargo tanks.

2 Sampling method of thickness measurement

2.1 Pursuant to the requirements of section 2.5, transverse sections should be chosen such that thickness measurements can be taken for as many different tanks in corrosive environments as possible, e.g. ballast tanks sharing a common plane boundary with cargo tanks fitted with heating coils, other ballast tanks, cargo tanks permitted to be filled with seawater and other cargo tanks. Ballast tanks sharing a common plane boundary with cargo tanks fitted with heating coils and cargo tanks permitted to be filled with seawater should be selected where present.

2.2 The minimum number of transverse sections to be sampled should be in accordance with annex 2. The transverse sections should be located where the largest thickness reductions are suspected to occur or are revealed from deck and bottom plating measurements prescribed in 2.3 and should be clear of areas which have been locally renewed or reinforced.

2.3 At least two points should be measured on each deck plate and/or bottom shell plate required to be measured within the cargo area in accordance with the requirements of annex 2.

2.4 Within $0.1D$ (where D is the ship's moulded depth) of the deck and bottom at each transverse section to be measured in accordance with the requirements of annex 2, every longitudinal and girder should be measured on the web and face plate, and every plate should be measured at one point between longitudinals.

2.5 For longitudinal members other than those specified in 2.4 to be measured at each transverse section in accordance with the requirements of annex 2, every longitudinal and girder should be measured on the web and face plate, and every plate should be measured at least in one point per strake.

2.6 The thickness of each component should be determined by averaging all of the measurements taken in way of the transverse section on each component.

3 Additional measurements where the longitudinal strength is deficient

3.1 Where one or more of the transverse sections are found to be deficient in respect of the longitudinal strength requirements given in this annex, the number of transverse sections for thickness measurement should be increased such that each tank within the $0.5L$ amidships region has been sampled. Tank spaces that are partially within, but extend beyond, the $0.5L$ region, should be sampled.

3.2 Additional thickness measurements should also be performed on one transverse section forward and one aft of each repaired area to the extent necessary to ensure that the areas bordering the repaired section also comply with the requirements of the Code.

4 Effective repair methods

4.1 The extent of renewal or reinforcement carried out to comply with this annex should be in accordance with 4.2.

4.2 The minimum continuous length of a renewed or reinforced structural member should be not less than twice the spacing of the primary members in way. In addition, the thickness diminution in way of the butt joint of each joining member forward and aft of the replaced member (plates, stiffeners, girder webs and flanges, etc.) should not be within the substantial corrosion range (75% of the allowable diminution associated with each particular member). Where differences in thickness at the butt joint exceed 15% of the lower thickness, a transition taper should be provided.

4.3 Alternative repair methods involving the fitting of straps or structural member modification should be subject to special consideration. In considering the fitting of straps, it should be limited to the following conditions:

- .1 to restore and/or increase longitudinal strength;
- .2 the thickness diminution of the deck or bottom plating to be reinforced should not be within the substantial corrosion range (75% of the allowable diminution associated with the deck plating);
- .3 the alignment and arrangement, including the termination of the straps, is in accordance with a standard recognized by the Administration;
- .4 the straps are continuous over the entire 0.5L amidships length; and
- .5 continuous fillet welding and full penetration welds are used at butt welding and, depending on the width of the strap, slot welds. The welding procedures applied should be acceptable to the Administration.

4.4 The existing structure adjacent to replacement areas and in conjunction with the fitted straps, etc., should be capable of withstanding the applied loads, taking into account the buckling resistance and the condition of welds between the longitudinal members and hull envelope plating.

Part B

**CODE ON THE ENHANCED PROGRAMME OF INSPECTIONS DURING SURVEYS OF
OIL TANKERS OTHER THAN DOUBLE-HULL OIL TANKERS****1 General****1.1 Application**

1.1.1 The Code should apply to self-propelled oil tankers of 500 gross tonnage and above other than double-hull oil tankers, as defined in 1.2.1 of part A of annex B.

1.1.2 The Code should apply to surveys of hull structure and piping systems in way of cargo tanks, pump-rooms, cofferdams, pipe tunnels, void spaces within the cargo area and all ballast tanks.

1.1.3 The Code contains the minimum extent of examination, thickness measurements and tank pressure testing. The survey should be extended when substantial corrosion and/or structural defects are found and include additional close-up survey when necessary.

1.1.4 The surveys should be carried out during the surveys prescribed by regulation I/10 of the Convention.

1.2 Definitions

1.2.1 *Ballast tank* is a tank which is used solely for the carriage of salt water ballast.

1.2.2 *Combined cargo/ballast tank*, if referred to within the Code, is a tank which is used for the carriage of cargo or ballast water as a routine part of the ship's operation and will be treated as a ballast tank. Cargo tanks in which water ballast might be carried only in exceptional cases per MARPOL regulation I/18.3 are to be treated as cargo tanks.

1.2.3 *Overall survey* is a survey intended to report on the overall condition of the hull structure and determine the extent of additional close-up surveys.

1.2.4 *Close-up survey* is a survey where the details of structural components are within the close visual inspection range of the surveyor, i.e. normally within reach of hand.

1.2.5 *Transverse section* is the cross section of the hull perpendicular to the ship's centerline and includes all longitudinal members such as plating, longitudinals and girders at the deck, sides, bottom, inner bottom and longitudinal bulkheads.

1.2.6 *Representative tanks* are those which are expected to reflect the condition of other tanks of similar type and service and with similar corrosion prevention systems. When selecting representative tanks, account should be taken of the service and repair history on board and identifiable critical and/or suspect areas.

1.2.7 *Suspect areas* are locations showing substantial corrosion and/or are considered by the surveyor to be prone to rapid wastage.

1.2.8 *Substantial corrosion* is an extent of corrosion such that assessment of corrosion pattern indicates a wastage in excess of 75% of allowable margins, but within acceptable limits.

1.2.9 *Corrosion prevention system* is normally considered a full hard protective coating. Hard protective coating should usually be epoxy coating or equivalent. Other coating systems, which are neither soft nor semi-hard coatings, may be considered acceptable as alternatives provided that they are applied and maintained in compliance with the manufacturer's specifications.

1.2.10 *Coating condition* is defined as follows:

GOOD condition with only minor spot rusting;

FAIR condition with local breakdown of coating at edges of stiffeners and weld connections and/or light rusting over 20% or more of areas under consideration, but less than as defined for POOR condition;

POOR condition with general breakdown of coating over 20% or more of areas or hard scale at 10% or more of areas under consideration.

1.2.11 *Critical structural areas* are locations which have been identified from calculations to require monitoring or from the service history of the subject ship or from similar or sister ships to be sensitive to cracking, buckling or corrosion which would impair the structural integrity of the ship.

1.2.12 *Cargo area* is that part of the ship which contains cargo tanks, slop tanks and cargo/ballast pump-rooms, cofferdams, ballast tanks and 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.

1.2.13 *Intermediate survey* is a survey carried out either at the second or third annual survey.

1.2.14 *Prompt and thorough repair* is a permanent repair completed at the time of survey to the satisfaction of the surveyor, therein removing the need for the imposition of any associated condition of classification or recommendation.

1.2.15 *Specially considered* (in connection with close-up surveys and thickness measurements) means sufficient close-up inspection and thickness measurements are taken to confirm the actual average condition of the structure under coating.

1.3 Repairs

1.3.1 Any damage in association with wastage over the allowable limits (including buckling, grooving, detachment or fracture), or extensive areas of wastage over the allowable limits, which affects or, in the opinion of the Administration, will affect the ship's structural, watertight or weathertight integrity, should be promptly and thoroughly repaired. Areas to be considered include:

- .1 side shell frames, their end attachments or adjacent shell plating;
- .2 deck structure and deck plating;
- .3 bottom structure and bottom plating;
- .4 watertight or oiltight bulkheads; and
- .5 hatch covers and hatch coamings where fitted to combination carriers.

Where adequate repair facilities are not available, the Administration may allow the ship to proceed directly to a repair facility. This may require discharging the cargo and/or temporary repairs for the intended voyage.

1.3.2 Additionally, when a survey results in the identification of corrosion or structural defects, either of which, in the opinion of the Administration, will impair the ship's fitness for continued service, remedial measures should be implemented before the ship continues in service.

1.4 Surveyors

For tankers of 20,000 tons deadweight and above, two surveyors should jointly carry out the first scheduled renewal survey after the tanker passes 10 years of age (i.e. third renewal survey), and all subsequent renewal surveys and intermediate surveys. If the surveys are carried out by a recognized organization, the surveyors should be exclusively employed by such recognized organizations.

1.5 Thickness measurements and close-up surveys

In any kind of survey, i.e. renewal, intermediate, annual or other surveys having the scope of the foregoing ones, thickness measurements of structures in areas where close-up surveys are required should be carried out simultaneously with close-up surveys.

2 Renewal survey

2.1 General

2.1.1 The renewal survey may be commenced at the fourth annual survey and be progressed during the succeeding year with a view to completion by the fifth anniversary date.

2.1.2 As part of the preparation for the renewal survey, the survey programme should be dealt with, in advance of the renewal survey. The thickness measurement should not be held before the fourth annual survey.

2.1.3 The survey should include, in addition to the requirements of the annual survey, examination, tests and checks of sufficient extent to ensure that the hull and related piping as required in 2.1.5 is in a satisfactory condition and is fit for its intended purpose for the new period of validity of the Cargo Ship Safety Construction Certificate, subject to proper maintenance and operation and to periodical surveys being carried out at the due dates.

2.1.4 All cargo tanks, ballast tanks, and any other tanks within the cargo areas which are forming hull structures, pump-rooms, pipe tunnels, cofferdams and void spaces bounding cargo tanks, decks and outer hull should be examined, and this examination should be supplemented by thickness measurement and testing as required in 2.5 and 2.6, to ensure that the structural integrity remains effective. The aim of the examination is to discover substantial corrosion, significant deformation, fractures, damages or other structural deterioration that may be present.

2.1.5 Cargo piping on deck, including crude oil washing (COW) piping, and cargo and ballast piping within the above tanks and spaces should be examined and operationally tested to working pressure to attending surveyor's satisfaction to ensure that tightness and condition remain satisfactory. Special attention should be given to any ballast piping in cargo tanks and any cargo piping in any ballast tanks and void spaces, and surveyors should be advised on all occasions when this piping, including valves and fittings, are open during repair periods and can be examined internally.

2.1.6 The survey extent of combined ballast/cargo tanks should be evaluated based on the records of ballast history and extent of the corrosion prevention system provided.

2.2 *Dry-dock survey*

2.2.1 A survey in dry-dock should be a part of the renewal survey. There should be a minimum of two inspections of the outside of the ship's bottom during the five-year period of the Cargo Ship Safety Construction Certificate. In all cases, the maximum interval between bottom inspections should not exceed 36 months.

2.2.2 For ships of 15 years of age and over, inspection of the outside of the ship's bottom should be carried out with the ship in dry-dock. For ships of less than 15 years of age, alternate inspections of the ship's bottom not conducted in conjunction with the renewal survey may be carried out with the ship afloat. Inspection of the ship afloat should only be carried out when the conditions are satisfactory and the proper equipment and suitably qualified staff is available.

2.2.3 If a survey in dry-dock is not completed in conjunction with the renewal survey or if the 36 month maximum interval referred to in 2.2.1 is not complied with, the Cargo Ship Safety Construction Certificate should cease to be valid until a survey in dry-dock is completed.

2.2.4 The overall and close-up surveys and thickness measurements, as applicable, of the lower portions of the cargo tanks and ballast tanks should be carried out in accordance with the applicable requirements for renewal surveys, if not already performed.

Note: Lower portions of the cargo and ballast tanks are considered to be the parts below light ballast water line.

2.3 *Tank corrosion prevention system*

Where provided, the condition of the corrosion prevention system of cargo tanks should be examined. A ballast tank should be examined at annual intervals where:

- .1 a hard protective coating has not been applied from the time of construction; or
- .2 a soft or semi-hard coating has been applied; or
- .3 substantial corrosion is found within the tank; or
- .4 the hard protective coating is found to be in less than GOOD condition and the hard protective coating is not repaired to the satisfaction of the surveyor.

Thickness measurements should be carried out as deemed necessary by the surveyor.

2.4 *Extent of overall and close-up surveys*

2.4.1 An overall survey of all tanks and spaces should be carried out at the renewal survey. Suspect areas identified at previous surveys should be examined.

2.4.2 The minimum requirements for close-up surveys at the renewal survey are given in annex 1.

2.4.3 The surveyor may extend the scope of the close-up survey as deemed necessary taking into account the maintenance of the tanks under survey, the condition of the corrosion prevention system and also in the following cases:

- .1 In particular, tanks having structural arrangements or details which have suffered defects in similar tanks or on similar ships according to available information; and
- .2 in tanks which have structures with reduced scantlings in association with a corrosion prevention system approved by the Administration.

2.4.4 For areas in tanks where hard protective coatings are found to be in GOOD condition as defined in 1.2.10, the extent of close-up surveys according to annex 1 may be specially considered by the Administration.

2.5 *Extent of thickness measurements*

2.5.1 The minimum requirements for thickness measurements at the renewal survey are given in annex 2.

2.5.2 Provisions for extended measurements for areas with substantial corrosion are given in annex 4, and as may be additionally specified in the survey programme as required in 5.1. These extended thickness measurements should be carried out before the survey is credited as completed. Suspect areas identified at previous surveys should have thickness measurements taken.

2.5.3 The surveyor may further extend the thickness measurements as deemed necessary.

2.5.4 For areas in tanks where hard protective coatings are found to be in GOOD condition as defined in 1.2.10, the extent of thickness measurements according to annex 2 may be specially considered by the Administration.

2.5.5 Transverse sections should be chosen where the largest reductions are suspected to occur or are revealed from deck plating measurements.

2.5.6 In cases where two or three sections should be measured, at least one should include a ballast tank within 0.5L amidships. In case of oil tankers of 130 m in length and upwards (as defined in the International Convention on Load Lines in force) and more than 10 years of age, for the evaluation of the ship's longitudinal strength as required in 8.1.2, the sampling method of thickness measurements is given in annex 12.

2.6 *Extent of tank pressure testing*

2.6.1 The minimum requirements for tank pressure testing at the renewal survey are given in annex 3.

2.6.2 The surveyor may extend the tank pressure testing as deemed necessary.

2.6.3 Boundaries of ballast tanks should be tested with a head of liquid to the top of air pipes.

2.6.4 Boundaries of cargo tanks should be tested to the highest point that liquid will rise under service conditions.

3 Annual survey

3.1 General

The annual survey should consist of an examination for the purpose of ensuring, as far as practicable, that the hull and piping are maintained in a satisfactory condition and should take into account the service history, condition and extent of the corrosion prevention system of ballast tanks and areas identified in the survey report file.

3.2 Examination of the hull

3.2.1 Examination of the hull plating and its closing appliances should be carried out as far as can be seen.

3.2.2 Examination of watertight penetrations should be carried out as far as practicable.

3.3 Examination of weather decks

3.3.1 Examination of cargo tank openings including gaskets, covers, coamings and flame screens.

3.3.2 Examination of cargo tank pressure/vacuum valves and flame screens.

3.3.3 Examination of flame screens on vents to all bunker tanks.

3.3.4 Examination of cargo, crude oil washing, bunker and vent piping systems, including vent masts and headers.

3.4 Examination of cargo pump-rooms and pipe tunnels if fitted

3.4.1 Examination of all pump-room bulkheads for signs of oil leakage or fractures and, in particular, the sealing arrangements of all penetrations of pump-room bulkheads.

3.4.2 Examination of the condition of all piping systems and pipe tunnels.

3.5 Examination of ballast tanks

3.5.1 Examination of ballast tanks should be carried out when required as a consequence of the results of the renewal survey and intermediate survey. When considered necessary by the Administration or when extensive corrosion is found, thickness measurements should be carried out.

3.5.2 Where substantial corrosion as defined in 1.2.8 is found, the extent of thickness measurements should be increased in accordance with the requirements in annex 4. These extended thickness measurements should be carried out before the survey is credited as completed. Suspect areas identified at previous surveys should be examined. Areas of substantial corrosion identified at previous surveys should have thickness measurements taken.

4 Intermediate survey

4.1 General

4.1.1 Items that are additional to the requirements of the annual survey may be surveyed either at the second or third annual survey or between these surveys.

4.1.2 The survey extent of cargo and ballast tanks dependent on the age of the ship is specified in 4.2, 4.3 and 4.4.

4.1.3 For weather decks, an examination as far as applicable of cargo, crude oil washing, bunker, ballast, steam and vent piping systems as well as vent masts and headers should be carried out. If upon examination there is any doubt as to the condition of the piping, the piping may be required to be pressure tested, thickness measured or both.

4.1.4 Concurrent crediting to both intermediate survey and renewal survey for surveys and thickness measurements of spaces should not be acceptable.

4.2 *Oil tankers 5 to 10 years of age*

4.2.1 The requirements of 4.1.3 apply.

4.2.2 All ballast tanks should be examined. When considered necessary by the Administration, thickness measurement and testing should be carried out to ensure that the structural integrity remains effective.

4.2.3 A ballast tank should be examined at subsequent annual intervals where:

- .1 a hard protective coating has not been applied from the time of construction; or
- .2 a soft or semi-hard coating has been applied; or
- .3 substantial corrosion is found within the tanks; or
- .4 the hard protective coating is found to be in less than GOOD condition and the hard protective coating is not repaired to the satisfaction of the surveyor.

4.2.4 In addition to the requirements above, suspect areas identified at previous surveys should be examined.

4.3 *Oil tankers 10 to 15 years of age*

4.3.1 The requirements of the intermediate survey should be to the same extent as the previous renewal survey as required in 2 and 5.1. However, pressure testing of cargo and ballast tanks and the requirements for longitudinal strength evaluation of hull girder as required in 8.1.2 are not required unless deemed necessary by the Administration.

4.3.2 In application of 4.3.1, the intermediate survey may be commenced at the second annual survey and be progressed during the succeeding year with a view to completion at the third annual survey in lieu of the application of 2.1.1.

4.3.3 In application of 4.3.1, an underwater survey may be considered in lieu of the requirements of 2.2.

4.4 *Oil tankers exceeding 15 years of age*

4.4.1 The requirements of the intermediate survey should be to the same extent as the previous renewal survey as required in 2 and 5.1. However, pressure testing of cargo and ballast tanks and the requirements for longitudinal strength evaluation of hull girder as required in 8.1.2 are not required unless deemed necessary by the Administration.

4.4.2 In application of 4.4.1, the intermediate survey may be commenced at the second annual survey and be progressed during the succeeding year with a view to completion at the third annual survey in lieu of the application of 2.1.1.

4.4.3 In application of 4.4.1 a survey in dry-dock should be part of the intermediate survey. The overall and close-up surveys and thickness measurements, as applicable, of the lower portions of the cargo tanks and water ballast tanks should be carried out in accordance with the applicable requirements for intermediate surveys, if not already performed.

Note: Lower portions of the cargo and ballast tanks are considered to be the parts below the light ballast water line.

5 Preparations for survey

5.1 Survey programme

5.1.1 The owner in cooperation with the Administration or organization recognized by the Administration should work out a specific survey programme prior to the commencement of any part of:

- .1 the renewal survey, and
- .2 the intermediate survey for oil tanker over 10 years of age.

The survey programme at intermediate survey may consist of the survey programme at the previous renewal survey supplemented by the condition evaluation report of that renewal survey and later relevant survey reports. The survey programme should be worked out taking into account any amendments to the survey requirements implemented after the last renewal survey carried out. The survey programme should be in a written format based on the information in annex 6A. The survey should not commence until the survey programme has been agreed.

5.1.1.1 Prior to the development of the survey programme, the survey planning questionnaire should be completed by the owner based on the information set out in annex 6B, and forwarded to the Administration.

5.1.2 In developing the survey programme, the following documentation should be collected and consulted with a view to selecting tanks, areas, and structural elements to be examined:

- .1 survey status and basic ship information;
- .2 documentation on board, as described in 6.2 and 6.3;
- .3 main structural plans of cargo and ballast tanks (scantlings drawings), including information regarding use of high-tensile steels (HTS);
- .4 Condition Evaluation Report, according to annex 9;
- .5 relevant previous damage and repair history;
- .6 relevant previous survey and inspection reports from both the recognized organization and the owner;
- .7 cargo and ballast history for the last 3 years, including carriage of cargo under heated conditions;

- .8 details of the inert gas plant and tank cleaning procedures;
- .9 information and other relevant data regarding conversion or modification of the ship's cargo and ballast tanks since the time of construction;
- .10 description and history of the coating and corrosion protection system (including anodes and previous class notations), if any;
- .11 inspections of the owner's personnel during the last three years with reference to structural deterioration in general, leakages in tank boundaries and piping and condition of the coating and corrosion protection system (including anodes) if any. Guidance for reporting is shown in annex 5;
- .12 information regarding the relevant maintenance level during operation, including port State control reports of inspection containing hull related deficiencies, safety management system non-conformities relating to hull maintenance, including the associated corrective action(s); and
- .13 any other information that will help identify suspect areas and critical structural areas.

5.1.3 The submitted survey programme should account for and comply, as a minimum, with the requirements of 2.6 and annexes 1, 2 and 3 for close-up survey, thickness measurement and tank testing, respectively, and should include relevant information including at least:

- .1 basic ship information and particulars;
- .2 main structural plans of cargo and ballast tanks (scantling drawings), including information regarding use of high tensile steels (HTS);
- .3 plan of tanks;
- .4 list of tanks with information on their use, corrosion prevention system and condition of coating;
- .5 conditions for survey (e.g. information regarding tank cleaning, gas freeing, ventilation, lighting, etc.);
- .6 provisions and methods for access to structures;
- .7 equipment for surveys;
- .8 identification of tanks and areas for close-up survey (see 2.4);
- .9 identification of areas and sections for thickness measurement (see 2.5);
- .10 identification of tanks for tank testing (see 2.6);
- .11 identification of the thickness measurement company;
- .12 damage experience related to the ship in question; and
- .13 critical structural areas and suspect areas, where relevant.

5.1.4 The Administration will advise the owner of the maximum acceptable structural corrosion diminution levels applicable to the ship.

5.1.5 Use may also be made of the Guidelines for technical assessment in conjunction with the planning of enhanced surveys for tankers, contained in annex 11. These Guidelines are a recommended tool which may be invoked at the discretion of the Administration, when considered necessary and appropriate, in conjunction with the preparation of the required survey programme.

5.2 *Conditions for survey*

5.2.1 The owner should provide the necessary facilities for a safe execution of the survey.

5.2.1.1 In order to enable the attending surveyors to carry out the survey, provisions for proper and safe access should be agreed between the owner and the Administration.

5.2.1.2 Details of the means of access should be provided in the survey planning questionnaire.

5.2.1.3 In cases where the provisions of safety and required access are judged by the attending surveyors not to be adequate, the survey of the spaces involved should not proceed.

5.2.2 Tanks and spaces should be safe for access. Tanks and spaces should be gas-free and properly ventilated. Prior to entering tank, void or enclosed space, it should be verified that the atmosphere in that space is free from hazardous gas and contains sufficient oxygen.

5.2.3 In preparation for survey and thickness measurements and to allow for a thorough examination, all spaces should be cleaned including removal from surfaces of all loose accumulated corrosion scale. Spaces should be sufficiently clean and free from water, scale, dirt, oil residues, etc., to reveal corrosion, deformation, fractures, damages or other structural deterioration as well as the condition of the coating. However, those areas of structure whose renewal has already been decided by the owner need only be cleaned and descaled to the extent necessary to determine the limits of the areas to be renewed.

5.2.4 Sufficient illumination should be provided to reveal corrosion, deformation, fractures, damages or other structural deterioration as well as the condition of the coating.

5.2.5 Where soft or semi-hard coatings have been applied, safe access should be provided for the surveyor to verify the effectiveness of the coating and to carry out an assessment of the condition of internal structures which may include spot removal of the coating. When safe access cannot be provided, the soft or semi-hard coating should be removed.

5.2.6 The surveyor(s) should always be accompanied by at least one responsible person, assigned by the owner, experienced in tank and enclosed spaces inspection. In addition a backup team of at least two experienced persons should be stationed at the hatch opening of the tank or space that is being surveyed. The back-up team should continuously observe the work in the tank or space and should keep life-saving and evacuation equipment ready for use.

5.2.7 A communication system should be arranged between the survey party in the tank or space being examined, the responsible officer on deck and, as the case may be, the navigation bridge. The communication arrangements should be maintained throughout the survey.

5.3 *Access to structures*

5.3.1 For overall survey, means should be provided to enable the surveyor to examine the structure in a safe and practical way.

5.3.2 For close-up surveys, one or more of the following means for access, acceptable to the surveyor, should be provided:

- .1 permanent staging and passages through structures;
- .2 temporary staging and passages through structures;
- .3 lifts and moveable platforms;
- .4 boats or rafts;
- .5 portable ladders; and/or
- .6 other equivalent means.

5.4 *Equipment for survey*

5.4.1 Thickness measurement should normally be carried out by means of ultrasonic test equipment. The accuracy of the equipment should be proven to the surveyor as required.

5.4.2 One or more of the following fracture detection procedures may be required if deemed necessary by the surveyor:

- .1 radiographic equipment;
- .2 ultrasonic equipment;
- .3 magnetic particle equipment;
- .4 dye penetrant; and/or
- .5 other equivalent means.

5.4.3 Explosimeter, oxygen-meter, breathing apparatus, lifelines, riding belts with rope and hook and whistles together with instructions and guidance on their use should be made available during the survey. A safety checklist should be provided.

5.4.4 Adequate and safe lighting should be provided for the safe and efficient conduct of the survey.

5.4.5 Adequate protective clothing should be made available and used (e.g. safety helmet, gloves, safety shoes, etc.) during the survey.

5.5 *Surveys at sea or at anchorage*

5.5.1 Surveys at sea or at anchorage may be accepted provided the surveyor(s) is given the necessary assistance from the personnel on board. Necessary precautions and procedures for carrying out the survey should be in accordance with 5.1, 5.2, 5.3 and 5.4.

5.5.2 A communication system should be arranged between the survey party in the tank and the responsible officer on deck. This system should also include the personnel in charge of ballast pump handling if boats or rafts are used.

5.5.3 Surveys of tanks by means of boats or rafts may only be undertaken with the agreement of the surveyor, who should take into account the safety arrangements provided, including weather forecasting and ship response under foreseeable conditions and provided the expected rise of water within the tank does not exceed 0.25 m.

5.5.4 When rafts or boats are used for close-up survey the following conditions should be observed:

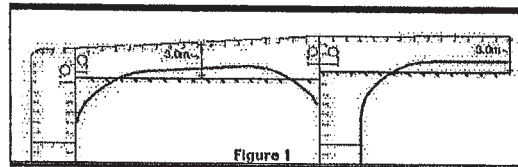
- .1 only rough duty, inflatable rafts or boats, having satisfactory residual buoyancy and stability even if one chamber is ruptured, should be used;
- .2 the boat or raft should be tethered to the access ladder and an additional person should be stationed down the access ladder with a clear view of the boat or raft;
- .3 appropriate lifejackets should be available for all participants;
- .4 the surface of water in the tank should be calm (under all foreseeable conditions the expected rise of water within the tank should not exceed 0.25 m) and the water level stationary. On no account should the level of the water be rising while the boat or raft is in use;
- .5 the tank or space must contain clean ballast water only. Even a thin sheen of oil on the water is not acceptable;
- .6 at no time should the water level be allowed to be within 1 m of the deepest under-deck web face flat so that the survey team is not isolated from a direct escape route to the tank hatch. Filling to levels above the deck transverses should only be contemplated if a deck access manhole is fitted and open in the bay being examined, so that an escape route for the survey party is available at all times. Other effective means of escape to the deck may be considered; and
- .7 if the tanks (or spaces) are connected by a common venting system, or inert gas system, the tank in which the boat or raft should be used should be isolated to prevent a transfer of gas from other tanks (or spaces).

5.5.5 Rafts or boats alone may be allowed for inspection of the underdeck areas of tanks or spaces if the depth of the webs is 1.5 m or less.

5.5.6 If the depth of the webs is more than 1.5 m, rafts or boats alone may be allowed only:

- .1 when the coating of the under-deck structure is in GOOD condition and there is no evidence of wastage; or
- .2 if a permanent means of access is provided in each bay to allow safe entry and exit. This means:
 - .1 access direct from the deck via a vertical ladder with a small platform fitted approximately 2 m below the deck; and

- .2 access to deck from a longitudinal permanent platform having ladders to deck in each end of the tank. The platform should, for the full length of the tank, be arranged in level with, or above, the maximum water level needed for rafting of under deck structure. For this purpose, the ullage corresponding to the maximum water level should be assumed not more than 3 m from the deck plate measured at the midspan of deck transverses and in the middle length of the tanks (see figure 1).



If neither of the above conditions are met, then staging or other equivalent means should be provided for the survey of the under-deck areas.

5.5.7 The use of rafts or boats alone in 5.5.5 and 5.5.6 does not preclude the use of boats or rafts to move about within a tank during a survey.

5.6 Survey planning meeting

5.6.1 Proper preparation and close cooperation between the attending surveyor(s) and the owner's representatives on board prior to and during the survey are an essential part in the safe and efficient conduct of the survey. During the survey onboard safety meetings should be held regularly.

5.6.2 Prior to commencement of any part of the renewal and intermediate survey, a survey planning meeting should be held between the attending surveyor(s), the owner's representative in attendance, the thickness measurement company operator (as applicable) and the master of the ship or an appropriately qualified representative nominated by the master or company for the purpose to ascertain that all the arrangements envisaged in the survey programme are in place, so as to ensure the safe and efficient conduct of the survey work to be carried out.

5.6.3 The following is an indicative list of items that should be addressed in the meeting:

- .1 schedule of the ship (i.e. the voyage, docking and undocking manoeuvres, periods alongside, cargo and ballast operations, etc.);
- .2 provisions and arrangements for thickness measurements (i.e. access, cleaning/de-scaling, illumination, ventilation, personal safety);
- .3 extent of the thickness measurements;
- .4 acceptance criteria (refer to the list of minimum thicknesses);
- .5 extent of close-up survey and thickness measurement considering the coating condition and suspect areas/areas of substantial corrosion;
- .6 execution of thickness measurements;

- .7 taking representative readings in general and where uneven corrosion/pitting is found;
- .8 mapping of areas of substantial corrosion; and
- .9 communication between attending surveyor(s), the thickness measurement company operator(s), and owner representative(s) concerning findings.

6 Documentation on board

6.1 General

6.1.1 The owner should obtain, supply and maintain on board the ship documentation as specified in 6.2 and 6.3, which should be readily available for the surveyor. The condition evaluation report referred to in 6.2 should include a translation into English.

6.1.2 The documentation should be kept on board for the lifetime of the ship.

6.2 Survey report file

6.2.1 A survey report file should be a part of the documentation on board consisting of:

- .1 reports of structural surveys (annex 8);
- .2 condition evaluation report (annex 9); and
- .3 thickness measurement reports (annex 10).

6.2.2 The survey report file should be available also in the owner's and the Administration offices, or in the office of the organization recognized by the Administration.

6.3 Supporting documents

The following additional documentation should be available on board:

- .1 main structural plans of cargo and ballast tanks;
- .2 previous repair history;
- .3 cargo and ballast history;
- .4 extent of use of inert gas plant and tank cleaning procedures;
- .5 inspections by ship's personnel with reference to:
 - .1 structural deterioration in general;
 - .2 leakages in bulkheads and piping; and
 - .3 condition of coating or corrosion prevention system, if any. Guidance for reporting is shown in annex 5; and
- .6 survey programme as required by 5.1 until such time as the renewal survey has been completed; and

- .7 any other information that would help to identify critical structural areas and/or suspect areas requiring inspection.

6.4 *Review of documentation on board*

Prior to survey, the surveyor should examine the completeness of the documentation on board and its contents as a basis for the survey.

7 **Procedures for thickness measurements**

7.1 *General*

7.1.1 The required thickness measurements, if not carried out by the recognized organization acting on behalf of the Administration, should be witnessed by a surveyor of the recognized organization. The surveyor should be on board to the extent necessary to control the process.

7.1.2 The thickness measurement company should be part of the survey planning meeting to be held prior to commencing the survey.

7.1.3 Thickness measurements of structures in areas where close-up surveys are required should be carried out simultaneously with close-up surveys.

7.1.4 In all cases the extent of the thickness measurements should be sufficient as to represent the actual average condition.

7.2 *Certification of thickness measurement company*

The thickness measurements should be carried out by a qualified company certified by an organization recognized by the Administration according to principles stated in annex 7.

7.3 *Reporting*

7.3.1 A thickness measurement report should be prepared and submitted to the Administration. The report should give the location of measurements, the thickness measured as well as corresponding original thickness. Furthermore, the report should give the date when the measurements were carried out, type of measuring equipment, names of personnel and their qualifications and be signed by the operator. The thickness measurement report should follow the principles as specified in the recommended procedures for thickness measurements set out in annex 10.

7.3.2 The surveyor should review the final thickness measurement report and countersign the cover page.

8 **Reporting and evaluation of survey**

8.1 *Evaluation of survey report*

8.1.1 The data and information on the structural condition of the ship collected during the survey should be evaluated for acceptability and continued structural integrity of the ship.

8.1.2 In case of oil tankers of 130 m in length and upwards (as defined in the International Convention on Load Lines in force), the ship's longitudinal strength should be evaluated by using the thickness of structural members measured, renewed and reinforced, as appropriate, during the renewal survey of safety construction carried out after the ship reached 10 years of age, in accordance with the criteria for longitudinal strength of the ship's hull girder for oil tankers specified in annex 12.

8.1.3 The analysis of data should be carried out and endorsed by the Administration or recognized organization authorized by the Administration and the conclusions of the analysis should form a part of the condition evaluation report.

8.1.4 The final result of the evaluation of the ship's longitudinal strength required in 8.1.2, after renewal or reinforcement work of structural members, if carried out as a result of initial evaluation, should be reported as a part of the condition evaluation report.

8.2 *Reporting*

8.2.1 Principles for survey reporting are shown in annex 8.

8.2.2 When a survey is split between different survey stations, a report should be made for each portion of the survey. A list of items examined and/or tested (pressure-testing, thickness measurements, etc.) and an indication of whether the item has been credited, should be made available to the next attending surveyor(s), prior to continuing or completing the survey.

8.2.3 A condition evaluation report of the survey and results should be issued to the owner as shown in annex 9 and placed on board the ship for reference at future surveys. The condition evaluation report should be endorsed by the Administration or recognized organization authorized by the Administration.

ANNEX 1

REQUIREMENTS FOR CLOSE-UP SURVEY AT RENEWAL SURVEYS

Age ≤ 5 years Renewal Survey No. 1	5 < Age ≤ 10 years Renewal Survey No. 2	10 < Age ≤ 15 years Renewal Survey No. 3	Age > 15 years Renewal Survey No. 4 and subsequent
(A) ONE WEB FRAME RING – in a ballast wing tank, if any, or a cargo wing tank used primarily for water ballast (B) ONE DECK TRANSVERSE – in a cargo tank (D) ONE TRANSVERSE BULKHEAD – in a ballast tank (D) ONE TRANSVERSE BULKHEAD – in a cargo wing tank (D) ONE TRANSVERSE BULKHEAD – in a cargo centre tank	(A) ALL WEB FRAME RINGS – in a ballast wing tank, if any, or a cargo wing tank used primarily for water ballast (B) ONE DECK TRANSVERSE – in each of the remaining ballast tanks, if any (B) ONE DECK TRANSVERSE – in a cargo wing tank (B) ONE DECK TRANSVERSE – in two cargo centre tanks (C) BOTH TRANSVERSE BULKHEADS in a wing ballast tank, if any, or a cargo wing tank used primarily for water ballast (D) ONE TRANSVERSE BULKHEAD – in each remaining ballast tank (D) ONE TRANSVERSE BULKHEAD – in a cargo wing tank (D) ONE TRANSVERSE BULKHEAD – in two cargo centre tanks	(A) ALL WEB FRAME RINGS – in all ballast tanks (A) ALL WEB FRAME RINGS – in a cargo wing tank (A) A minimum of 30% of all web frame rings in each remaining cargo wing tank (see note 1) (C) ALL TRANSVERSE BULKHEADS – in all cargo and ballast tanks (E) A minimum of 30% of deck and bottom transverses including adjacent structural members in each cargo centre tank (see note 1) (F) As considered necessary by the Administration	As for ships referred to in column 3 Additional transverses included as deemed necessary by the Administration

Note 1:

The 30% should be rounded up to the next whole integer.

- (A) Complete transverse web frame ring including adjacent structural members
- (B) Deck transverse including adjacent deck structural members
- (C) Transverse bulkheads complete – including girder system and adjacent members
- (D) Transverse bulkhead lower part – including girder system and adjacent structural members
- (E) Deck and bottom transverse including adjacent structural members
- (F) Additional complete transverse web ring frame

ANNEX 2

REQUIREMENTS FOR THICKNESS MEASUREMENTS AT RENEWAL SURVEYS

Age ≤ 5 years 1		5 < Age ≤ 10 years 2		10 < Age ≤ 15 years 3		Age > 15 years 4	
1	One section of deck plating for the full beam of the ship within the cargo area (in way of a ballast tank, if any, or a cargo tank used primarily for water ballast)	1	Within the cargo area: .1 each deck plate .2 one transverse section	1	Within the cargo area: .1 each deck plate .2 two transverse sections .3 all wind and water strakes	1	Within the cargo area: .1 each deck plate .2 three transverse sections .3 each bottom plate
2	Measurements of structural members subject to close-up survey according to annex 1, for general assessment and recording of corrosion pattern	2	Members subject to close-up survey according to annex 1, for general assessment and recording of corrosion pattern	2	Measurements of structural members subject to close-up survey according to annex 1, for general assessment and recording of corrosion pattern	2	Measurements of structural members subject to close-up survey according to annex 1, for general assessment and recording of corrosion pattern
3	Suspect areas	3	Suspect areas	3	Suspect areas	3	Suspect areas
		4	Selected wind and water strakes outside the cargo area	4	Selected wind and water strakes outside the cargo area	4	All wind and water strakes in full length

ANNEX 3
REQUIREMENTS FOR TANK PRESSURE TESTING AT RENEWAL SURVEYS

Age ≤ 5 years		Age > 5 years	
1		2	
1	Cargo tank boundaries facing ballast tanks, void spaces, pipe tunnels, fuel oil tanks, pump-rooms or cofferdams	1 All ballast tank boundaries	
2	All ballast tank boundaries.	2 All cargo tank bulkheads	

ANNEX 4

**REQUIREMENTS FOR EXTENT OF THICKNESS MEASUREMENTS AT
AREAS OF SUBSTANTIAL CORROSION**

Renewal survey within the cargo area

Bottom structure

Structural member	Extent of measurement	Pattern of measurement
1 Bottom plating	Minimum of three bays across tank, including aft bay. Measurements around and under all bell mouths	Five-point pattern for each panel between longitudinals and webs
2 Bottom longitudinals	Minimum of three longitudinals in each bay where bottom plating measured	Three measurements in line across flange and three measurements on vertical web
3 Bottom girders and brackets	At fore and aft transverse bulkhead bracket toes and in centre of tanks	Vertical line of single measurements on web plating with one measurement between each panel stiffener, or a minimum of three measurements. Two measurements across face flat. Five-point pattern on girder/bulkhead brackets
4 Bottom transverse webs	Three webs in bays where bottom plating measured, with measurements at both ends and middle	Five-point pattern over 2 m ² area. Single measurements on face flat.
5 Panel stiffening	Where fitted	Single measurements

Deck structure

Structural member	Extent of measurement	Pattern of measurement
1 Deck plating	Two bands across tank	Minimum of three measurements per plate per band
2 Deck longitudinals	Minimum of three longitudinals in each of two bays	Three measurements in line vertically on webs, and two measurements on flange (if fitted)
3 Deck girders and brackets	At fore and aft transverse bulkhead, bracket toes and in centre of tanks	Vertical line of single measurements on web plating with one measurement between each panel stiffener, or a minimum of three measurements. Two measurements across face flat. Five-point pattern on girder/bulkhead brackets
4 Deck transverse webs	Minimum of two webs with measurements at middle and both ends of span	Five-point pattern over about 2 m ² area. Single measurements on face flat
5 Panel stiffening	Where available	Single measurements

Shell and longitudinal bulkheads

Structural member	Extent of measurement	Pattern of measurement
1 Deckhead and bottom strakes, and strakes in way of stringer platforms	Plating between each pair of longitudinals in a minimum of three bays	Single measurement
2 All other strakes	Plating between every third pair of longitudinals in same three bays	Single measurement
3 Longitudinals – deckhead and bottom strakes	Each longitudinal in same three bays	Three measurements across web and one measurement on flange
4 Longitudinals – all others	Every third longitudinal in same three bays	Three measurements across web and one measurement on flange
5 Longitudinals – bracket	Minimum of three at top, middle and bottom of tank in same three bays	Five-point pattern over area of bracket
6 Web frames and cross ties	Three webs with minimum of three locations on each web, including in way of cross tie connections	Five-point pattern over about 2 m ² area, plus single measurements on web frame and cross tie face flats

Transverse bulkheads and swash bulkheads

Structural member	Extent of measurement	Pattern of measurement
1 Deckhead and bottom strakes, and strakes in way of stringer platforms	Plating between pair of stiffeners at three locations – approximately quarter, half and three-quarters width of tank	Five-point pattern between stiffeners over 1 m length
2 All other strakes	Plating between pair of stiffeners at middle location	Single measurement
3 Strakes in corrugated bulkheads	Plating for each change of scantling at centre of panel and at flange or fabricated connection	Five-point pattern over about 1 m ² of plating
4 Stiffeners	Minimum of three typical stiffeners	For web, five-point pattern over span between bracket connections (two measurements across web at each bracket connection, and one at centre of span). For flange, single measurements at each bracket toe and at centre of span
5 Brackets	Minimum of three at top, middle and bottom of tank	Five-point pattern over area of bracket
6 Deep webs and girders	Measurements at toe of bracket and centre of span	For web, five-point pattern over about 1 m ² area. Three measurements across face flat
7 Stringer platforms	All stringers with measurements at both ends and middle	Five-point pattern over 1 m ² area plus single measurements near bracket toes and on face flats

ANNEX 5

OWNER'S INSPECTION REPORT

Structural condition							
Ship's name:							
Owners's inspection report – Structural condition							
For tank No:							
Grade of steel: deck: side:							
bottom: longitudinal bulkhead:							
Elements	Cracks	Buckles	Corrosion	Coating	Pitting	Modification/repair	Other
	condition						
Deck:							
Bottom:							
Side:							
Longitudinal bulkheads:							
Transverse bulkheads:							
Repairs carried out due to:							
Thickness measurements carried out (dates):							
Results in general:							
Overdue surveys:							
Outstanding conditions of class:							
Comments:							
Date of inspection:							
Inspected by:							
Signature:							

ANNEX 6A

SURVEY PROGRAMME

Basic information and particulars

Name of ship:
IMO number:
Flag State:
Port of registry:
Gross tonnage:
Deadweight (metric tonnes):
Length between perpendiculars (m):
Shipbuilder:
Hull number:
Recognized organization (RO):
RO ship identity:
Date of delivery of the ship:
Owner:
Thickness measurement company:

1 Preamble**1.1 Scope**

1.1.1 The present survey programme covers the minimum extent of overall surveys, close-up surveys, thickness measurements and pressure testing within the cargo area, ballast tanks, including fore and aft peak tanks, required by the Code.

1.1.2 The arrangements and safety aspects of the survey should be acceptable to the attending surveyor(s).

1.2 Documentation

All documents used in the development of the survey programme should be available on board during the survey as required by section 6.

2 Arrangement of tanks and spaces

This section of the survey programme should provide information (either in the form of plans or text) on the arrangement of tanks and spaces that fall within the scope of the survey.

3 List of tanks and spaces with information on their use, extent of coatings and corrosion prevention system

This section of the survey programme should indicate any changes relating to (and should update) the information on the use of the tanks of the ship, the extent of coatings and the corrosion protective system provided in the survey planning questionnaire.

4 Conditions for survey

This section of the survey programme should provide information on the conditions for survey, e.g. information regarding cargo hold and tank cleaning, gas freeing, ventilation, lighting, etc.

5 Provisions and method of access to structures

This section of the survey programme should indicate any changes relating to (and should update) the information on the provisions and methods of access to structures provided in the survey planning questionnaire.

6 List of equipment for survey

This section of the survey programme should identify and list the equipment that will be made available for carrying out the survey and the required thickness measurements.

7 Survey requirements**7.1 Overall survey**

This section of the survey programme should identify and list the spaces that should undergo an overall survey for the ship in accordance with 2.4.1.

7.2 Close-up survey

This section of the survey programme should identify and list the hull structures that should undergo a close-up survey for the ship in accordance with 2.4.2.

8 Identification of tanks for tank testing

This section of the survey programme should identify and list the tanks that should undergo tank testing for the ship in accordance with 2.6.

9 Identification of areas and sections for thickness measurements

This section of the survey programme should identify and list the areas and sections where thickness measurements should be taken in accordance with 2.5.1.

10 Minimum thickness of hull structures

This section of the survey programme should specify the minimum thickness for hull structures of the ship that are subject to the Code (indicate either (a) or preferably (b), if such information is available):

- (a) Determined from the attached wastage allowance table and the original thickness to the hull structure plans of the ship;

(b) Given in the following table(s):

Area or location	Original as-built thickness (mm)	Minimum thickness (mm)	Substantial corrosion thickness (mm)
Deck			
Plating			
Longitudinals			
Longitudinal girders			
Bottom			
Plating			
Longitudinals			
Longitudinal girders			
Ship side			
Plating			
Longitudinals			
Longitudinal girders			
Longitudinal bulkhead			
Plating			
Longitudinals			
Longitudinal girders			
Inner bottom			
Plating			
Longitudinals			
Longitudinal girders			
Transverse bulkheads			
Plating			
Stiffeners			
Transverse web frames, floors and stringers			
Plating			
Flanges			
Stiffeners			
Cross ties			
Flanges			
Webs			

Note: The wastage allowance tables should be attached to the survey programme.

11 Thickness measurement company

This section of the survey programme should identify changes, if any, relating to the information on the thickness measurement company provided in the survey planning questionnaire.

12 Damage experience related to the ship

This section of the survey programme should, using the tables provided below, provide details of the hull damages for at least the last three years in way of the cargo and ballast tanks and void spaces within the cargo area. These damages are subject to survey.

Hull damages sorted by location for the ship

Tank or space number or area	Possible cause, if known	Description of the damages	Location	Repair	Date of repair

Hull damages for sister or similar ships (if available) in the case of design related damage

Tank or space number or area	Possible cause, if known	Description of the damages	Location	Repair	Date of repair

13 Areas identified with substantial corrosion from previous surveys

This section of the survey programme should identify and list the areas of substantial corrosion from previous surveys.

14 Critical structural areas and suspect areas

This section of the survey programme should identify and list the critical structural areas and the suspect areas, if such information is available.

15 Other relevant comments and information

This section of the survey programme should provide any other comments and information relevant to the survey.

Appendices

Appendix 1 – List of plans

Paragraph 5.1.3.2 requires that main structural plans of cargo and ballast tanks (scantling drawings), including information on regarding use of high tensile steel (HTS), to be available. This appendix of the survey programme should identify and list the main structural plans which form part of the survey programme.

Appendix 2 – Survey planning questionnaire

The survey planning questionnaire (annex 6B), which has been submitted by the owner, should be appended to the survey programme.

Appendix 3 – Other documentation

This part of the survey programme should identify and list any other documentation that forms part of the plan.

Prepared by the owner in cooperation with the Administration for compliance with 5.1.3.

Date:

(name and signature of authorized owner's representative)

Date:

(name and signature of authorized representative of the Administration)

ANNEX 6B

SURVEY PLANNING QUESTIONNAIRE

The following information will enable the owner in cooperation with the Administration to develop a survey programme complying with the requirements of the Code. It is essential that the owner provides, when completing the present questionnaire, up-to-date information. The present questionnaire, when completed, should provide all information and material required by the resolution.

Particulars

Ship's name:

IMO number:

Flag State:

Port of registry:

Owner:

Recognized organization (RO):

Gross tonnage:

Deadweight (metric tonnes):

Date of delivery:

Information on access provision for close-up surveys and thickness measurement

The owner should indicate, in the table below, the means of access to the structures subject to close-up survey and thickness measurement. A close-up survey is an examination where the details of structural components are within the close visual inspection range of the attending surveyor, i.e. normally within reach of hand.

Tank No.	Structure	C (Cargo)/B (Ballast)	Temporary staging	Rafts	Ladders	Direct access	Other means (please specify)
F.P.	Fore peak						
A.P.	Aft peak						
	Underdeck						
	Side shell						
	Bottom transverse						
Wing tanks	Longitudinal						
	Transverse						
	Under deck						
Centre tanks	Bottom transverse						
	Transverse						

History of cargo with H₂S content or heated cargo for the last three years together with indication as to whether cargo was heated and, where available, Material Safety Data Sheets (MSDS)

Owner's inspections

Using a format similar to that of the table below (which is given as an example), the owner should provide details of the results of their inspections for the last three years on all cargo and ballast tanks and void spaces within the cargo area, including peak tanks.

Tank No.	Corrosion protection (1)	Coating extent (2)	Coating condition (3)	Structural deterioration (4)	Tank damage history (5)
Cargo centre tanks					
Cargo wing tanks					
Slop					
Ballast tanks					
Aft peak					
Fore peak					
Miscellaneous spaces					

Note:

Indicate tanks which are used for oil/ballast.

- 1) HC = hard coating; SC = soft coating;
A = anodes; NP = no protection
- 2) U = upper part; M = middle part;
L = lower part; C = complete
- 3) G = good; F = fair; P = poor;
RC = recoated (during the last three years)
- 4) N = no findings recorded; Y = findings recorded,
description of findings should be attached to this questionnaire
- 5) DR = Damage & Repair; L = Leakages;
CV = Conversion (description to be attached to this questionnaire)

Name of owner's representative:

.....

Signature:

Date:

List the reports of port State control inspections containing hull structural related deficiencies, relevant information on rectification of the deficiencies:

List non-conformities related to hull maintenance, including the associated corrective actions:

[illegible]

ANNEX 7

PROCEDURES FOR CERTIFICATION OF A COMPANY ENGAGED IN THICKNESS MEASUREMENT OF HULL STRUCTURES**1 Application**

This guidance applies for certification of the company which intends to engage in the thickness measurement of hull structures of ships.

2 Procedures for certification*Submission of documents*

2.1 The following documents should be submitted to an organization recognized by the Administration for approval:

- .1 outline of the company, e.g. organization and management structure;
- .2 experience of the company on thickness measurement of hull structures of ships;
- .3 technicians' careers, i.e. experience of technicians as thickness measurement operators, technical knowledge and experience of hull structure, etc. Operators should be qualified according to a recognized industrial NDT Standard;
- .4 equipment used for thickness measurement such as ultrasonic testing machines and their maintenance/calibration procedures;
- .5 a guide for thickness measurement operators;
- .6 training programmes for technicians for thickness measurement; and
- .7 measurement record format in accordance with recommended procedures for thickness measurements (see annex 10).

Auditing of the company

2.2 Upon reviewing the documents submitted with satisfactory results, the company should be audited in order to ascertain that the company is duly organized and managed in accordance with the documents submitted, and eventually is capable of conducting thickness measurement of the hull structure of ships.

2.3 Certification is conditional upon an on board demonstration of thickness measurement as well as satisfactory reporting.

3 Certification

3.1 Upon satisfactory results of both the audit of the company referred to in 2.2 and the demonstration tests referred to in 2.3, the Administration or organization recognized by the Administration should issue a certificate of approval as well as a notice to the effect that the thickness measurement operation system of the company has been certified.

3.2 Renewal/endorsement of the certificate should be made at intervals not exceeding three years by verification that original conditions are maintained.

4 Report of any alteration to the certified thickness measurement operation system

In cases where any alteration to the certified thickness measurement operation system of the company is made, such an alteration should be immediately reported to the organization recognized by the Administration. Re-audit should be made where deemed necessary by the organization recognized by the Administration.

5 Withdrawal of the certification

The certification may be withdrawn in the following cases:

- .1 where the measurements were improperly carried out or the results were improperly reported;
- .2 where the surveyor found any deficiencies in the approved thickness measurement operation system of the company; and
- .3 where the company failed to report any alteration referred to in 4 to the organization recognized by the Administration as required.

ANNEX 8

SURVEY REPORTING PRINCIPLES

As a principle, for oil tankers subject to the Code, the surveyor should include the following contents in his report for survey of hull structure and piping systems, as relevant for the survey.

1 General

1.1 A survey report should be generated in the following cases:

- .1 in connection with commencement, continuation and/or completion of periodical hull surveys, i.e. annual, intermediate and renewal surveys, as relevant;
- .2 when structural damages/defects have been found;
- .3 when repairs, renewals or modifications have been carried out; and
- .4 when condition of class (recommendation) has been imposed or deleted.

1.2 The reporting should provide:

- .1 evidence that prescribed surveys have been carried out in accordance with applicable requirements;
- .2 documentation of surveys carried out with findings, repairs carried out and condition of class (recommendation) imposed or deleted;
- .3 survey records, including actions taken, which should form an auditable documentary trail. Survey reports should be kept in the survey report file required to be on board;
- .4 information for planning of future surveys; and
- .5 information which may be used as input for maintenance of classification rules and instructions.

1.3 When a survey is split between different survey stations, a report should be made for each portion of the survey. A list of items surveyed, relevant findings and an indication of whether the item has been credited, should be made available to the next attending surveyor, prior to continuing or completing the survey. Thickness measurement and tank testing carried out should also be listed for the next surveyor.

2 Extent of the survey

2.1 Identification of compartments where an overall survey has been carried out.

2.2 Identification of locations, in each tank, where a close-up survey has been carried out, together with information of the means of access used.

2.3 Identification of locations, in each tank, where thickness measurement has been carried out.

Note: As a minimum, the identification of location of close-up survey and thickness measurement should include a confirmation with description of individual structural members corresponding to the extent of requirements stipulated in this part of Annex B based on type of periodical survey and the ship's age.

Where only partial survey is required, i.e. one web frame ring/one deck transverse, the identification should include location within each ballast tank and cargo hold by reference to frame numbers.

2.4 For areas in tanks where protective coating is found to be in good condition and the extent of close-up survey and/or thickness measurement has been specially considered, structures subject to special consideration should be identified.

2.5 Identification of tanks subject to tank testing.

2.6 Identification of piping systems on deck, including crude oil washing (COW) piping, and ballast piping within cargo and ballast tanks, pipe tunnels, cofferdams and void spaces where:

- .1 examination, including internal examination of piping with valves and fittings and thickness measurement, as relevant, has been carried out; and
- .2 operational test to working pressure has been carried out.

3 Result of survey

3.1 Type, extent and condition of protective coating in each tank, as relevant (rated GOOD, FAIR or POOR), including identification of tanks fitted with anodes.

3.2 Structural condition of each compartment with information on the following, as relevant:

- .1 Identification of findings, such as:
 - .1 corrosion with description of location, type and extent;
 - .2 areas with substantial corrosion;
 - .3 cracks/fractures with description of location and extent;
 - .4 buckling with description of location and extent; and
 - .5 indents with description of location and extent.
- .2 Identification of compartments where no structural damages/defects are found. The report may be supplemented by sketches/photographs.
- .3 Thickness measurement report should be verified and signed by the surveyor controlling the measurements on board.

- .4 Evaluation result of longitudinal strength of the hull girder of oil tankers of 130 m in length and upwards and over 10 years of age. The following data should be included, as relevant:
 - .1 measured and as-built transverse sectional areas of deck and bottom flanges;
 - .2 diminution of transverse sectional areas of deck and bottom flanges; and
 - .3 details of renewals or reinforcements carried out, as relevant (see 4.2).

4 Actions taken with respect to findings

4.1 Whenever the attending surveyor is of the opinion that repairs are required, each item to be repaired should be identified in a numbered list. Whenever repairs are carried out, details of the repairs effected should be reported by making specific reference to relevant items in the numbered list.

4.2 Repairs carried out should be reported with identification of:

- .1 compartment;
- .2 structural member;
- .3 repair method (i.e. renewal or modification), including:
 - .3.1 steel grades and scantlings (if different from the original);
 - .3.2 sketches/photographs, as appropriate;
- .4 repair extent; and
- .5 non-destructive tests (NDT).

4.3 For repairs not completed at the time of survey, condition of class/recommendation should be imposed with a specific time limit for the repairs. In order to provide correct and proper information to the surveyor attending for survey of the repairs, condition of class/recommendation should be sufficiently detailed with identification of each item to be repaired. For identification of extensive repairs, reference may be given to the survey report.

ANNEX 9

CONDITION EVALUATION REPORT

Issued upon completion of renewal survey

General particulars

Ship's name: Class/Administration identity number:
 Previous class/Administration identity number(s):
 IMO number:

Port of registry: National flag:
 Previous national flag(s):

Deadweight (metric tonnes): Gross tonnage:
 National:
 ITC (1969):

Date of build: Classification notation:

Date of major conversion:
 Type of conversion: Owner:
 Previous owner(s):

1 The survey reports and documents listed below have been reviewed by the undersigned and found to be satisfactory.

2 A summary of the survey is attached herewith on sheet 2

3 The renewal survey has been completed in accordance with the present Code on (date)

Condition evaluation report completed by	Name Signature	Title
Office	Date	
Condition evaluation report verified by	Name Signature	Title
Office	Date	

Attached reports and documents:

- 1)
- 2)
- 3)
- 4)
- 5)
- 6)

Contents of condition evaluation report

- Part 1 – General particulars: - See front page
- Part 2 – Report review: - Where and how survey was done
- Part 3 – Close-up survey: - Extent (which tanks)
- Part 4 – Cargo and ballast piping system: - Examined
- Part 5 – Thickness measurements: - Operationally tested
- Reference to thickness measurement report
- Summary of where measured
- Separate form indicating the spaces with substantial corrosion, and corresponding:
 - thickness diminution
 - corrosion pattern
- Part 6 – Tank corrosion prevention system: - Separate form indicating:
 - location of coating/anodes
 - condition of coating (if applicable)
- Part 7 – Repairs: - Identification of spaces/areas
- Part 8 – Condition of class/flag State requirements:
- Part 9 – Memoranda:
 - Acceptable defects
 - Any points of attention for future surveys, e.g. for suspect areas
 - Extended annual/intermediate survey due to coating breakdown
- Part 10 – Evaluation results of the ship's longitudinal strength (for oil tankers of 130 m in length and upwards and over 10 years of age)
- Part 11 – Conclusion: - Statement on evaluation/verification of survey report

Extract of thickness measurements

Reference is made to the thickness measurement report:

Position of substantially corroded tanks/areas ¹ or areas with deep pitting ³	Thickness diminution [%]	Corrosion pattern ²	Remarks: (e.g. reference to attached sketches)

Notes:

- 1 Substantial corrosion, i.e. 75 to 100% of acceptable margins wasted.
- 2 P = Pitting
C = Corrosion in general
- 3 Any bottom plating with a pitting intensity of 20% or more, with wastage in the substantial corrosion range or having an average depth of pitting of $\frac{1}{8}$ or more of actual plate thickness should be noted.

Tank corrosion prevention system

Tank Nos. ¹	Tank corrosion prevention system ²	Coating condition ³	Remarks

Notes:

- 1 All segregated ballast tanks and combined cargo/ballast tanks should be listed.
- 2 C = Coating NP = No protection
- 3 Coating condition according to the following standard:

GOOD condition with only minor spot rusting.

FAIR condition with local breakdown of coating at edges of stiffeners and weld connections and/or light rusting over 20% or more of areas under consideration, but less than as defined for POOR condition.

POOR condition with general breakdown of coating over 20% or more of areas or hard scale at 10% or more of areas under consideration.

If coating condition less than GOOD is given, extended annual surveys should be introduced. This should be noted in part 9 of the Contents of condition evaluation report.

Evaluation result of longitudinal strength of the hull girder of oil tankers of 130 m in length and upwards and of over 10 years of age
(of sections 1, 2 and 3 below, only one applicable section should be completed)

1 This section applies to ships regardless of the date of construction: Transverse sectional areas of deck flange (deck plating and deck longitudinals) and bottom flange (bottom shell plating and bottom longitudinals) of the ship's hull girder have been calculated by using the thickness measured, renewed or reinforced, as appropriate, during the renewal survey of the Cargo Ship Safety Construction Certificate or the Cargo Ship Safety Certificate (SC renewal survey) most recently conducted after the ship reached 10 years of age, and found that the diminution of the transverse sectional area does not exceed 10% of the as-built area, as shown in the following table:

Table 1 – Transverse sectional area of hull girder flange

		Measured	As-built	Diminution
Transverse section 1	Deck flange	cm ²	cm ²	cm ² (%)
	Bottom flange	cm ²	cm ²	cm ² (%)
Transverse section 2	Deck flange	cm ²	cm ²	cm ² (%)
	Bottom flange	cm ²	cm ²	cm ² (%)
Transverse section 3	Deck flange	cm ²	cm ²	cm ² (%)
	Bottom flange	cm ²	cm ²	cm ² (%)

2 This section applies to ships constructed on or after 1 July 2002: Section moduli of transverse section of the ship's hull girder have been calculated by using the thickness of structural members measured, renewed or reinforced, as appropriate, during the SC renewal survey most recently conducted after the ship reached 10 years of age in accordance with the provisions of paragraph 2.2.1.1 of annex 12, and are found to be within their diminution limits determined by the Administration, taking into account the recommendations adopted by the Organization, as shown in the following table:

Table 2 – Transverse section modulus of hull girder

		Z _{act} (cm ³) ¹	Z _{req} (cm ³) ²	Remarks
Transverse section 1	Upper deck			
	Bottom			
Transverse section 2	Upper deck			
	Bottom			
Transverse section 3	Upper deck			
	Bottom			

Notes:

- 1 Z_{act} means the actual section moduli of the transverse section of the ship's hull girder calculated by using the thickness of structural members measured, renewed or reinforced, as appropriate, during the SC renewal survey, in accordance with the provisions of paragraph 2.2.1.1 of annex 12.
- 2 Z_{req} means the diminution limit of the longitudinal bending strength of ships, as calculated in accordance with the provisions of paragraph 2.2.1.1 of annex 12.

The calculation sheets for Z_{act} should be attached to this report.

3 This section applies to ships constructed before 1 July 2002: Section moduli of transverse sections of the ship's hull girder have been calculated by using the thickness of structural members measured, renewed or reinforced, as appropriate, during the SC renewal survey most recently conducted after the ship reached 10 years of age in accordance with the provisions of paragraph 2.2.1.2 of annex 12, and found to meet the criteria required by the Administration or the recognized classification society and that Z_{act} is not less than Z_{mc} (defined in note 2 below) as specified in appendix 2 to annex 12, as shown in the following table.

Describe the criteria for acceptance of the minimum section moduli of the ship's hull girder for ships in service required by the Administration or the recognized classification society.

Table 3 – Transverse section modulus of hull girder

		$Z_{act} (cm^3)^1$	$Z_{mc} (cm^3)^2$	Remarks
Transverse section 1	Upper deck			
	Bottom			
Transverse section 2	Upper deck			
	Bottom			
Transverse section 3	Upper deck			
	Bottom			

Notes:

- 1 As defined in note 1 of table 2.
- 2 Z_{mc} means the diminution limit of minimum section modulus calculated in accordance with the provisions of paragraph 2.2.1.2 of annex 12.

ANNEX 10

RECOMMENDED PROCEDURES FOR THICKNESS MEASUREMENTS**General**

- 1 These procedures should be used for recording thickness measurements as required by annexes 2 and 4.
- 2 Reporting forms TM1-T, TM2-T(i), TM2-T(ii), TM3-T, TM4-T, TM5-T and TM6-T, set out in appendix 2, should be used for recording thickness measurements and the maximum allowable diminution should be stated. The maximum allowable diminution could be stated in an attached document.
- 3 Appendix 3 contains guidance diagrams and notes relating to the reporting forms and the requirements for thickness measurement.
- 4 The reporting forms should, where appropriate, be supplemented by data presented on structural sketches.

Appendix 1

GENERAL PARTICULARS

Ship's name:
 IMO number:
 Class/Administration identity number:
 Port of registry:
 Gross tonnage:
 Deadweight:
 Date of build:
 Classification society:

Name of company performing thickness measurement:
 Thickness measurement company certified by:
 Certificate number:
 Certificate valid from: to
 Place of measurement:
 First date of measurement:
 Last date of measurement:
 Periodical survey/intermediate survey due:
 Details of measurement equipment:
 Qualification of operator:
 Report number: consisting of pages
 Name of operator: Name of surveyor:
 Signature of operator: Signature of surveyor:
 Company official stamp: Administration:

Official stamp

Appendix 2

Report on thickness measurement of all deck plating, all bottom shell plating or side shell plating (TM1-T)

Ship's name.....		Class Identity No.....		Report No.....		IMO number.....		
STRAKE								
POSITION								
PLATE	No. or letter	Orig. thk. (mm)	Forward reading		Aft reading		Mean diminution %	Max. allow. dimin. (mm)
			Gauged P	S	Diminution P mm	%		
12th forward								
11th								
10th								
9th								
8th								
7th								
6th								
5th								
4th								
3rd								
2nd								
1st								
Amidships								
1st aft								
2nd								
3rd								
4th								
5th								
6th								
7th								
8th								
10th								
11th								
12th								
Operator's signature.....								Notes — see following page

Notes to report TM1-T:

- 1 This report should be used for recording the thickness measurement of:
 - .1 All strength deck plating within the cargo area.
 - .2 All keel, bottom shell plating and bilge plating within the cargo area.
 - .3 Side shell plating including selected wind and water strakes outside the cargo area.
 - .4 All wind and water strakes within the cargo area
- 2 The strake position should be clearly indicated as follows:
 - .1 For strength deck plating, indicate the number of the strake of plating inboard from the stringer plate.
 - .2 For bottom plating, indicate the number of the strake of plating outboard from the keel plate.
 - .3 For side shell plating, give number of the strake of plating below sheer strake and letter as shown on shell expansion.
- 3 For oil tankers, all deck plating strakes should be recorded, for ore/oil ships only the deck plating strakes outside line of openings should be recorded.
- 4 Measurements should be taken at the forward and aft areas of all plates and where plates cross ballast/cargo tank boundaries, separate measurements for the area of plating in way of each type of tank should be recorded.
- 5 The single measurements recorded should represent the average of multiple measurements.
- 6 The maximum allowable diminution could be stated in an attached document.

Report on thickness measurement of shell and deck plating (one, two or three transverse sections) (TM2-T(ii))

Ship's name..... Class Identity No..... Report No..... IMO number.....

STRAKE POSITION	FIRST TRANSVERSE SECTION AT FRAME NUMBER....						SECOND TRANSVERSE SECTION AT FRAME NUMBER....						THIRD TRANSVERSE SECTION AT FRAME NUMBER....					
	No. or letter	Orig. thk. mm	Max allow. dthn. mm	Gauged P	Diminution P mm	Diminution S %	No. or letter	Orig. thk. mm	Max allow. dthn. mm	Gauged P	Diminution P mm	Diminution S %	No. or letter	Orig. thk. mm	Max allow. dthn. mm	Gauged P	Diminution P mm	Diminution S %
Stringer plate																		
1st stake inboard																		
2nd																		
3rd																		
4th																		
5th																		
6th																		
7th																		
8th																		
9th																		
10th																		
11th																		
12th																		
13th																		
14th																		
centre strake																		
sheerstrake																		
TOPSIDE TOTAL																		
Operator's signature.....																		

Notes – see following page

Notes to report TM2-T(I):

- 1 This report should be used for recording the thickness measurement of strength deck plating and sheerstrake plating transverse sections:

One, two or three sections within the cargo area comprising structural items (1), (2) and (3) as shown on the diagrams of typical transverse section indicating longitudinal and transverse members, in appendix 3.
- 2 For oil tankers all deck plating strakes should be recorded, for ore/oil ships only the deck plating strakes outside line of openings should be recorded.
- 3 The topside area comprises deck plating, stringer plate and sheerstrake (including rounded gunwales).
- 4 The exact frame station of measurement should be stated.
- 5 The single measurements recorded should represent the average of multiple measurements.
- 6 The maximum allowable diminution could be stated in an attached document.

Report on thickness measurement of shell and deck plating (one, two or three transverse sections) (TM2-T(ii))

Ship's name..... Class Identity No..... Report No..... IMO number..... SHELL PLATING NUMBER.....

STRAKE POSITION	FIRST TRANSVERSE SECTION AT FRAME NUMBER.....						SECOND TRANSVERSE SECTION AT FRAME NUMBER.....						THIRD TRANSVERSE SECTION AT FRAME NUMBER.....						
	No. or lette r	Orig thk. mm	Max allow. dimin mm	Gauge d P	Diminutio n P mm	Diminutio n S mm	No. or lette r	Orig thk. mm	Max allow. dimin mm	Gauge d P	Diminutio n P mm	Diminutio n S mm	No. or lette r	Orig thk. mm	Max allow. dimin mm	Gauge d P	Diminutio n P mm	Diminutio n S mm	
1st below sheerstrak e																			
2nd																			
3rd																			
4th																			
5th																			
6th																			
7th																			
8th																			
9th																			
10th																			
11th																			
12th																			
13th																			
14th																			
15th																			
16th																			
17th																			
18th																			
19th																			
20th																			
Keel strake																			
BOTTOM TOTAL																			

Operator's signature..... Notes – see following page

Notes to report TM2-T(II):

- 1 This report should be used for recording the thickness measurements of shell plating transverse sections:

One, two or three sections within the cargo area comprising structural items (4), (5), (6), and (7) as shown on the diagrams of typical transverse section indicating longitudinal and transverse members, in appendix 3.
- 2 The bottom area comprises keel, bottom and bilge plating.
- 3 The exact frame station of measurement should be stated.
- 4 The single measurements recorded should represent the average of multiple measurements.
- 5 The maximum allowable diminution could be stated in an attached document.

Notes to report TM3-T:

- 1 This report should be used for recording the thickness measurement of longitudinal members at transverse sections:

One, two or three sections within the cargo area comprising structural items (8) to (20) as shown on the diagrams of typical transverse section indicating longitudinal and transverse members, in appendix 3.
- 2 The exact frame station of measurement should be stated.
- 3 The single measurements recorded should represent the average of multiple measurements.
- 4 The maximum allowable diminution could be stated in an attached document.

Notes to report TM4-T:

- 1 This report should be used for recording the thickness measurement of transverse structural members, comprising appropriate structural items (25) to (32) as shown on the diagrams of typical transverse section indicating longitudinal and transverse members in appendix 3.
- 2 Guidance for areas of measurement is indicated in appendix 3.
- 3 The single measurements recorded should represent the average of multiple measurements.
- 4 The maximum allowable diminution could be stated in an attached document.

Notes to report TM5-T:

- 1 This report should be used for recording the thickness measurement of W.T./O.T. transverse bulkheads.
- 2 Guidance for areas of measurement is indicated in appendix 3.
- 3 The single measurements recorded should represent the average of multiple measurements.
- 4 The maximum allowable diminution could be stated in an attached document.

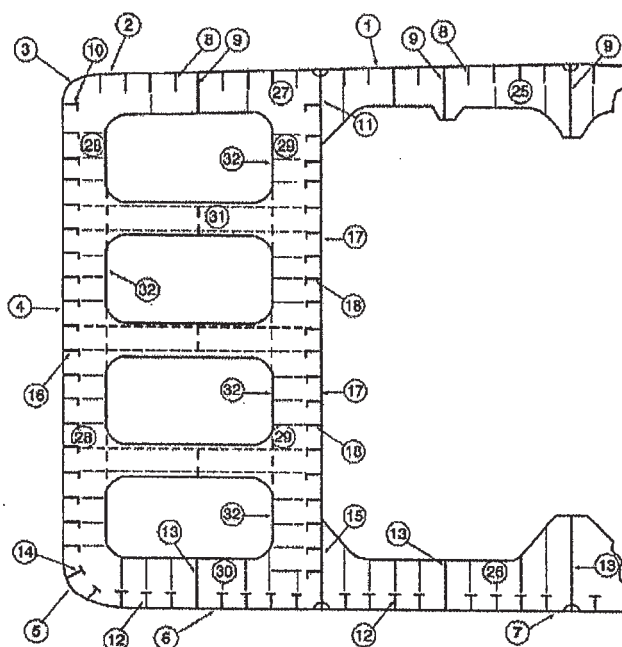
Notes to report TM6-T:

- 1 This report should be used for recording the thickness measurement of miscellaneous structural members including structural items (36), (37) and (38) shown in appendix 3.
- 2 The single measurements recorded should represent the average of multiple measurements.
- 3 The maximum allowable diminution could be stated in an attached document.

Appendix 3

GUIDANCE ON THICKNESS MEASUREMENT

Typical transverse section of oil tanker indicating longitudinal and transverse members



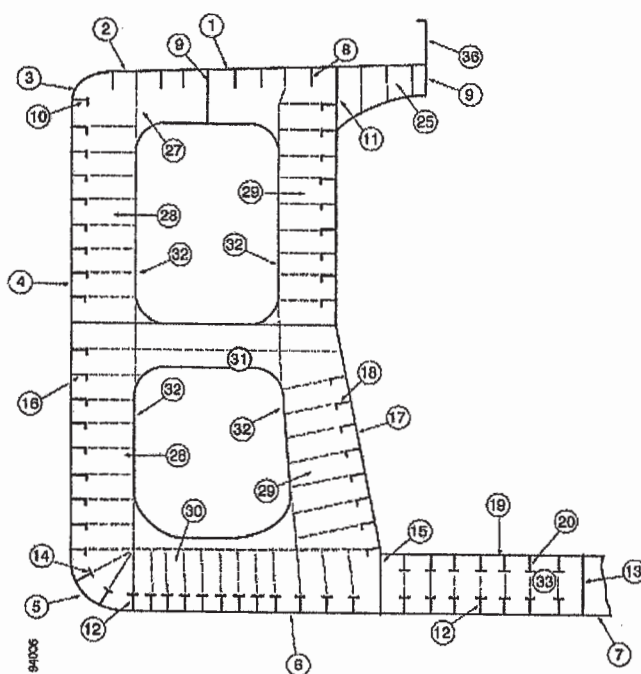
REPORT ON TM2-T(I) & (II)	
①	Strength deck plating
②	Stringer plate
③	Sheerstrake
④	Side shell plating
⑤	Bilge plating
⑥	Bottom shell plating
⑦	Keel plate

REPORT ON TM6-T	
③⑥	Hatch coamings
③⑦	Deck plating between hatches
③⑧	Hatch covers
③⑨	
④①	

REPORT ON TM3-T	
⑧	Deck longitudinal
⑨	Deck girders
⑩	Sheerstrake longitudinal
⑪	Longitudinal bulkhead top strake
⑫	Bottom longitudinal
⑬	Bottom girders
⑭	Bilge longitudinal
⑮	Longitudinal bulkhead lower strake
⑯	Side shell longitudinal
⑰	Longitudinal bulkhead plating (remainder)
⑱	Longitudinal bulkhead longitudinal
⑲	Inner bottom plating
⑳	Inner bottom longitudinal
㉑	
㉒	
㉓	
㉔	

REPORT ON TM4-T	
㉕	Deck transverse centre tank
㉖	Bottom transverse centre tank
㉗	Deck transverse wing tank
㉘	Side shell vertical web
㉙	Longitudinal bulkhead vertical web
㉚	Bottom transverse wing tank
㉛	Studs
㉜	Transverse web face plate
㉝	O.B. floors
㉞	
㉟	

Typical transverse section of ore/oil ship indicating longitudinal and transverse members



REPORT ON TM2-T_{III} & (II)

- ① Strength deck plating
- ② Stringer plate
- ③ Sheerstrake
- ④ Side shell plating
- ⑤ Bilge plating
- ⑥ Bottom shell plating
- ⑦ Keel plate

REPORT ON TM6-Y

- ③⑥ Hatch coamings
- ③⑦ Deck plating between hatches
- ③⑧ Hatch covers
- ③⑨
- ④①

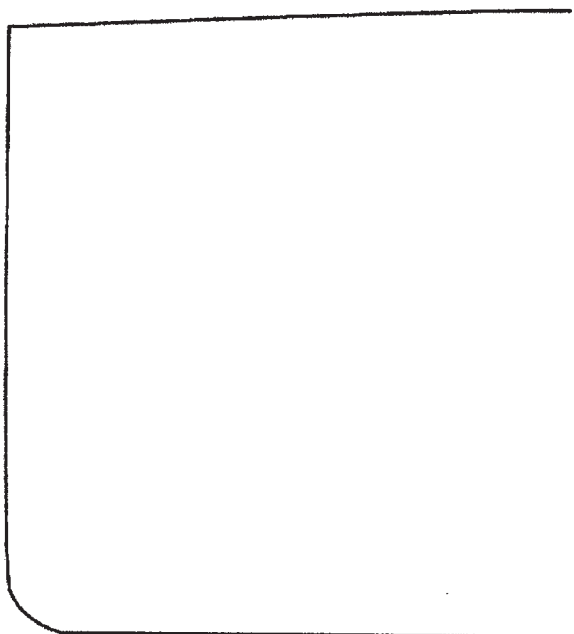
REPORT ON TM3-T

- ⑧ Deck longitudinals
- ⑨ Deck girders
- ⑩ Sheerstrake longitudinals
- ⑪ Longitudinal bulkhead top strake
- ⑫ Bottom longitudinals
- ⑬ Bottom girders
- ⑭ Bilge longitudinal
- ⑮ Longitudinal bulkhead lower strake
- ⑯ Side shell longitudinals
- ⑰ Longitudinal bulkhead plating (remainder)
- ⑱ Longitudinal bulkhead longitudinals
- ⑲ Inner bottom plating
- ⑳ Inner bottom longitudinals
- ㉑
- ㉒
- ㉓
- ㉔

REPORT ON TM4-T

- ㉕ Deck transverse centre tank
- ㉖ Bottom transverse centre tank
- ㉗ Deck transverse wing tank
- ㉘ Side shell vertical web
- ㉙ Longitudinal bulkhead vertical web
- ㉚ Bottom transverse wing tank
- ㉛ Struts
- ㉜ Transverse web face plate
- ㉝ D.B. floors
- ㉞
- ㉟

Transverse section outline (to be used for longitudinal and transverse members where typical oil tanker or oil/ore ship sections are not applicable)



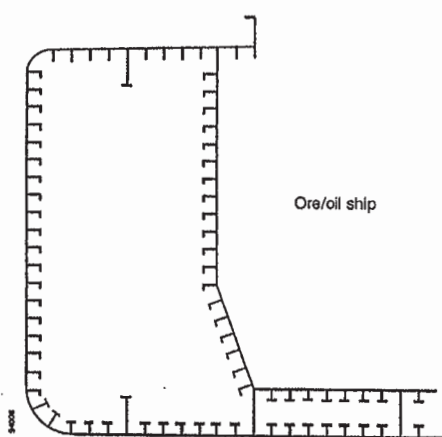
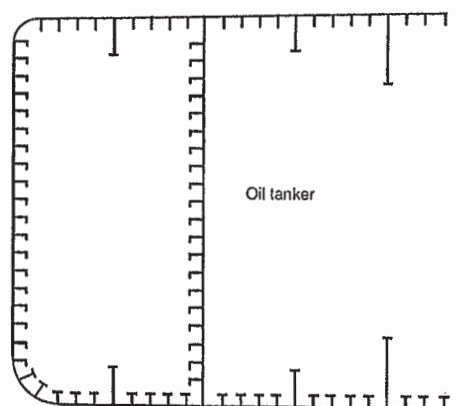
REPORT ON TM2-TM3 & TM4	
①	Strength deck plating
②	Stringer plate
③	Sheerstrake
④	Side shell plating
⑤	Bilge plating
⑥	Bottom shell plating
⑦	Keel plate

REPORT ON TM6-T	
③⑥	Hatch coamings
③⑦	Deck plating between hatches
③⑧	Hatch covers
③⑨	
④①	

REPORT ON TM3-T	
⑧	Deck longitudinals
⑨	Deck girders
⑩	Sheerstrake longitudinals
⑪	Longitudinal bulkhead top strake
⑫	Bottom longitudinals
⑬	Bottom girders
⑭	Bilge longitudinals
⑮	Longitudinal bulkhead lower strake
⑯	Side shell longitudinals
⑰	Longitudinal bulkhead plating (remainder)
⑱	Longitudinal bulkhead longitudinals
⑲	Inner bottom plating
⑳	Inner bottom longitudinals
㉑	
㉒	
㉓	
㉔	

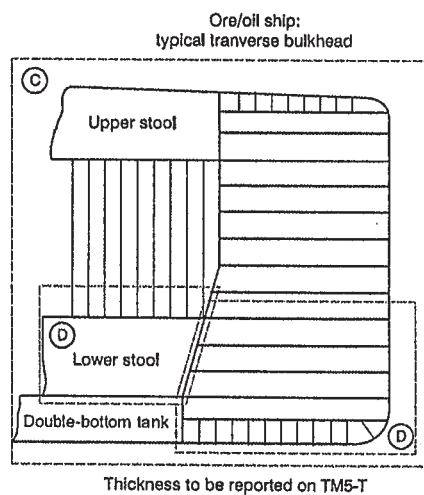
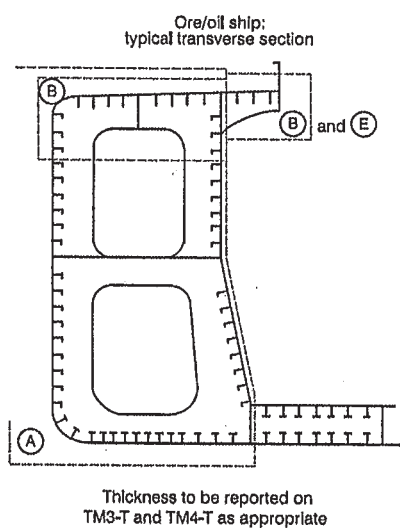
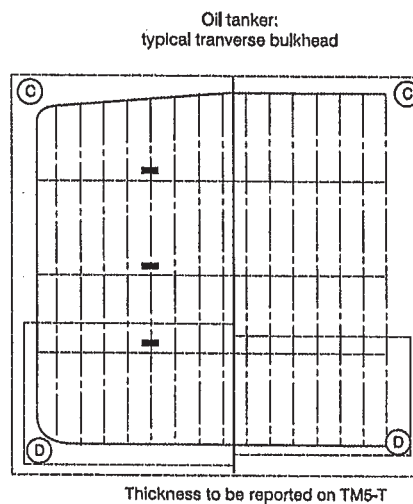
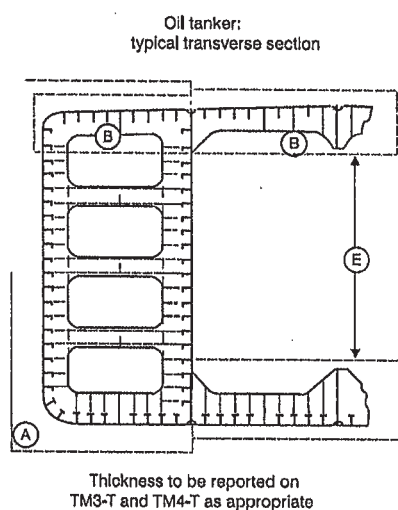
REPORT ON TM4-T	
㉕	Deck transverse centre tank
㉖	Bottom transverse centre tank
㉗	Deck transverse wing tank
㉘	Side shell vertical web
㉙	Longitudinal bulkhead vertical web
㉚	Bottom transverse wing tank
㉛	Struts
㉜	Transverse web face plate
㉝	W.B. floors
㉞	
㉟	

**Typical transverse sections showing all longitudinal members
to be reported on TM2-T(i) & (ii) and TM3-T**



Close-up survey requirements

(Transverse sections of oil tankers and ore/oil ships showing typical areas for thickness measurement in association with close-up survey requirements)



94008

Close-up
survey area

Recommendations for the extent and pattern of thickness
measurements are indicated in annex 4.

ANNEX 11

**GUIDELINES FOR TECHNICAL ASSESSMENT IN CONJUNCTION WITH
THE PLANNING OF ENHANCED SURVEYS FOR OIL TANKERS****Renewal survey****1 Introduction**

These Guidelines contain information and suggestions concerning technical assessments which may be of use in conjunction with the planning of enhanced special surveys of oil tankers. As indicated in 5.1.5, these Guidelines are a recommended tool which may be invoked at the discretion of an Administration, when considered necessary and appropriate, in conjunction with the preparation of the required survey programme.

2 Purpose and principles**2.1 Purpose**

The purpose of the technical assessments described in these Guidelines is to assist in identifying critical structural areas, nominating suspect areas and in focusing attention on structural elements or areas of structural elements which may be particularly susceptible to, or evidence a history of, wastage or damage. This information may be useful in nominating locations, areas and tanks for thickness measurement, close-up survey and tank testing.

2.2 Minimum requirements

These Guidelines may not be used to reduce the requirements of annexes 1, 2 and 3 for close-up survey, thickness measurement and tank testing, respectively, which are, in all cases, to be complied with as a minimum.

2.3 Timing

As with other aspects of survey planning, the technical assessments described in these Guidelines should be carried out by the owner or operator in cooperation with the Administration well in advance of the commencement of the renewal survey, i.e. prior to commencing the survey and normally at least 12 to 15 months before the survey's completion due date.

2.4 Aspects to be considered

2.4.1 Technical assessments, which may include quantitative or qualitative evaluation of relative risks of possible deterioration, of the following aspects of a particular ship may be used as a basis for the nomination of tanks and areas for survey:

- .1 design features such as stress levels on various structural elements, design details and extent of use of high-tensile steel (HTS);
- .2 former history with respect to corrosion, cracking, buckling, indents and repairs for the particular ship as well as similar vessels, where available; and
- .3 information with respect to types of cargo carried, use of different tanks for cargo/ballast, protection of tanks and condition of coating, if any.

2.4.2 Technical assessments of the relative risks of susceptibility to damage or deterioration of various structural elements and areas should be judged and decided on the basis of recognized principles and practices, such as may be found in references 1 and 2.

3 Technical assessment

3.1 General

3.1.1 There are three basic types of possible failure which may be the subject of technical assessment in connection with planning of surveys: corrosion, cracks and buckling. Contact damages are not normally covered by the survey plan since indents are usually noted in memoranda and assumed to be dealt with as a normal routine by surveyors.

3.1.2 Technical assessments performed in conjunction with the survey planning process should, in principle, be as shown schematically in figure 1 which depicts, schematically, how technical assessments can be carried out in conjunction with the survey planning process. The approach is basically an evaluation of the risk based on the knowledge and experience related to design and corrosion.

3.1.3 The design should be considered with respect to structural details which may be susceptible to buckling or cracking as a result of vibration, high stress levels or fatigue.

3.1.4 Corrosion is related to the ageing process, and is closely connected with the quality of corrosion protection at newbuilding, and subsequent maintenance during the service life. Corrosion may also lead to cracking and/or buckling.

3.2 Methods

3.2.1 Design details

3.2.1.1 Damage experience related to the ship in question and similar ships, where available, are the main source of information to be used in the process of planning. In addition, a selection of structural details from the design drawings should be included. Typical damage experience to be considered will consist of:

- .1 number, extent, location and frequency of cracks; and
- .2 location of buckles.

3.2.1.2 This information may be found in the survey reports and/or the owner's files, including the results of the owner's own inspections. The defects should be analysed, noted and marked on sketches.

3.2.1.3 In addition, general experience should be utilized. For example, reference should be made to reference 1, which contains a catalogue of typical damages and proposed repair methods for various tanker structural details.

3.2.1.4 Such figures should be used together with a review of the main drawings, in order to compare with the actual structure and search for similar details which may be susceptible to damage. An example is shown in figure 2.

3.2.1.5 The review of the main structural drawings, in addition to using the above-mentioned figures, should include checking for typical design details where cracking has been experienced. The factors contributing to damage should be carefully considered.

3.2.1.6 The use of HTS is an important factor. Details showing good service experience where ordinary, mild steel has been used may be more susceptible to damage when HTS, and its higher associated stresses, are utilized. There is extensive and, in general, good experience, with the use of HTS for longitudinal material in deck and bottom structures. Experience in other locations, where the dynamic stresses may be higher, is less favourable, e.g. side structures.

3.2.1.7 In this respect, stress calculations of typical and important components and details, in accordance with relevant methods, may prove useful and should be considered.

3.2.1.8 The selected areas of the structure identified during this process should be recorded and marked on the structural drawings to be included in the survey programme.

3.2.2 *Corrosion*

3.2.2.1 In order to evaluate relative corrosion risks, the following information is generally to be considered:

- .1 usage of tanks and spaces;
- .2 condition of coatings;
- .3 condition of anodes;
- .4 cleaning procedures;
- .5 previous corrosion damage;
- .6 ballast use and time for cargo tanks;
- .7 corrosion risk scheme (see reference 2, table 3.1); and
- .8 location of heated tanks.

3.2.2.2 Reference 2 gives definitive examples which can be used for judging and describing coating condition, using typical pictures of conditions.

3.2.2.3 The evaluation of corrosion risks should be based on information in reference 2, together with the age of the ship and relevant information on the anticipated condition as derived from the information collected in order to prepare the survey programme.

3.2.2.4 The various tanks and spaces should be listed with the corrosion risks nominated accordingly.

3.2.3 *Locations for close-up survey and thickness measurement*

3.2.3.1 On the basis of the table of corrosion risks and the evaluation of design experience, the locations for initial close-up survey and thickness measurement (sections) may be nominated.

3.2.3.2 The sections subject to thickness measurement should normally be nominated in tanks and spaces where corrosion risk is judged to be the highest.

3.2.3.3 The nomination of tanks and spaces for close-up survey should, initially, be based on highest corrosion risk, and should always include ballast tanks. The principle for the selection should be that the extent is increased by age or where information is insufficient or unreliable.

References

- 1 TSCF, Guidance Manual for the Inspection and Condition Assessment of Tanker Structures, 1986.
- 2 TSCF, Condition Evaluation and Maintenance of Tanker Structures, 1992.

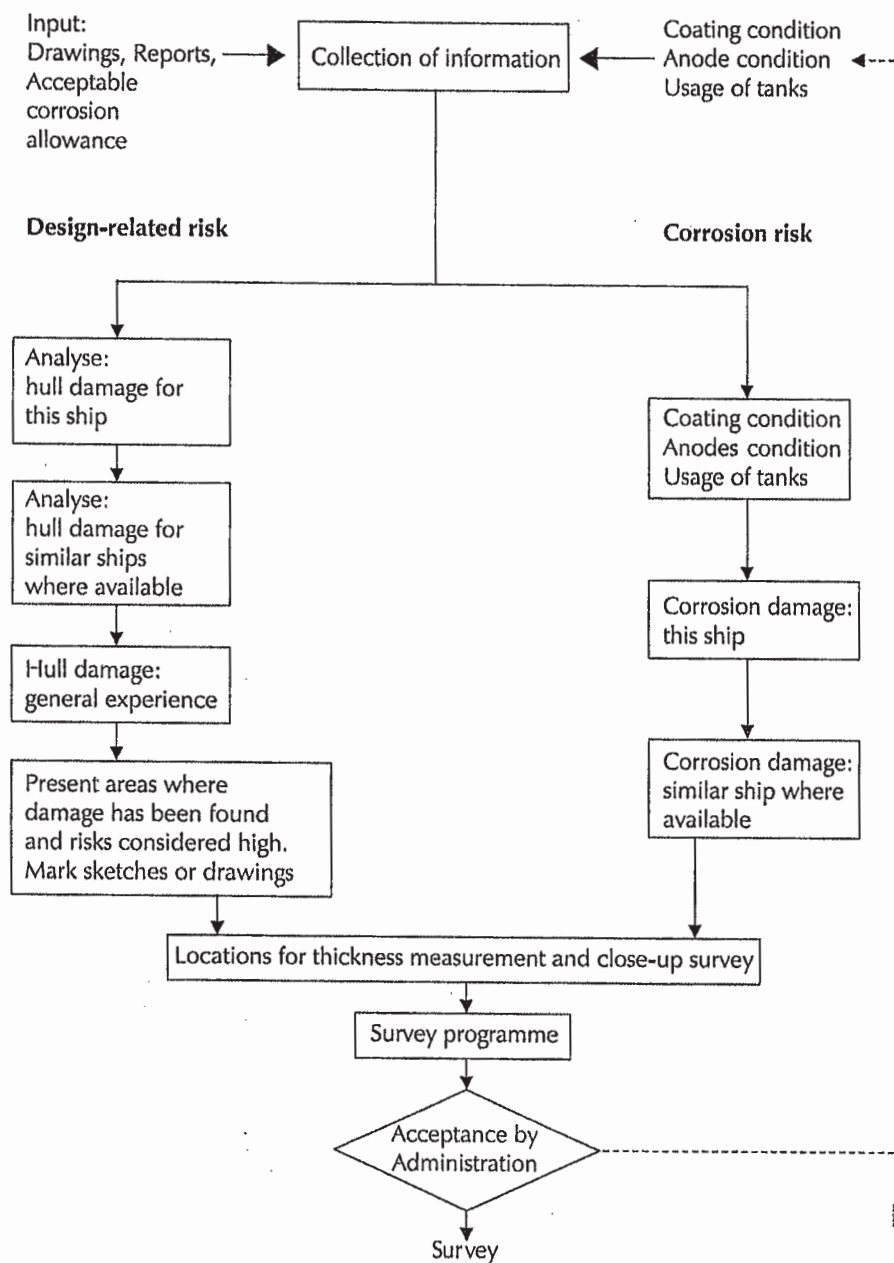


Figure 1 – Planning process: technical assessment and the survey

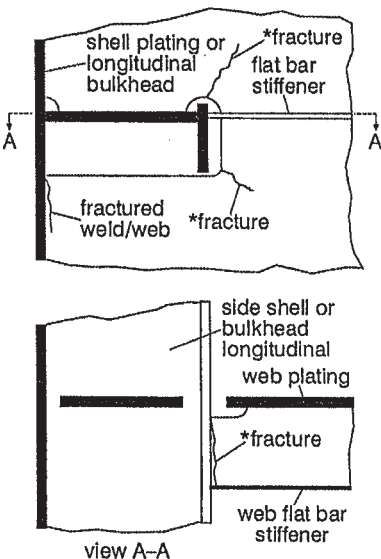
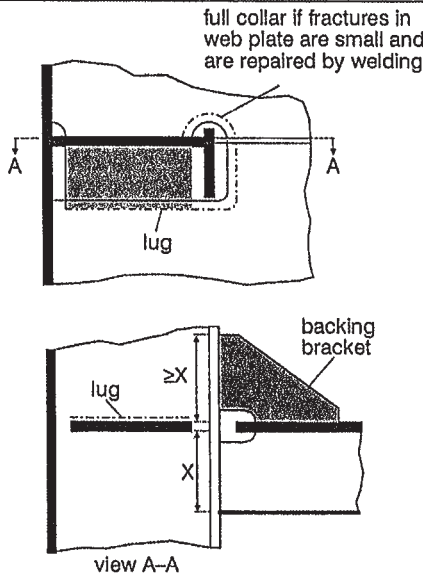
LOCATION: Connection of longitudinals to transverse webs		
EXAMPLE NO. 1 Web and flat bar fractures at cut-outs for longitudinal stiffener connections		
TYPICAL DAMAGE		PROPOSED REPAIR
 view A-A		 view A-A
Note* one or more fractures may occur		
FACTORS CONTRIBUTING TO DAMAGE		
1 Asymmetrical connection of flat bar stiffener resulting in high peak stresses at the heel of the stiffener under fatigue loading. 2 Insufficient area of connection of longitudinal to web plate. 3 Defective weld at return around the plate thickness. 4 High localized corrosion at areas of stress concentration such as flat bar stiffener connections, corners of cut-out for the longitudinal and connection of web to shell at cut-outs. 5 High shear stress in the web of the transverse. 6 Dynamic seaway loads/ship motions.		
FIGURE 1	TANKER STRUCTURE CO-OPERATIVE FORUM SUBJECT: CATALOGUE OF STRUCTURAL DETAILS	FIGURE 1

Figure 2 – Typical damage and repair example (reproduced from reference 1)

ANNEX 12

CRITERIA FOR LONGITUDINAL STRENGTH OF HULL GIRDER
FOR OIL TANKERS**1 General**

1.1 These criteria should be used for the evaluation of the longitudinal strength of the ship's hull girder as required by 8.1.2.

1.2 In order that the ship's longitudinal strength to be evaluated can be recognized as valid, fillet welding between longitudinal internal members and hull envelopes should be in sound condition so as to keep the integrity of longitudinal internal members with hull envelopes.

2 Evaluation of longitudinal strength

On oil tankers of 130 m in length and upwards and over 10 years of age, the longitudinal strength of the ship's hull girder should be evaluated in compliance with the requirements of this annex on the basis of the thickness measured, renewed or reinforced, as appropriate, during the renewal survey of the Cargo Ship Safety Construction Certificate or Cargo Ship Safety Certificate (SC renewal survey). The condition of the hull girder for longitudinal strength evaluation should be determined in accordance with the methods specified in appendix 3.

2.1 Calculation of transverse sectional areas of deck and bottom flanges of hull girder

2.1.1 The transverse sectional areas of deck flange (deck plating and deck longitudinals) and bottom flange (bottom shell plating and bottom longitudinals) of the ship's hull girder should be calculated by using the thickness measured, renewed or reinforced, as appropriate, during the SC renewal survey.

2.1.2 If the diminution of sectional areas of either deck or bottom flange exceeds 10% of their respective as-built area (i.e. original sectional area when the ship was built), either one of the following measures should be taken:

- .1 to renew or reinforce the deck or bottom flanges so that the actual sectional area is not less than 90% of the as-built area; or
- .2 to calculate the actual section of moduli (Z_{act}) of transverse section of the ship's hull girder by applying the calculation method specified in appendix 1, by using the thickness measured, renewed or reinforced, as appropriate, during the SC renewal survey.

2.2 Requirements for transverse section modulus of hull girder

2.2.1 The actual section moduli of the transverse section of the ship's hull girder, calculated in accordance with paragraph 2.1.2.2, should satisfy either of the following provisions, as applicable:

- .1 for ships constructed on or after 1 July 2002, the actual section moduli (Z_{act}) of the transverse section of the ship's hull girder calculated in accordance with the requirements of paragraph 2.1.2.2 should be not less than the diminution limits determined by the Administration, taking into account the recommendations adopted by the Organization; or
- .2 for ships constructed before 1 July 2002, the actual section moduli (Z_{act}) of the transverse section of the ship's hull girder calculated in accordance with the requirements of paragraph 2.1.2.2 should meet the criteria for minimum section modulus for ships in service required by the Administration or recognized classification society, provided that in no case Z_{act} should be less than the diminution limit of the minimum section modulus (Z_{mc}) as specified in appendix 2.

Appendix 1

CALCULATION CRITERIA OF SECTION MODULI OF
MIDSHIP SECTION OF HULL GIRDER

- 1 When calculating the transverse section modulus of the ship's hull girder, the sectional area of all continuous longitudinal strength members should be taken into account.
- 2 Large openings, i.e. openings exceeding 2.5 m in length or 1.2 m in breadth, and scallops, where scallop welding is applied, are always to be deducted from the sectional areas used in the section modulus calculation.
- 3 Smaller openings (manholes, lightening holes, single scallops in way of seams, etc.) need not be deducted, provided that the sum of their breadths or shadow area breadths in one transverse section does not reduce the section modulus at deck or bottom by more than 3% and provided that the height of lightening holes, draining holes and single scallops in longitudinals or longitudinal girders does not exceed 25% of the web depth, for scallops of maximum 75 mm.
- 4 A deduction-free sum of smaller opening breadths in one transverse section in the bottom or deck area of $0.06 (B - \Sigma b)$ (where B = breadth of ship, Σb = total breadth of large openings) may be considered equivalent to the above reduction in sectional modulus.
- 5 The shadow area will be obtained by drawing two tangent lines with an opening angle of 30° .
- 6 The deck modulus is related to the moulded deck line at side.
- 7 The bottom modulus is related to the base line.
- 8 Continuous trunks and longitudinal hatch coamings should be included in the longitudinal sectional area provided they are effectively supported by longitudinal bulkheads or deep girders. The deck modulus is then to be calculated by dividing the moment of inertia by the following distance, provided this is greater than the distance to the deck line at side:

$$y_t = y (0.9 + 0.2 \frac{x}{y})$$

where:

y = distance from neutral axis to top of continuous strength member;

x = distance from top of continuous strength member to centerline of the ship;

x and y to be measured to the point giving the largest value of y_t .

- 9 Longitudinal girders between multi-hatchways will be considered by special calculations.

Appendix 2

DIMINUTION LIMIT OF MINIMUM LONGITUDINAL STRENGTH OF SHIPS IN SERVICE

1 The diminution limit of the minimum section modulus (Z_{mc}) of oil tankers in service is given by the following formula:

$$Z_{mc} = cL^2 B (C_b + 0.7)k \quad (\text{cm}^3)$$

where:

L = Length of ship. L is the distance, in metres, on the summer load waterline from the fore-side of stem to the after-side of the rudder post, or the centre of the rudder stock if there is no rudder post. L is not to be less than 96%, and need not be greater than 97%, of the extreme length on the summer load waterline. In ships with unusual stern and bow arrangement, the length L may be specially considered.

B = Greatest moulded breadth in metres.

C_b = Moulded block coefficient at draught d corresponding to summer load waterline, based on L and B . C_b is not to be taken less than 0.6.

$$C_b = \frac{\text{moulded displacement (m}^3\text{) at draught } d}{LBd}$$

$$c = 0.9c_n$$

$$c_n = 10.75 - \left(\frac{300-L}{100}\right)^{1.5} \quad \text{for } 130 \text{ m} \leq L \leq 300 \text{ m}$$

$$c_n = 10.75 \quad \text{for } 300 \text{ m} \leq L \leq 350 \text{ m}$$

$$c_n = 10.75 - \left(\frac{L-350}{150}\right)^{1.5} \quad \text{for } 350 \text{ m} \leq L \leq 500 \text{ m}$$

k = material factor, e.g.

$$k = 1.0 \text{ for mild steel with yield stress of } 235 \text{ N/mm}^2 \text{ and over}$$

$$k = 0.78 \text{ for high-tensile steel with yield stress of } 315 \text{ N/mm}^2 \text{ and over}$$

$$k = 0.72 \text{ for high-tensile steel with yield stress of } 355 \text{ N/mm}^2 \text{ and over.}$$

2 Scantlings of all continuous longitudinal members of the ship's hull girder based on the section modulus requirement in 1 above should be maintained within $0.4L$ amidships. However, in special cases, based on consideration of type of ship, hull form and loading conditions, the scantlings may be gradually reduced towards the end of $0.4L$ part, bearing in mind the desire not to inhibit the ship's loading flexibility.

3 However, the above standard may not be applicable to ships of unusual type or design, e.g. for ships of unusual main proportions and/or weight distributions.

Appendix 3**SAMPLING METHOD OF THICKNESS MEASUREMENTS FOR LONGITUDINAL STRENGTH EVALUATION AND REPAIR METHODS****1 Extent of longitudinal strength evaluation**

Longitudinal strength should be evaluated within 0.4L amidships for the extent of the hull girder length that contains tanks therein and within 0.5L amidships for adjacent tanks which may extend beyond 0.4L amidships, where tanks means ballast tanks and cargo tanks.

2 Sampling method of thickness measurement

2.1 Pursuant to the requirements of section 2.5, transverse sections should be chosen such that thickness measurements can be taken for as many different tanks in corrosive environments as possible, e.g. ballast tanks sharing a common plane boundary with cargo tanks fitted with heating coils, other ballast tanks, cargo tanks permitted to be filled with sea water and other cargo tanks. Ballast tanks sharing a common plane boundary with cargo tanks fitted with heating coils and cargo tanks permitted to be filled with seawater should be selected where present.

2.2 The minimum number of transverse sections to be sampled should be in accordance with annex 2. The transverse sections should be located where the largest thickness reductions are suspected to occur or are revealed from deck and bottom plating measurements prescribed in 2.3 and should be clear of areas which have been locally renewed or reinforced.

2.3 At least two points should be measured on each deck plate and/or bottom shell plate required to be measured within the cargo area in accordance with the requirements of annex 2.

2.4 Within 0.1D (where *D* is the ship's moulded depth) of the deck and bottom at each transverse section to be measured in accordance with the requirements of annex 2, every longitudinal and girder should be measured on the web and face plate, and every plate should be measured at one point between longitudinals.

2.5 For longitudinal members other than those specified in 2.4 to be measured at each transverse section in accordance with the requirements of annex 2, every longitudinal and girder should be measured on the web and face plate, and every plate should be measured at least in one point per strake.

2.6 The thickness of each component should be determined by averaging all of the measurements taken in way of the transverse section on each component.

3 Additional measurements where the longitudinal strength is deficient

3.1 Where one or more of the transverse sections are found to be deficient in respect of the longitudinal strength requirements given in this annex, the number of transverse sections for thickness measurement should be increased such that each tank within the 0.5L amidships region has been sampled. Tank spaces that are partially within, but extend beyond, the 0.5L region, should be sampled.

3.2 Additional thickness measurements should also be performed on one transverse section forward and one aft of each repaired area to the extent necessary to ensure that the areas bordering the repaired section also comply with the requirements of the Code.

4 Effective repair methods

4.1 The extent of renewal or reinforcement carried out to comply with this annex should be in accordance with 4.2.

4.2 The minimum continuous length of a renewed or reinforced structural member should be not less than twice the spacing of the primary members in way. In addition, the thickness diminution in way of the butt joint of each joining member forward and aft of the replaced member (plates, stiffeners, girder webs and flanges, etc.) should not be within the substantial corrosion range (75% of the allowable diminution associated with each particular member). Where differences in thickness at the butt joint exceed 15% of the lower thickness, a transition taper should be provided.

4.3 Alternative repair methods involving the fitting of straps or structural member modification should be subject to special consideration. In considering the fitting of straps, it should be limited to the following conditions:

- .1 to restore and/or increase longitudinal strength;
- .2 the thickness diminution of the deck or bottom plating to be reinforced should not be within the substantial corrosion range (75% of the allowable diminution associated with the deck plating);
- .3 the alignment and arrangement, including the termination of the straps, is in accordance with a standard recognized by the Administration;
- .4 the straps are continuous over the entire $0.5L$ amidships length; and
- .5 continuous fillet welding and full penetration welds are used at butt welding and, depending on the width of the strap, slot welds. The welding procedures applied should be acceptable to the Administration.

4.4 The existing structure adjacent to replacement areas and in conjunction with the fitted straps, etc., should be capable of withstanding the applied loads, taking into account the buckling resistance and the condition of welds between the longitudinal members and hull envelope plating.

第 MSC.371 (93) 號決議

(2014 年 5 月 22 日通過)

《2011 年國際散貨船和油船檢驗期間加強檢驗程序 規則》(2011 年加強檢驗規則) 修正案

海上安全委員會，

憶及國際海事組織公約關於本委員會的職能的第 28 (二) 條，

注意到第 A.1049 (27) 號決議所通過的《國際散貨船和油船檢驗期間加強檢驗程序規則》(以下稱“2011 年加強檢驗規則”)，該規則根據經第 MSC.325 (90) 號決議所通過的《1974 年國際海上人命安全公約》(SOLAS)(以下稱“公約”)第 XI-1/2 條相關修正案的生效而生效，

在其第 93 屆會議上審議了按公約 VIII (b) (i) 條提出和分發的 2011 年加強檢驗規則修正案，

1 按照公約第 VIII (b) (iv) 條，通過 2011 年加強檢驗規則修正案，其文本載於本決議附件；

2 按照公約第 VIII (b) (vi) (2) (bb) 條，決定該修正案於 2015 年 7 月 1 日須視為已獲接受，除非在此日期之前，有三分之一以上的公約締約國政府或其商船合計噸位不少於世界商船總噸 50% 的締約國政府通報其反對該修正案；

- 3 **提請**各締約國政府注意，按照公約第 VIII (b) (vii) (2) 條，該修正案在按上述 2 款獲接受後，須於 2016 年 1 月 1 日生效，
- 4 **要求**秘書長按照公約第 VIII (b) (v) 條，將本決議及其附件中的修正案文本的核准無誤副本分發給所有公約締約國政府；
- 5 **還要求**秘書長將本決議及其附件的副本分發給非公約締約國的本組織會員國。

附件

2011年國際散貨船和油船檢驗期間加強檢驗程序規則

(2011年加強檢驗規則)修正案

附件 A

散貨船檢驗期間加強檢驗程序規則

A 部分

單舷側結構散貨船檢驗期間加強檢驗程序規則

1—總則

- 1 在 1.2.6 末尾增加如下句子：

“對於橫骨架式的散貨船，橫剖面包括附連的骨架及其在橫剖面處的端部連接。”

- 2 在 1.2.7 中，在“可識別的關鍵”和“和/或可疑區域”之間插入“結構區域”。

- 3 在 1.2.9 末尾，“其測量（或測厚）厚度介於 $t_{net}+0.5\text{mm}$ 和 t_{net} 之間的腐蝕程度。”由“其測量厚度介於 $t_{ren}+0.5\text{mm}$ 和 t_{ren} 之間的腐蝕程度。換新厚度（ t_{ren} ）係指最小許用厚度，mm，如低於此數值，應進行結構構件換新。”替代。

- 4 在 1.2.11 中，“或有%或更大範圍的塗層”由“或有 10%或更大範圍的塗層”替代。

- 5 在 1.2.17 的開頭，在“特別考慮”前插入“特殊考慮或”。

- 6 在現有 1.2.17 後新增 1.2.18 如下：

“1.2.18 點腐蝕係指分散的腐蝕點/區域，其腐蝕程度大於其周圍區域的總體腐蝕程度。點腐蝕密度的定義見附則 15 的圖 2。”

- 7 在現有 1.3.2 之後新增 1.3.3 如下：

“1.3.3 如上述 1.3.1 中提及的結構損壞為局部損壞，其性質不會影響到船舶的結構完整性（例如橫向甲板條上微小的孔）並已妥善處理，則驗船師在對周圍的結構評估後可考慮允許進行適當的臨時性修理以確保水密或風雨密完整性，並為完成永久性修理和保持船級給出特定期限的相關船級條件或遺留項目。”

2—換證檢驗

- 8 在 2.1.1 末尾增加如下句子：

“當換證檢驗在第 4 次年度檢驗之前開始，如將該工作作為換證檢驗的組成部分，則整個檢驗應在 15 個月內完成。”

- 9 在現有 2.3.2 之後新增 2.3.3 如下：

“2.3.3 對於根據船級社協會共同結構規範（CSR）建造的散貨船，已確定的顯著腐蝕區域可：

- .1 由按塗料製造商的要求敷設的塗層予以保護，並每年進行檢查以確認該處的塗層仍處於良好的狀況；或
- .2 要求每年進行測厚。”

3—年度檢驗

- 10 在 3.4.1.3、3.4.2.3 和 3.5 末尾增加如下句子：

“對於根據船級社協會共同結構規範建造的散貨船，如果按塗料製造商的要求敷設保護塗層並維持處於良好的狀況，則無需進行年度厚度測量；”。

4—中間檢驗

11 在 4.2.1.3 的第二句中，“發現塗層狀況”由“發現硬保護塗層狀況”替代。

12 在 4.2.3.3 末尾，新增句子和解釋性說明如下：

“對於根據船級社協會共同結構規範建造的散貨船，已確定的顯著腐蝕區域可：

- .1 由按塗料製造商的要求敷設的塗層予以保護，並每年進行檢查以確認該處的塗層仍處於良好的狀況；或
- .2 要求每年進行測厚。

解釋性說明：

對於現有散貨船，如果船東可選擇對貨艙進行上述要求的塗裝或重新塗裝，則可考慮近觀檢驗和測厚的範圍。在對現有船舶的貨艙進行塗裝之前，應在驗船師在場的情況下確定尺寸。”

13 在現有 4.2.3.3 之後新增 4.2.3.4 如下：

“4.2.3.4 如果在貨艙中敷設了硬保護塗層，並且發現其處於良好的狀況，則近觀檢驗和測厚的範圍可予以特殊考慮。”

6—船上文件

- 14 在 6.3.2 末尾增加如下內容：

“（對於共同結構規範散貨船，這些圖紙應包括每一結構構件的建造厚度和換新厚度。圖紙上還應清晰地標註任何自願增加的厚度。船上提供的船中剖面圖應包括所有貨艙內貨艙橫剖面的最小許用船體梁剖面特性）。”

B 部分

雙舷側結構散貨船檢驗期間加強檢驗程序規則

1－總則

- 15 在 1.2.6 末尾，增加如下句子：

“對於橫骨架式的散貨船，橫剖面包括附連的骨架及其在橫剖面處的端部連接。”

- 16 在 1.2.9 末尾，“其測量（或測厚）厚度介於 $t_{net}+0.5\text{mm}$ 和 t_{net} 之間的腐蝕程度。”由“其測量厚度介於 $t_{ren}+0.5\text{mm}$ 和 t_{ren} 之間的腐蝕程度。換新厚度（ t_{ren} ）係最小許用厚度，mm，如低於此數值，應進行結構構件換新。”替代。

- 17 在 1.2.17 的開頭，在“特別考慮”前插入“特殊考慮或”。

- 18 在現有 1.3.2 之後新增 1.3.3 如下：

“1.3.3 如上述 1.3.1 中提及的結構損壞為局部損壞，其性質不會影響到船舶的結構完整性（例如橫向甲板條上微小的孔）並已妥善處理，則驗船師在對周圍的結構評估後可考慮允許進行適當的臨時性修理以確保水密或風雨密完整性，並為完成永久性

修理和保持船級給出特定期限的相關船級條件或遺留項目。”

2—換證檢驗

19 在 2.1.1 末尾增加如下句子：

“當換證檢驗在第 4 次年度檢驗之前開始，如將該工作作為換證檢驗的組成部分，則整個檢驗應在 15 個月內完成。”

20 在現有 2.3.2 之後新增 2.3.3 如下：

“2.3.3 對於根據船級社協會共同結構規範（CSR）建造的散貨船，已確定的顯著腐蝕區域可：

- .1 由按塗料製造商的要求敷設的塗層予以保護，並每年進行檢查以確認該處的塗層仍處於良好的狀況；或
- .2 要求每年進行測厚。”

3—年度檢驗

21 在 3.4.1.2、3.4.2.2 和 3.5 末尾增加如下句子：

“對於根據船級社協會共同結構規範建造的散貨船，如果按塗料製造商的要求敷設保護塗層並維持處於良好的狀況，則無需進行年度厚度測量；”

4—中間檢驗

22 在 4.2.3.3 末尾新增句子和解釋性說明如下：

“對於根據船級社協會共同結構規範建造的散貨船，已確定的顯著腐蝕區域可：

- .1 由按塗料製造商的要求敷設的塗層予以保護，並每年進行檢查以確認該處的塗層仍處於良好的狀況；或
- .2 要求每年進行測厚。

解釋性說明：

對於現有散貨船，如果船東可選擇對貨艙進行上述要求的塗裝或重新塗裝，則可考慮近觀檢驗和測厚範圍。在對現有船舶的貨艙進行塗裝之前，應在驗船師在場的情況下確定尺寸。”

6－船上文件

- 23 在 6.3.1.2 末尾增加如下內容：

“（對於共同規範散貨船，這些圖紙應包括每一結構構件的建造厚度和換新厚度。圖紙上還應清晰地標註任何自願增加的厚度。船上提供的船中剖面圖應包括所有貨艙內貨艙橫剖面的最小許用船體梁剖面特性）。”

附件 B

油船檢驗期間加強檢驗程序規則

A 部分

雙殼油船檢驗期間加強檢驗程序規則

1—總則

24 在 1.2.6 末尾增加如下句子：

“對於橫骨架式的油船，橫剖面包括附連的骨架及其在橫剖面處的端部連接。”

25 在 1.2.7 中，在“可識別的關鍵”和“和/或可疑區域”之間插入“結構區域”一詞。

26 在 1.2.9 末尾，“其測量（或測厚）厚度介於 $t_{net}+0.5\text{mm}$ 和 t_{net} 之間的腐蝕程度。”由“其測量厚度介於 $t_{ren}+0.5\text{mm}$ 和 t_{ren} 之間的腐蝕程度。換新厚度（ t_{ren} ）係指最小許用厚度，mm，如低於此數值，應進行結構構件換新。”替代。

27 在 1.2.10 中，第一句“防腐系統通常可考慮全硬塗層”由“防腐系統通常可考慮全硬保護塗層”替代。

28 在 1.2.16 的開頭，在“特別考慮”前插入“特殊考慮或”。

29 在 1.3.1.5 末尾增加“（兼裝船）”。

30 在現有 1.3.2 之後新增 1.3.3 如下：

“1.3.3 如上述 1.3.1 中提及的結構損壞為局部損壞，其性質不會影響到船舶的結構完整性（例如橫向甲板條上微小的孔）並已

妥善處理，則驗船師在對周圍的結構評估後可考慮允許進行適當的臨時性修理以確保水密或風雨密完整性，並為完成永久性修理和保持船級給出特定期限的相關船級條件或遺留項目。”

2－換證檢驗

- 31 在 2.1.1 末尾增加如下句子：

“當換證檢驗在第 4 次年度檢驗之前開始，如將該工作作為換證檢驗的組成部分，則整個檢驗應在 15 個月內完成。”

- 32 在現有 2.1.5 之後新增 2.1.6 如下：

“2.1.6 不接受將中間檢驗時對於處所的檢驗和測厚同時作為換證檢驗的組成部分。”

- 33 在 2.5.2 末尾，“以前檢驗中確定的可疑區域應進行測厚。”由“應檢查以前檢驗中確定的可疑區域。以前檢驗中確定的顯著腐蝕區域應進行測厚。”替代。

3－年度檢驗

- 34 在 3.5.2 末尾增加如下句子：

“對於根據船級社協會共同結構規範建造的油船，要求檢查已確定的顯著腐蝕區域，並進行附加的測厚。”

4－中間檢驗

- 35 在現有 4.1.3 之後新增 4.1.4 如下，現有 4.1.4 重新編號為 4.1.5：

“4.1.4 對於根據船級社協會共同結構規範建造的油船，要求檢查已確定的顯著腐蝕區域，並進行附加的測厚。”

6—船上文件

- 36 在 6.3.2 末尾增加如下內容：

“(對於共同規範船舶，這些圖紙應包括每一結構構件的建造厚度和換新厚度。圖紙上還應清晰地標註任何自願增加的厚度。船上提供的船中剖面圖應包括所有液貨艙內液貨艙橫剖面的最小許用船體梁剖面特性)。”

B 部分

雙殼油船以外的油船檢驗期間加強檢驗程序規則

1—總則

- 37 在 1.2.5 末尾增加如下句子：

“對於橫骨架式的油船，橫剖面包括附連的骨架及其在橫剖面處的端部連接。”

- 38 在 1.2.6 中，在“可識別的關鍵”和“和/或可疑區域”之間插入“結構區域”一詞。

- 39 在 1.2.15 的開頭，在“特別考慮”前插入“特殊考慮或”。

- 40 在現有 1.3.2 之後新增 1.3.3 如下：

“1.3.3 如上述 1.3.1 中提及的結構損壞為局部損壞，其性質不會影響到船舶的結構完整性（例如橫向甲板條上微小的孔）並已妥善處理，則驗船師在對周圍的結構評估後可考慮允許進行適當的臨時性修理以確保水密或風雨密完整性，並為完成永久性修理和保持船級給出特定期限的相關船級條件或遺留項目。”

2－換證檢驗

- 41 在 2.1.1 末尾增加如下句子：

“當換證檢驗在第 4 次年度檢驗之前開始，如將該工作作為換證檢驗的組成部分，則整個檢驗應在 15 個月內完成。”

- 42 在現有 2.1.6 之後新增 2.1.7 如下：

“2.1.7 不接受將中間檢驗時對於處所的檢驗和測厚同時作為換證檢驗的組成部分。”

- 43 在 2.5.2 末尾，“以前檢驗中確定的可疑區域應進行測厚。”由
“應檢查以前檢驗中確定的可疑區域。以前檢驗中確定的顯著腐蝕區域應進行測厚。”替代。

6－船上文件

- 44 在 6.3.1 末尾增加如下內容：

“(對於共同規範船舶，這些圖紙應包括每一結構構件的建造厚度和換新厚度。圖紙上還應清晰地標註任何自願增加的厚度。船上提供的船中剖面圖應包括所有液貨艙內液貨艙橫剖面的最小許用船體梁剖面特性)。”

RESOLUTION MSC.371(93)
(adopted on 22 May 2014)

**AMENDMENTS TO THE INTERNATIONAL CODE ON THE
ENHANCED PROGRAMME OF INSPECTIONS DURING SURVEYS OF
BULK CARRIERS AND OIL TANKERS, 2011 (2011 ESP CODE)**

THE MARITIME SAFETY COMMITTEE,

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

NOTING resolution A.1049(27), by which the Assembly adopted the International Code on the Enhanced Programme of Inspections During Surveys of Bulk Carriers and Oil Tankers (hereinafter referred to as "the 2011 ESP Code"), which became effective upon entry into force of the associated amendments to regulation XI-1/2 of the International Convention for the Safety of Life at Sea (SOLAS), 1974 (hereinafter referred to as "the Convention"), adopted by resolution MSC.325(90),

HAVING CONSIDERED, at its ninety-third session, amendments to the 2011 ESP Code proposed and circulated in accordance with article VIII(b)(i) of the Convention,

1 ADOPTS, in accordance with article VIII(b)(iv) of the Convention, amendments to the 2011 ESP Code, the text of which is set out in the annex to the present resolution;

2 DETERMINES, in accordance with article VIII(b)(vi)(2)(bb) of the Convention, that the amendments shall be deemed to have been accepted on 1 July 2015 unless, prior to that date, more than one third of the Contracting Governments to the Convention or Contracting Governments the combined merchant fleets of which constitute not less than 50% of the gross tonnage of the world's merchant fleet, have notified their objections to the amendments;

3 INVITES Contracting Governments to note that, in accordance with article VIII(b)(vii)(2) of the Convention, the amendments shall enter into force on 1 January 2016 upon their acceptance in accordance with paragraph 2 above;

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

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

ANNEX

**AMENDMENTS TO THE INTERNATIONAL CODE ON THE
ENHANCED PROGRAMME OF INSPECTIONS DURING SURVEYS
OF BULK CARRIERS AND OIL TANKERS, 2011 (2011 ESP CODE)****ANNEX A
CODE ON THE ENHANCED PROGRAMME OF INSPECTIONS
DURING SURVEYS OF BULK CARRIERS****Part A
CODE ON THE ENHANCED PROGRAMME OF INSPECTIONS
DURING SURVEYS OF BULK CARRIERS HAVING
SINGLE-SIDE SKIN CONSTRUCTION****1 – General**

- 1 At the end of paragraph 1.2.6, the following sentence is added:

"For transversely framed bulk carriers, a transverse section includes adjacent frames and their end connections in way of transverse sections."
- 2 In paragraph 1.2.7, the words "structural areas" are inserted between the words "identifiable critical" and "and/or suspect areas".
- 3 At the end of paragraph 1.2.9, the words "a gauged (or measured) thickness between $t_{net} + 0.5$ mm and t_{net} " are replaced by the words "a measured thickness between $t_{ren} + 0.5$ mm and t_{ren} . Renewal thickness (t_{ren}) is the minimum allowable thickness, in mm, below which renewal of structural members is to be carried out."
- 4 In paragraph 1.2.11 the figure "10" is inserted between the words "hard scale at" and "per cent".
- 5 At the beginning of paragraph 1.2.17, the words "*Special consideration or*" are inserted before the words "*specially considered*".
- 6 The following new paragraph 1.2.18 is added after existing paragraph 1.2.17:

"1.2.18 *Pitting corrosion* is defined as scattered corrosion spots/areas with local material reductions which are greater than the general corrosion in the surrounding area. Pitting intensity is defined in figure 2 of annex 15."
- 7 The following new paragraph 1.3.3 is added after existing paragraph 1.3.2:

"1.3.3 Where the damage found on the structure mentioned in paragraph 1.3.1 above is isolated and of a localized nature which does not affect the ship's structural integrity (as for example a minor hole in a cross-deck strip), consideration may be given by the surveyor to allow an appropriate temporary repair to restore watertight or weather tight integrity after evaluation of the surrounding structure and impose an associated condition of classification or recommendation with a specific time limit in order to complete the permanent repair and retain classification."

2 – Renewal survey

- 8 At the end of paragraph 2.1.1, the following sentence is added:
- "When the renewal survey is commenced prior to the fourth annual survey, the entire survey is to be completed within 15 months if such work is to be credited to the renewal survey."
- 9 The following new paragraph 2.3.3 is added after existing paragraph 2.3.2:
- "2.3.3 For bulk carriers built under IACS Common Structural Rules (CSR), the identified substantial corrosion areas may be:
- .1 protected by coating applied in accordance with the coating manufacturer's requirements and examined at annual intervals to confirm the coating in way is still in good condition; or alternatively
 - .2 required to be measured at annual intervals."

3 – Annual survey

- 10 At the end of paragraphs 3.4.1.3, 3.4.2.3 and 3.5, the following sentence is added:
- "For bulk carriers built under the IACS Common Structural Rules, the annual thickness gauging may be omitted where a protective coating has been applied in accordance with the coating manufacturer's requirements and is maintained in good condition;"

4 – Intermediate survey

- 11 In the second sentence of paragraph 4.2.1.3, the words "hard protective" are inserted between the words "breakdown of" and "coating".
- 12 At the end of paragraph 4.2.3.3, the following new sentence and explanatory note are added:
- "For bulk carriers built under IACS Common Structural Rules, the identified substantial corrosion areas may be:
- .1 protected by coating applied in accordance with the coating manufacturer's requirements and examined at annual intervals to confirm the coating in way is still in good condition; or alternatively
 - .2 required to be measured at annual intervals."

Explanatory note:

For existing bulk carriers, where owners may elect to coat or recoat cargo holds as noted above, consideration may be given to the extent of the close-up surveys and thickness measurement. Prior to the coating of cargo holds of existing ships, scantlings should be ascertained in the presence of a surveyor."

- 13 The following new paragraph 4.2.3.4 is added after existing paragraph 4.2.3.3:
- "4.2.3.4 Where hard protective coating is fitted in cargo holds and is found in GOOD condition, the extent of the close-up surveys and thickness measurements may be specially considered."

6 – Documentation on board

- 14 At the end of paragraph 6.3.2, the following text is added:
- "(for CSR bulk carriers, these plans are to include for each structural element both the as-built and renewal thickness. Any thickness for voluntary addition is also to be clearly indicated on the plans. The midship section plan to be supplied on board the ship is to include the minimum allowable hull girder sectional properties for hold transverse section in all cargo holds)."

Part B CODE ON THE ENHANCED PROGRAMME OF INSPECTIONS DURING SURVEYS OF BULK CARRIERS HAVING DOUBLE-SIDE SKIN CONSTRUCTION

1 – General

- 15 At the end of paragraph 1.2.6, the following sentence is added:
- "For transversely framed bulk carriers, a transverse section includes adjacent frames and their end connections in way of transverse sections."
- 16 At the end of paragraph 1.2.9, the words "a gauged (or measured) thickness between $t_{net} + 0.5$ mm and t_{net} " are replaced by the words "a measured thickness between $t_{ren} + 0.5$ mm and t_{ren} . Renewal thickness (t_{ren}) is the minimum allowable thickness, in mm, below which renewal of structural members is to be carried out".
- 17 At the beginning of paragraph 1.2.17, the words "*Special consideration or*" are inserted before the words "*specially considered*".
- 18 The following new paragraph 1.3.3 is added after the existing paragraph 1.3.2:
- "1.3.3 Where the damage found on the structure mentioned in paragraph 1.3.1 above is isolated and of a localized nature which does not affect the ship's structural integrity (as for example a minor hole in a cross-deck strip), consideration may be given by the surveyor to allow an appropriate temporary repair to restore watertight or weather tight integrity after evaluation of the surrounding structure and impose an associated condition of classification or recommendation with a specific time limit in order to complete the permanent repair and retain classification."

2 – Renewal survey

- 19 At the end of paragraph 2.1.1, the following sentence is added:
- "When the renewal survey is commenced prior to the fourth annual survey, the entire survey is to be completed within 15 months if such work is to be credited to the renewal survey."

- 20 The following new paragraph 2.3.3 is added after the existing paragraph 2.3.2:

"2.3.3 For bulk carriers built under IACS Common Structural Rules (CSR), the identified substantial corrosion areas may be:

- .1 protected by coating applied in accordance with the coating manufacturer's requirements and examined at annual intervals to confirm the coating in way is still in good condition; or alternatively
- .2 required to be measured at annual intervals."

3 – Annual survey

- 21 At the end of paragraphs 3.4.1.2, 3.4.2.2 and 3.5, the following sentence is added:

"For bulk carriers built under the IACS Common Structural Rules, the annual thickness gauging may be omitted where a protective coating has been applied in accordance with the coating manufacturer's requirements and is maintained in good condition;"

4 – Intermediate survey

- 22 At the end of paragraph 4.2.3.3, the following new sentence and explanatory note are added:

"For bulk carriers built under IACS Common Structural Rules, the identified substantial corrosion areas may be:

- .1 protected by coating applied in accordance with the coating manufacturer's requirements and examined at annual intervals to confirm the coating in way is still in good condition; or alternatively
- .2 required to be measured at annual intervals."

Explanatory note:

For existing bulk carriers, where owners may elect to coat or recoat cargo holds as noted above, consideration may be given to the extent of the close-up surveys and thickness measurement. Prior to the coating of cargo holds of existing ships, scantlings should be ascertained in the presence of a surveyor."

6 – Documentation on board

- 23 At the end of paragraph 6.3.1.2, the following text is added:

"(for CSR bulk carriers, these plans are to include for each structural element both the as-built and renewal thickness. Any thickness for voluntary addition is also to be clearly indicated on the plans. The midship section plan to be supplied on board the ship is to include the minimum allowable hull girder sectional properties for hold transverse section in all cargo holds)."

ANNEX B**CODE ON THE ENHANCED PROGRAMME OF INSPECTIONS
DURING SURVEYS OF OIL TANKERS****Part A
CODE ON THE ENHANCED PROGRAMME OF INSPECTIONS
DURING SURVEYS OF DOUBLE-HULL OIL TANKERS****1 – General**

- 24 At the end of paragraph 1.2.6, the following sentence is added:
- "For transversely framed oil tankers, a transverse section includes adjacent frames and their end connections in way of transverse sections."
- 25 In paragraph 1.2.7, the words "structural areas" are inserted between the words "identifiable critical" and "and/or suspect areas".
- 26 At the end of paragraph 1.2.9, the words "a gauged (or measured) thickness between $t_{net} + 0.5$ mm and t_{net} " are replaced by the words "a measured thickness between $t_{ren} + 0.5$ mm and t_{ren} . Renewal thickness (t_{ren}) is the minimum allowable thickness, in mm, below which renewal of structural members is to be carried out".
- 27 In the first sentence of paragraph 1.2.10, the word "protective" is inserted between the words "full hard" and "coating".
- 28 At the beginning of paragraph 1.2.16, the words "*Special consideration or*" are inserted before the words "*specially considered*".
- 29 At the end of paragraph 1.3.1.5, the words "(combination carriers)" are added.
- 30 The following new paragraph 1.3.3 is added after existing paragraph 1.3.2:
- "1.3.3 Where the damage found on the structure mentioned in paragraph 1.3.1 above is isolated and of a localized nature which does not affect the ship's structural integrity (as for example a minor hole in a cross-deck strip), consideration may be given by the surveyor to allow an appropriate temporary repair to restore watertight or weathertight integrity after evaluation of the surrounding structure and impose an associated condition of classification or recommendation with a specific time limit in order to complete the permanent repair and retain classification."

2 – Renewal survey

- 31 At the end of paragraph 2.1.1, the following sentence is added:
- "When the renewal survey is commenced prior to the fourth annual survey, the entire survey is to be completed within 15 months if such work is to be credited to the renewal survey."

- 32 The following new paragraph 2.1.6 is added after existing paragraph 2.1.5:
- "2.1.6 Concurrent crediting to both intermediate survey and renewal survey for surveys and thickness measurements of spaces should not be acceptable."
- 33 At the end of paragraph 2.5.2, the words "should have thickness measurements taken." are replaced by the words "are to be examined. Areas of substantial corrosion identified at previous surveys are to have thickness measurements taken".

3 – Annual survey

- 34 At the end of paragraph 3.5.2, the following sentence is added:
- "For oil tankers built under IACS Common Structural Rules, the identified substantial corrosion areas are required to be examined and additional thickness measurements are to be carried out."

4 – Intermediate survey

- 35 The following new paragraph 4.1.4 is added after existing paragraph 4.1.3 and the existing paragraph 4.1.4 is renumbered as 4.1.5:
- "4.1.4 For oil tankers built under IACS Common Structural Rules, the identified substantial corrosion areas are required to be examined and additional thickness measurements are to be carried out."

6 – Documentation on board

- 36 At the end of paragraph 6.3.2, the following text is added:
- "(for CSR ships these plans are to include for each structural element both the as-built and renewal thickness. Any thickness for voluntary addition is also to be clearly indicated on the plans. The midship section plan to be supplied on board the ship is to include the minimum allowable hull girder sectional properties for the tank transverse section in all cargo tanks)."

Part B CODE ON THE ENHANCED PROGRAMME OF INSPECTIONS DURING SURVEYS OF OIL TANKERS OTHER THAN DOUBLE-HULL OIL TANKERS

1 – General

- 37 At the end of paragraph 1.2.5, the following sentence is added:
- "For transversely framed oil tankers, a transverse section includes adjacent frames and their end connections in way of transverse sections."
- 38 In paragraph 1.2.6, the words "structural areas" are inserted between the words "identifiable critical" and "and/or suspect areas".

39 At the beginning of paragraph 1.2.15, the words "*Special consideration or*" are added before the words "*specially considered*".

40 The following new paragraph 1.3.3 is added after the existing paragraph 1.3.2:

"1.3.3 Where the damage found on structure mentioned in paragraph 1.3.1 above is isolated and of a localized nature which does not affect the ship's structural integrity (as for example a minor hole in a cross-deck strip), consideration may be given by the surveyor to allow an appropriate temporary repair to restore watertight or weather tight integrity after evaluation of the surrounding structure and impose an associated condition of classification or recommendation with a specific time limit in order to complete the permanent repair and retain classification."

2 – Renewal survey

41 At the end of paragraph 2.1.1, the following sentence is added:

"When the renewal survey is commenced prior to the fourth annual survey, the entire survey is to be completed within 15 months if such work is to be credited to the renewal survey."

42 The following new paragraph 2.1.7 is added after existing paragraph 2.1.6:

"2.1.7 Concurrent crediting to both intermediate survey and renewal survey for surveys and thickness measurements of spaces should not be acceptable."

43 At the end of paragraph 2.5.2, the words "should have thickness measurements taken" are replaced by the words "are to be examined. Areas of substantial corrosion identified at previous surveys are to have thickness measurements taken."

6 – Documentation on board

44 At the end of paragraph 6.3.1, the following text is added:

"(for CSR ships these plans are to include for each structural element both the as-built and renewal thickness. Any thickness for voluntary addition is also to be clearly indicated on the plans. The midship section plan to be supplied on board the ship is to include the minimum allowable hull girder sectional properties for hold transverse section in all cargo tanks)."

第 MSC.381 (94) 號決議

(2014 年 11 月 21 日通過)

《2011 年國際散貨船和油船檢驗期間加強檢驗計劃規則》(《2011 年加強檢驗規則》) 修正案

海上安全委員會，

憶及《國際海事組織公約》關於本委員會職能的第二十八條第(二)款，

注意到第 A.1049 (27) 號決議通過的《2011 年國際散貨船和油船檢驗期間加強檢驗計劃規則》(“2011 年加強檢驗規則”)將於《1974 年國際海上人命安全公約》(《安全公約》)(“本公約”)第 XI-1 章的相關修正案生效時生效，

在其第 94 屆會議上審議了按照本公約第 VIII (b) (i) 條建議和分發的《2011 年加強檢驗規則》修正案，

1 按照本公約第 VIII (b) (iv) 條，通過《2011 年加強檢驗規則》修正案，其文本載於本決議附件；

2 按照本公約第 VIII (b) (vi) (2) (bb) 條，決定該修正案將於 2016 年 1 月 1 日視為已被接受，除非在此日期之前，有三分之一以上的本公約締約國政府或其商船隊總和佔世界商船總噸數不少於 50% 的締約國政府通報本組織秘書長反對該修正案；

- 3 提請締約國政府注意，按照本公約第 VIII (b) (vii) (2) 條，該修正案將在按上述第 2 段被接受後，於 2016 年 7 月 1 日生效；
- 4 要求秘書長就本公約第 VIII (b) (v) 條之目的，將本決議及其附件中的修正案文本的核證無誤副本分發給所有本公約締約國政府；
- 5 還要求秘書長將本決議及其附件的副本分發給非本公約締約國的本組織會員國。

附件

《2011年國際散貨船和油船檢驗期間加強檢驗計劃規則》

（《2011年加強檢驗規則》）的修正案

附件 A

散貨船檢驗期間加強檢驗計劃規則

A 部分

單舷側結構散貨船檢驗期間加強檢驗計劃規則

1 第 1.3.3 段由下文替代：

“1.3.3 如以上第 1.3.1 段中所述結構上發現的損壞係孤立的及局部性質的，不影響船舶機構完整性（例如跨甲板板條中的小洞），驗船師在對周圍結構做出評估並提出相關條件或建議及完成永久性修理的具體時間限制後可考慮允許適當臨時修理，以恢復水密或風雨密完整性並保留相關法定發證的有效性。”

2 5.3.2.3 中的文本由下文替代：

“.3 液壓臂升降台，如傳統的車載升降台、升降機和可移動台架；”

3 在現有 5.4 之後新增 5.5 如下：

“5.5 救助和應急響應設備

如果呼吸器和/或其他設備用作“救助和應急響應設備”，該設

備應適合於被檢驗處所的結構。”

4 現有 5.5 和 5.6 分別重新編號。

5 在目錄中，在索引 5.4 之後新增索引“5.5 救助和應急響應設備”，現有索引 5.5 和 5.6 相應重新編號。

6 在重新編號的 5.6.7 中，引述的 5.5.5 和 5.5.6 由 5.6.5 和 5.6.6 替代。

7 在現有 6.1.2 之後新增 6.1.3 如下：

“6.1.3 對於受《安全公約》第 II-1/3-10 條約束的散貨船，一旦船舶建造檔案（SCF）中包含的文件出現更改，船東應在船舶整個壽命期間安排對 SCF 的更新。關於 SCF 更新的程序文件應納入安全管理體系”。

8 將 6.3 下的現有文本編號為 6.3.1，並在原 6.3 的末尾新增 6.3.2 如下：

“6.3.2 對於受《安全公約》第 II-1/3-10 條約束的散貨船，船上應備有船舶建造檔案（SCF），檔案中僅需包括船上應保留的條目”。

9 將 6.4 下的現有文本編號為 6.4.1，並在原 6.4 的末尾新增 6.4.2 和 6.4.3 如下：

“6.4.2 對於受《安全公約》第 II-1/3-10 條約束的散貨船，一旦船舶建造檔案（SCF）中包含的文件出現更改，在檢驗完成後，驗船師應核實船舶建造檔案業經更新。

6.4.3 對於受《安全公約》第 II-1/3-10 條約束的散貨船，在

檢驗完成後，驗船師應核實船體結構建造所用材料的任何增加和/或換新均記錄在船舶建造檔案的材料清單中。”

附件 7 狀況評估報告

10 船舶概況改為：

“船舶概況

船名：主管機關/經認可組織標識號：

原主管機關/經認可組織標識號：

國際海事組織編號：

...”

附件 14 厚度測量程序要求

11 第 1 節改為：

“1 總則

船體結構檢驗中所要求的厚度測量，如並非由經認可組織代主管機關進行，應由經認可組織驗船師予以見證。驗船師的到場應予以記錄。這也適用於航行期間進行的厚度測量。”

B 部分

雙舷側結構散貨船檢驗期間加強檢驗計劃規則

12 第 1.3.3 段由下文替代：

“1.3.3 如以上第 1.3.1 段中所述結構上發現的損壞係孤立的及局部性質的，不影響船舶機構完整性（例如跨甲板板條中的

小洞)，驗船師在對周圍結構做出評估並提出相關條件或建議及完成永久性修理的具體時間限制後可考慮允許適當臨時修理，以恢復水密或風雨密完整性並保留相關法定發證的有效性。”

- 13 5.3.2.3 中的文本由下文替代：

“3 液壓臂升降台，如傳統的車載升降台、升降機和可移動台架；”

- 14 在現有 5.4 之後新增 5.5 如下：

“5.5 救助和應急響應設備

如果呼吸器和/或其他設備用作“救助和應急響應設備”，該設備應適合於被檢驗處所的結構。”

- 15 現有 5.5 和 5.6 分別重新編號。

- 16 在目錄中，在索引 5.4 後新增索引“5.5 救助和應急響應設備”，現有索引 5.5 和 5.6 相應重新編號。

- 17 在重新編號的 5.6.7 中，引述的 5.5.5 和 5.5.6 由 5.6.5 和 5.6.6 替代。

- 18 在現有 6.1.2 之後新增 6.1.3 如下：

“6.1.3 對於受《安全公約》第 II-1/3-10 條約束的散貨船，一旦船舶建造檔案（SCF）中包含的文件出現更改，船東應在船舶整個壽命期間安排對 SCF 的更新。關於 SCF 更新的程序文件應納入安全管理體系。”

- 19 將 6.3 下的現有文本編號為 6.3.1，並在原 6.3 的末尾新增 6.3.2

如下：

“6.3.2 對於受《安全公約》第 II-1/3-10 條約束的散貨船，船上應備有船舶建造檔案（SCF），檔案中僅需包括船上應保留的條目”。

20 將 6.4 下的現有文本編號為 6.4.1，並在原 6.4 的末尾新增 6.4.2 和 6.4.3 如下：

“6.4.2 對於受《安全公約》第 II-1/3-10 條約束的散貨船，一旦船舶建造檔案（SCF）中包含的文件出現更改，在檢驗完成後，驗船師應核實船舶建造檔案業經更新。

6.4.3 對於受《安全公約》第 II-1/3-10 條約束的散貨船，在檢驗完成後，驗船師應核實船體結構建造所用材料的任何增加和/或換新均記錄在船舶建造檔案的材料清單中。”

附件 7 狀況評估報告

21 船舶概況改為：

“船舶概況

船名：主管機關/經認可組織標識號：

原主管機關/經認可組織標識號：

國際海事組織編號：

...”

附件 12 厚度測量程序要求

22 第 1 節改為：

“1 總則

船體結構檢驗中所要求的厚度測量，如並非由經認可組織代主管機關進行，應由經認可組織驗船師予以見證。驗船師的到場應予以記錄。這也適用於航行期間進行的厚度測量。”

附件 B

油船檢驗期間加強檢驗計劃規則

A 部分

雙殼油船檢驗期間加強檢驗計劃規則

23 第 1.3.3 段由下文替代：

“1.3.3 如以上第 1.3.1 段中所述結構上發現的損壞係孤立的及局部性質的，不影響船舶機構完整性（例如跨甲板板條中的小洞），驗船師在對周圍結構做出評估並提出相關條件或建議及完成永久性修理的具體時間限制後可考慮允許適當臨時修理，以恢復水密或風雨密完整性並保留相關法定發證的有效性。”

24 2.6.1 中的文本由下列新文本替代：

“2.6.1 在換證檢驗時壓載艙壓力試驗的最低要求見 2.6.3 和附則 3。

在換證檢驗時液貨艙試驗的最低要求見 2.6.4 和附則 3。

在滿足下列條件的前提下，驗船師可接受船上的船員在船長指導下進行液貨艙試驗：

- .1 在進行試驗前，船東已提交液艙試驗程序並經主管機關或被認可組織評審；
- .2 無影響液艙結構完整性的泄漏、變形或顯著腐蝕記錄；
- .3 已在全面或近觀檢驗完成之日以前不超過 3 個月的特別檢驗窗口內進行液艙試驗並合格；

.4 試驗合格結果記錄在船舶日誌中；和

.5 在全面和近觀檢驗時，驗船師查明液艙的內外部狀況和相關結構合格。”

25 5.3.2.3 中的文本由下文替代：

“3 液壓臂升降台，如傳統的車載升降台、升降機和可移動台架；”

26 在現有 5.4 之後新增 5.5 如下：

“5.5 救助和應急響應設備

如果呼吸器和/或其他設備用作“救助和應急響應設備”，該設備應適合於被檢驗處所的結構。”

27 現有 5.5 和 5.6 分別重新編號。

28 在目錄中，在索引 5.4 後新增索引“5.5 救助和緊急響應設備”，現有索引 5.5 和 5.6 相應重新編號。

29 在重新編號的 5.6.7 中，引述的 5.5.5 和 5.5.6 由 5.6.5 和 5.6.6 替代。

30 在現有 6.1.2 之後新增 6.1.3 如下：

“6.1.3 對於受《安全公約》第 II-1/3-10 條約束的散貨船，一旦船舶建造檔案（SCF）中包含的文件出現更改，船東應在船舶整個壽命期間安排對 SCF 的更新。關於 SCF 更新的程序文件應納入安全管理體系”。

31 將 6.3 下的現有文本編號為 6.3.1，並在原 6.3 的末尾新增 6.3.2

如下：

“6.3.2 對於受《安全公約》第 II-1/3-10 條約束的散貨船，船上應備有船舶建造檔案（SCF），檔案中僅需包括船上應保留的條目”。

32 將 6.4 下的現有文本編號為 6.4.1，並在原 6.4 的末尾新增 6.4.2 和 6.4.3 如下：

“6.4.2 對於受《安全公約》第 II-1/3-10 條約束的散貨船，一旦船舶建造檔案（SCF）中包含的文件出現更改，在檢驗完成後，驗船師應核實船舶建造檔案業經更新。

6.4.3 對於受《安全公約》第 II-1/3-10 條約束的散貨船，在檢驗完成後，驗船師應核實船體結構建造所用材料的任何增加和/或換新均記錄在船舶建造檔案的材料清單中。”

附件 9 狀況評估報告

33 船舶概況改為：

“船舶概況

船名：主管機關/經認可組織標識號：

原主管機關/經認可組織標識號：

國際海事組織編號：

...”

34 表 2（船體樑的橫剖面模數）註解 3 由以下所列替代：

“3 本節適用於 2002 年 7 月 1 日以前建造的船舶：按附件

12 中 2.2.1.2 段的規定，在對已達到 10 年船齡的船舶進行最近一次 SC 換證檢驗期間，已酌情使用測量、換新或加強的結構件厚度，對船體樑橫剖面模數進行了計算，發現其符合主管機關或經認可組織要求的衡準，且 Z_{act} 不小於附件 12 附錄 2 中規定的 Z_{mc} （見下列註 2 定義），如下表所列。

闡述主管機關或經認可組織要求的營運船舶船體樑最小剖面模數的認可衡準。”

附件 12 油船船體樑總縱強度衡準

35 2.2.1.2 段由下文替代：

“.2 對於 2002 年 7 月 1 日以前建造的船舶，只要實際剖面模數（ Z_{act} ）在任何情況下不小於附錄 2 中規定的最小剖面模數（ Z_{mc} ）的減小極限值，則根據 2.1.2.2 要求計算的船體樑橫剖面實際剖面模數（ Z_{act} ）應符合主管機關或經認可組織要求的營運船舶最小剖面模數（ Z_{mc} ）衡準。”

B 部分

雙殼油船以外的油船檢驗期間加強檢驗計劃規則

36 第 1.3.3 段由下文替代：

“1.3.3 如以上第 1.3.1 段中所述結構上發現的損壞係孤立的及局部性質的，不影響船舶機構完整性（例如跨甲板板條中的小洞），驗船師在對周圍結構做出評估並提出相關條件或建議及完成永久性修理的具體時間限制後可考慮允許適當臨時修理，以恢復水密或風雨密完整性並保留相關法定發證的有效性。”

37 2.6.1 中的文本由下列新文本替代：

“2.6.1 在換證檢驗時壓載艙壓力試驗的最低要求見 2.6.3 和附則 3。

在換證檢驗時液貨艙試驗的最低要求見 2.6.4 和附則 3。

在滿足下列條件的前提下，驗船師可接受船上的船員在船長指導下進行液貨艙試驗：

- .1 在進行試驗前，船東已提交液艙試驗程序並經主管機關或被認可組織評審；
- .2 無影響液艙結構完整性的泄漏、變形或顯著腐蝕記錄；
- .3 已在全面或近觀檢驗完成之日以前不超過 3 個月的特別檢驗窗口內進行液艙試驗並合格；
- .4 試驗合格結果記錄在船舶日誌中；和
- .5 在全面和近觀檢驗時，驗船師查明液艙的內外部狀況和相關結構合格。”

38 5.3.2.3 中的文本由下文替代：

“.3 液壓臂升降台，如傳統的車載升降台、升降機和可移動台架；”

39 在現有 5.4 之後新增 5.5 如下：

“5.5 救助和應急響應設備

如果呼吸器和/或其他設備用作“救助和應急響應設備”，該設備應適合於被檢驗處所的結構。”

- 40 現有 5.5 和 5.6 分別重新編號。
- 41 在目錄中，在索引 5.4 後新增索引“5.5 救助和應急響應設備”，現有索引 5.5 和 5.6 相應重新編號。
- 42 在重新編號的 5.6.7 中，引述的 5.5.5 和 5.5.6 由 5.6.5 和 5.6.6 替代。

附件 9 狀況評估報告

- 43 船舶概況改為：

“船舶概況

船名：主管機關/經認可組織標識號：

原主管機關/經認可組織標識號：

國際海事組織編號：

...”

- 44 表 2（船體樑的橫剖面模數）註解 3 由以下所列替代：

“3 本節適用於 2002 年 7 月 1 日以前建造的船舶：按附件 12 中 2.2.1.2 段的規定，在對已達到 10 年船齡的船舶進行最近一次 SC 換證檢驗期間，已酌情使用測量、換新或加強的結構件厚度，對船體樑橫剖面模數進行了計算，發現其符合主管機關或經認可組織要求的衡準，且 Z_{act} 不小於附件 12 附錄 2 中規定的 Z_{mc} （見下列註 2 定義），如下表所列。

闡述主管機關或經認可組織要求的營運船舶船體樑最小剖面模數的認可衡準。”

附件 12 油船船體樑總縱強度衡準

45 2.2.1.2 段由下文替代：

“.2 對於 2002 年 7 月 1 日以前建造的船舶，只要實際剖面模數 (Z_{act}) 在任何情況下不小於附錄 2 中規定的最小剖面模數 (Z_{mc}) 的減小極限值，則根據 2.1.2.2 要求計算的船體樑橫剖面實際剖面模數 (Z_{act}) 應符合主管機關或經認可組織要求的營運船舶最小剖面模數 (Z_{mc}) 衡準。”

RESOLUTION MSC.381(94)
(adopted on 21 November 2014)

**AMENDMENTS TO THE INTERNATIONAL CODE ON THE ENHANCED PROGRAMME
OF INSPECTIONS DURING SURVEYS OF BULK CARRIERS
AND OIL TANKERS, 2011 (2011 ESP CODE)**

THE MARITIME SAFETY COMMITTEE,

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

NOTING resolution A.1049(27), by which the Assembly adopted the International Code on the Enhanced Programme of Inspections During Surveys of Bulk Carriers and Oil Tankers, 2011 ("the 2011 ESP Code"), will become effective upon entry into force of the associated amendments to chapter XI-1 of the International Convention for the Safety of Life at Sea, 1974 ("the Convention"),

HAVING CONSIDERED, at its ninety-fourth session, amendments to the 2011 ESP Code proposed and circulated in accordance with article VIII(b)(i) of the Convention,

1 ADOPTS, in accordance with article VIII(b)(iv) of the Convention, amendments to the 2011 ESP Code, the text of which is set out in the annex to the present resolution;

2 DETERMINES, in accordance with article VIII(b)(vi)(2)(bb) of the Convention, that the amendments shall be deemed to have been accepted on 1 January 2016 unless, prior to that date, more than one third of the Contracting Governments to the Convention or Contracting Governments the combined merchant fleets of which constitute not less than 50% of the gross tonnage of the world's merchant fleet, have notified to the Secretary-General of the Organization their objections to the amendments;

3 INVITES Contracting Governments to note that, in accordance with article VIII(b)(vii)(2) of the Convention, the amendments shall enter into force on 1 July 2016 upon their acceptance in accordance with paragraph 2 above;

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

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

ANNEX

**AMENDMENTS TO THE INTERNATIONAL CODE ON THE ENHANCED PROGRAMME
OF INSPECTIONS DURING SURVEYS OF BULK CARRIERS
AND OIL TANKERS, 2011 (2011 ESP CODE)**

ANNEX A

**CODE ON THE ENHANCED PROGRAMME OF INSPECTIONS DURING SURVEYS OF
BULK CARRIERS**

Part A

**CODE ON THE ENHANCED PROGRAMME OF INSPECTIONS DURING SURVEYS OF
BULK CARRIERS HAVING SINGLE-SIDE SKIN CONSTRUCTION**

- 1 Paragraph 1.3.3 is replaced by the following:

"1.3.3 Where the damage found on the structure mentioned in paragraph 1.3.1 above is isolated and of a localized nature which does not affect the ship's structural integrity (as for example a minor hole in a cross-deck strip), consideration may be given by the surveyor to allow an appropriate temporary repair to restore watertight or weathertight integrity after evaluation of the surrounding structure and impose an associated condition or recommendation with a specific time limit in order to complete the permanent repair and retain the validity of the relevant statutory certification."
- 2 The text in paragraph 5.3.2.3 is replaced by the following:

"3 hydraulic arm vehicles such as conventional cherry pickers, lifts and moveable platforms;"
- 3 The following new paragraph 5.5 is added after the existing paragraph 5.4:

"5.5 Rescue and emergency response equipment
If breathing apparatus and/or other equipment is used as "Rescue and emergency response equipment" then the equipment should be suitable for the configuration of the space being surveyed."
- 4 The existing paragraphs 5.5 and 5.6 are renumbered, respectively.
- 5 In the table of contents, a new reference to paragraph "5.5 Rescue and emergency response equipment" is added after reference to paragraph 5.4 and the existing reference to paragraph numbers 5.5 and 5.6 are renumbered accordingly.
- 6 In the renumbered paragraph 5.6.7, the referenced paragraph numbers 5.5.5 and 5.5.6 are replaced by 5.6.5 and 5.6.6.
- 7 The following new paragraph 6.1.3 is added after the existing paragraph 6.1.2:

"6.1.3 For bulk carriers subject to SOLAS regulation II-1/3-10, the owner should arrange the updating of the Ship Construction File (SCF) throughout the ship's life whenever a modification of the documentation included in the SCF has taken place. Documented procedures for updating the SCF should be included within the Safety Management System."

- 8 The existing text under paragraph 6.3 is numbered as paragraph 6.3.1 and the following new paragraph 6.3.2 is added at the end of paragraph 6.3:

"6.3.2 For bulk carriers subject to SOLAS regulation II-1/3-10, the Ship Construction File (SCF), limited to the items to be retained on board, should be available on board."

- 9 The existing text under paragraph 6.4 is numbered as paragraph 6.4.1 and the following new paragraphs 6.4.2 and 6.4.3 are added at the end of paragraph 6.4:

"6.4.2 For bulk carriers subject to SOLAS regulation II-1/3-10, on completion of the survey, the surveyor should verify that the update of the Ship Construction File (SCF) has been done whenever a modification of the documentation included in the SCF has taken place.

6.4.3 For bulk carriers subject to SOLAS regulation II-1/3-10, on completion of the survey, the surveyor should verify any addition and/or renewal of materials used for the construction of the hull structure are documented within the Ship Construction File list of materials."

Annex 7 Condition evaluation report

- 10 The general particulars are replaced by the following:

"General particulars

Ship's name:	Administration/recognized organization identity number:
	Previous Administration/recognized organization identity number(s):
	IMO number:

..."

Annex 14 Procedural requirements for thickness measurement

- 11 Section 1 is replaced by the following:

"1 General

Thickness measurements required in the context of hull structural surveys, if not carried out by the recognized organization acting on behalf of the Administration, should be witnessed by a surveyor of the recognized organization. The attendance of the surveyor should be recorded. This also applies to thickness measurements taken during voyages."

Part B

CODE ON THE ENHANCED PROGRAMME OF INSPECTIONS DURING SURVEYS OF BULK CARRIERS HAVING DOUBLE-SIDE SKIN CONSTRUCTION

- 12 Paragraph 1.3.3 is replaced by the following:

"1.3.3 Where the damage found on the structure mentioned in paragraph 1.3.1 above is isolated and of a localized nature which does not affect the ship's structural integrity (as for example a minor hole in a cross-deck strip), consideration may be given by the surveyor to allow an appropriate temporary repair

to restore watertight or weathertight integrity after evaluation of the surrounding structure and impose an associated condition or recommendation with a specific time limit in order to complete the permanent repair and retain the validity of the relevant statutory certification."

- 13 The text in paragraph 5.3.2.3 is replaced by the following:
- "3 hydraulic arm vehicles such as conventional cherry pickers, lifts and moveable platforms;"
- 14 The following new paragraph 5.5 is added after the existing paragraph 5.4:
- "5.5 Rescue and emergency response equipment
- If breathing apparatus and/or other equipment is used as "Rescue and emergency response equipment" then the equipment should be suitable for the configuration of the space being surveyed."
- 15 The existing paragraphs 5.5 and 5.6 are renumbered, respectively.
- 16 In the table of contents, a new reference to paragraph "5.5 Rescue and emergency response equipment" is added after reference to paragraph 5.4 and the existing reference to paragraph numbers 5.5 and 5.6 are renumbered accordingly.
- 17 In the renumbered paragraph 5.6.7, the referenced paragraph numbers 5.5.5 and 5.5.6 are replaced by 5.6.5 and 5.6.6.
- 18 The following new paragraph 6.1.3 is added after the existing paragraph 6.1.2:
- "6.1.3 For bulk carriers subject to SOLAS regulation II-1/3-10, the Owner should arrange the updating of the Ship Construction File (SCF) throughout the ship's life whenever a modification of the documentation included in the SCF has taken place. Documented procedures for updating the SCF should be included within the Safety Management System."
- 19 The existing text under paragraph 6.3 is numbered as paragraph 6.3.1 and the following new paragraph 6.3.2 is added at the end of paragraph 6.3:
- "6.3.2 For bulk carriers subject to SOLAS regulation II-1/3-10, the Ship Construction File (SCF), limited to the items to be retained on board, should be available on board."
- 20 The existing text under paragraph 6.4 is numbered as paragraph 6.4.1 and the following new paragraphs 6.4.2 and 6.4.3 are added at the end of paragraph 6.4:
- "6.4.2 For bulk carriers subject to SOLAS regulation II-1/3-10, on completion of the survey, the surveyor should verify that the update of the Ship Construction File (SCF) has been done whenever a modification of the documentation included in the SCF has taken place.
- 6.4.3 For bulk carriers subject to SOLAS regulation II-1/3-10, on completion of the survey, the surveyor should verify any addition and/or renewal of materials used for the construction of the hull structure are documented within the Ship Construction File list of materials."

Annex 7 Condition evaluation report

- 21 The general particulars are replaced by the following:

"General particulars

Ship's name:	Administration/recognized organization identity number:
	Previous Administration/recognized organization identity number(s):
	IMO number:

..."

Annex 12 Procedural requirements for thickness measurement

- 22 Section 1 is replaced by the following:

"1 General

Thickness measurements required in the context of hull structural surveys, if not carried out by the recognized organization acting on behalf of the Administration, should be witnessed by a surveyor of the recognized organization. The attendance of the surveyor should be recorded. This also applies to thickness measurements taken during voyages."

ANNEX B**CODE ON THE ENHANCED PROGRAMME OF INSPECTIONS
DURING SURVEYS OF OIL TANKERS****Part A****CODE ON THE ENHANCED PROGRAMME OF INSPECTIONS
DURING SURVEYS OF DOUBLE-HULL OIL TANKERS**

- 23 Paragraph 1.3.3 is replaced by the following:

"1.3.3 Where the damage found on the structure mentioned in paragraph 1.3.1 above is isolated and of a localized nature which does not affect the ship's structural integrity (as for example a minor hole in a cross-deck strip), consideration may be given by the surveyor to allow an appropriate temporary repair to restore watertight or weathertight integrity after evaluation of the surrounding structure and impose an associated condition or recommendation with a specific time limit in order to complete the permanent repair and retain the validity of the relevant statutory certification."

- 24 The text in paragraph 2.6.1 is replaced by the following new text:

"2.6.1 The minimum requirements for ballast tank pressure testing at the renewal survey are given in 2.6.3 and in annex 3.

The minimum requirements for cargo tank testing at the renewal survey are given in 2.6.4 and annex 3.

Cargo tank testing carried out by the vessel's crew under the direction of the master may be accepted by the surveyor provided the following conditions are complied with:

- .1 the tank testing procedure has been submitted by the owner and reviewed by the Administration or recognized organization prior to the testing being carried out;
- .2 there is no record of leakage, distortion or substantial corrosion that would affect the structural integrity of the tank;
- .3 the tank testing has been satisfactorily carried out within special survey window not more than 3 months prior to the date of the survey on which the overall or close up survey is completed;
- .4 the satisfactory results of the testing is recorded in the vessel's logbook; and
- .5 the internal and external condition of the tanks and associated structure are found satisfactory by the surveyor at the time of the overall and close up survey."

25 The text in paragraph 5.3.2.3 is replaced by the following:

"3 hydraulic arm vehicles such as conventional cherry pickers, lifts and moveable platforms;"

26 The following new paragraph 5.5 is added after the existing paragraph 5.4:

"5.5 Rescue and emergency response equipment

If breathing apparatus and/or other equipment is used as "Rescue and emergency response equipment" then the equipment should be suitable for the configuration of the space being surveyed."

27 The existing paragraphs 5.5 and 5.6 are renumbered, respectively.

28 In the table of contents, a new reference to paragraph "5.5 Rescue and emergency response equipment" is added after reference to paragraph 5.4 and the existing reference to paragraph numbers 5.5 and 5.6 are renumbered accordingly.

29 In the renumbered paragraph 5.6.7, the referenced paragraph numbers 5.5.5 and 5.5.6 are replaced by 5.6.5 and 5.6.6.

30 The following new paragraph 6.1.3 is added after the existing paragraph 6.1.2:

"6.1.3 For oil tankers subject to SOLAS regulation II-1/3-10, the Owner should arrange the updating of the Ship Construction File (SCF) throughout the ship's life whenever a modification of the documentation included in the SCF has taken place. Documented procedures for updating the SCF should be included within the Safety Management System."

31 The existing text under paragraph 6.3 is numbered as paragraph 6.3.1 and the following new paragraph 6.3.2 is added at the end of paragraph 6.3:

"6.3.2 For oil tankers subject to SOLAS regulation II-1/3-10, the Ship Construction File (SCF), limited to the items to be retained on board, should be available on board."

32 The existing text under paragraph 6.4 is numbered as paragraph 6.4.1 and the following new paragraphs 6.4.2 and 6.4.3 are added at the end of paragraph 6.4:

"6.4.2 For oil tankers subject to SOLAS regulation II-1/3-10, on completion of the survey, the surveyor should verify that the update of the Ship Construction File (SCF) has been done whenever a modification of the documentation included in the SCF has taken place.

6.4.3 For oil tankers subject to SOLAS regulation II-1/3-10, on completion of the survey, the surveyor should verify any addition and/or renewal of materials used for the construction of the hull structure are documented within the Ship Construction File list of materials."

Annex 9 Condition evaluation report

33 The general particulars are replaced by the following:

"General particulars

Ship's name:	Administration/recognized organization identity number:
	Previous Administration/recognized organization identity number(s):
	IMO number:
...	

34 Note 3 to table 2 (Transverse section modulus of hull girder) is replaced by the following:

"3 This section applies to ships constructed before 1 July 2002: Section moduli of transverse sections of the ship's hull girder have been calculated by using the thickness of structural members measured, renewed or reinforced, as appropriate, during the SC renewal survey most recently conducted after the ship reached 10 years of age in accordance with the provisions of paragraph 2.2.1.2 of annex 12, and found to meet the criteria required by the Administration or the recognized organization and that Z_{act} is not less than Z_{mc} (defined in note 2 below) as specified in appendix 2 to annex 12, as shown in the following table.

Describe the criteria for acceptance of the minimum section moduli of the ship's hull girder for ships in service required by the Administration or the recognized organization."

Annex 12 Criteria for longitudinal strength of hull girder for oil tankers

35 Paragraph 2.2.1.2 is replaced by the following:

".2 for ships constructed before 1 July 2002, the actual section moduli (Z_{act}) of the transverse section of the ship's hull girder calculated in accordance with the requirements of 2.1.2.2 should meet the criteria for minimum section modulus for ships in service required by the Administration or recognized organization, provided that in no case Z_{act} should be less than the diminution limit of the minimum section modulus (Z_{mc}) as specified in appendix 2."

Part B**CODE ON THE ENHANCED PROGRAMME OF INSPECTIONS
DURING SURVEYS OF OIL TANKERS OTHER THAN
DOUBLE-HULL OIL TANKERS**

- 36 Paragraph 1.3.3 is replaced by the following:
- "1.3.3 Where the damage found on the structure mentioned in paragraph 1.3.1 above is isolated and of a localized nature which does not affect the ship's structural integrity (as for example a minor hole in a cross-deck strip), consideration may be given by the surveyor to allow an appropriate temporary repair to restore watertight or weathertight integrity after evaluation of the surrounding structure and impose an associated condition or recommendation with a specific time limit in order to complete the permanent repair and retain the validity of the relevant statutory certification."
- 37 The text in paragraph 2.6.1 is replaced by the following new text:
- "2.6.1 The minimum requirements for ballast tank pressure testing at the renewal survey are given in 2.6.3 and in annex 3.
- The minimum requirements for cargo tank testing at the renewal survey are given in 2.6.4 and annex 3.
- Cargo tank testing carried out by the vessel's crew under the direction of the master may be accepted by the surveyor provided the following conditions are complied with:
- .1 the tank testing procedure has been submitted by the owner and reviewed by the Administration or recognized organization prior to the testing being carried out;
 - .2 there is no record of leakage, distortion or substantial corrosion that would affect the structural integrity of the tank;
 - .3 the tank testing has been satisfactorily carried out within special survey window not more than 3 months prior to the date of the survey on which the overall or close up survey is completed;
 - .4 the satisfactory results of the testing is recorded in the vessel's logbook; and
 - .5 the internal and external condition of the tanks and associated structure are found satisfactory by the surveyor at the time of the overall and close up survey."
- 38 The text in paragraph 5.3.2.3 is replaced by the following:
- "3 hydraulic arm vehicles such as conventional cherry pickers, lifts and moveable platforms;"
- 39 The following new paragraph 5.5 is added after the existing paragraph 5.4:
- "5.5 Rescue and emergency response equipment

If breathing apparatus and/or other equipment is used as "Rescue and emergency response equipment" then the equipment should be suitable for the configuration of the space being surveyed."

40 The existing paragraphs 5.5 and 5.6 are renumbered, respectively.

41 In the table of contents, a new reference to paragraph "5.5 Rescue and emergency response equipment" is added after reference to paragraph 5.4 and the existing reference to paragraph numbers 5.5 and 5.6 are renumbered accordingly.

42 In the renumbered paragraph 5.6.7, the referenced paragraph numbers 5.5.5 and 5.5.6 are replaced by 5.6.5 and 5.6.6.

Annex 9 Condition evaluation report

43 The general particulars are replaced by the following:

"General particulars

Ship's name:	Administration/recognized organization identity number:
	Previous Administration/recognized organization identity number(s):
	IMO number:
...	

44 Note 3 to table 2 (Transverse section modulus of hull girder) is replaced by the following:

"3 This section applies to ships constructed before 1 July 2002: Section moduli of transverse sections of the ship's hull girder have been calculated by using the thickness of structural members measured, renewed or reinforced, as appropriate, during the SC renewal survey most recently conducted after the ship reached 10 years of age in accordance with the provisions of paragraph 2.2.1.2 of annex 12, and found to meet the criteria required by the Administration or the recognized organization and that Z_{act} is not less than Z_{mc} (defined in note 2 below) as specified in appendix 2 to annex 12, as shown in the following table.

Describe the criteria for acceptance of the minimum section moduli of the ship's hull girder for ships in service required by the Administration or the recognized organization."

Annex 12 Criteria for longitudinal strength of hull girder for oil tankers

45 Paragraph 2.2.1.2 is replaced by the following:

".2 for ships constructed before 1 July 2002, the actual section moduli (Z_{act}) of the transverse section of the ship's hull girder calculated in accordance with the requirements of 2.1.2.2 should meet the criteria for minimum section modulus for ships in service required by the Administration or recognized organization, provided that in no case Z_{act} should be less than the diminution limit of the minimum section modulus (Z_{mc}) as specified in appendix 2."

第 MSC.405 (96) 號決議

(2016 年 5 月 19 日通過)

2011 年國際散貨船和油船檢驗期間加強檢驗程序規則

(2011 年 ESP 規則) 修正案

海上安全委員會，

憶及國際海事組織公約關於本委員會職能的第 28 (b) 條，

注意到大會 A.1049 (27) 決議通過的《2011 年國際散貨船和油船檢驗期間加強檢驗程序規則》(“2011 年 ESP 規則”)已按照《1974 年國際海上人命安全公約》(“本公約”)第 XI-1 章成為強制性要求，

還注意到本公約第 VIII (b) 條和第 XI-1/2 條關於對 2011 年 ESP 規則的修正程序，

在其第 96 屆會議上審議了按本公約第 VIII (b) (i) 條提出和分發的 2011 年 ESP 規則修正案，

1 按本公約第 VIII (b) (iv) 條規定，通過了 2011 年 ESP 規則修正案，其文本載於本決議附件；

2 按本公約第 VIII (b) (vi) (2) (bb) 條規定，決定該修正案須於 2017 年 7 月 1 日視為已被接受，除非在此日期之前，有三分之一以上的本公約締約國政府或擁有商船合計噸位數不少於世界商船總噸數 50% 的締約國政府通報秘書長其反對該修正案；

- 3 **提請**本公約締約國政府注意，按本公約第 VIII (b) (vii) (2) 條規定，該修正案須在按上述 2 被接受後，於 2018 年 1 月 1 日生效；
- 4 **要求**秘書長按本公約第 VIII (b) (v) 條規定，將核正無誤的本決議及其附件中的修正案文本副本分發給所有本公約締約國政府；
- 5 **還要求**秘書長將本決議及其附件的副本分發給非本公約締約國的本組織會員國。

附件

2011年國際散貨船和油船檢驗期間加強檢驗程序規則

(2011年ESP規則)修正案

附件 A

散貨船檢驗期間加強檢驗程序規則

A 部分

單舷側結構散貨船檢驗期間加強檢驗程序規則

- 1 在 4.2.1.3 中，在“塗層狀況‘差’”前插入“硬保護”一詞。
- 2 5.2.2 由下文替代：

“5.2.2 為使現場驗船師能進行檢驗，船東和主管機關應基於本組織制定的建議案商定合適和安全的通道規定。”
- 3 5.2.9 由下文替代：

“5.2.9 船東應指派至少一位對液艙和封閉處所檢查有經驗的負責人員始終陪伴現場驗船師。”
- 4 刪除 5.2.10。

B 部分

雙舷側結構散貨船檢驗期間加強檢驗程序規則

- 5 5.2.2 由下文替代：

“5.2.2 為使現場驗船師能進行檢驗，船東和主管機關應基於本組織制定的建議案商定合適和安全的通道規定。”

6 5.2.9 由下文替代：

“5.2.9 船東應指派至少一位對液艙和封閉處所檢查有經驗的負責人員始終陪伴現場驗船師。”

7 刪除 5.2.10。

附件 B**油船檢驗期間加強檢驗程序規則****A 部分****雙殼油船檢驗期間加強檢驗程序規則****8 5.2.1.1 由下文替代：**

“5.2.1.1 為使現場驗船師能進行檢驗，船東和主管機關應基於本組織制定的建議案商定合適和安全的通道規定。”

9 5.2.6 由下文替代：

“5.2.6 船東應指派至少一位對液艙和封閉處所檢查有經驗的負責人員始終陪伴現場驗船師。”

10 刪除 5.2.7。**B 部分****雙殼油船以外的油船檢驗期間加強檢驗程序規則****11 5.2.1.1 由下文替代：**

“5.2.1.1 為使現場驗船師能進行檢驗，船東和主管機關應基於本組織制定的建議案商定合適和安全的通道規定。”

12 5.2.6 由下文替代：

“5.2.6 船東應指派至少一位對液艙和封閉處所檢查有經驗的負責人員始終陪伴現場驗船師。”

13 刪除 5.2.7。

RESOLUTION MSC.405(96)
(adopted on 19 May 2016)

**AMENDMENTS TO THE INTERNATIONAL CODE ON THE ENHANCED PROGRAMME
OF INSPECTIONS DURING SURVEYS OF BULK CARRIERS AND OIL TANKERS, 2011
(2011 ESP CODE)**

THE MARITIME SAFETY COMMITTEE,

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

NOTING resolution A.1049(27), by which the Assembly adopted the International Code on the Enhanced Programme of Inspections during Surveys of Bulk Carriers and Oil Tankers, 2011 ("the 2011 ESP Code"), which has become mandatory under chapter XI-1 of the International Convention for the Safety of Life at Sea, 1974 ("the Convention"),

NOTING ALSO article VIII(b) and regulation XI-1/2 of the Convention concerning the procedure for amending the 2011 ESP Code,

HAVING CONSIDERED, at its ninety-sixth session, amendments to the 2011 ESP Code proposed and circulated in accordance with article VIII(b)(i) of the Convention,

1 ADOPTS, in accordance with article VIII(b)(iv) of the Convention, amendments to the 2011 ESP Code the text of which is set out in the annex to the present resolution;

2 DETERMINES, in accordance with article VIII(b)(vi)(2)(bb) of the Convention, that the said amendments shall be deemed to have been accepted on 1 July 2017 unless, prior to that date, more than one third of the Contracting Governments to the Convention, or Contracting Governments the combined merchant fleets of which constitute not less than 50% of the gross tonnage of the world's merchant fleet, have notified the Secretary-General of their objections to the amendments;

3 INVITES Contracting Governments to the Convention to note that, in accordance with article VIII(b)(vii)(2) of the Convention, the amendments shall enter into force on 1 January 2018 upon their acceptance in accordance with paragraph 2 above;

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

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

ANNEX**AMENDMENTS TO THE INTERNATIONAL CODE ON THE ENHANCED PROGRAMME
OF INSPECTIONS DURING SURVEYS OF BULK CARRIERS AND OIL TANKERS, 2011
(2011 ESP CODE)****ANNEX A****CODE ON THE ENHANCED PROGRAMME OF INSPECTIONS DURING SURVEYS OF
BULK CARRIERS****Part A****CODE ON THE ENHANCED PROGRAMME OF INSPECTIONS DURING SURVEYS OF
BULK CARRIERS HAVING SINGLE-SIDE SKIN CONSTRUCTION**

- 1 In paragraph 4.2.1.3, the words "hard protective" are inserted after the words "When such breakdown of".
- 2 Paragraph 5.2.2 is replaced with the following text:

"5.2.2 In order to enable the attending surveyors to carry out the survey, provisions for proper and safe access should be agreed between the owner and the Administration, based on recommendations developed by the Organization.
- 3 Paragraph 5.2.9 is replaced with the following text:

"5.2.9 The surveyor(s) should always be accompanied by at least one responsible person, assigned by the owner, experienced in tank and enclosed space inspection."
- 4 Paragraph 5.2.10 is deleted.

Part B**CODE ON THE ENHANCED PROGRAMME OF INSPECTIONS DURING SURVEYS OF
BULK CARRIERS HAVING DOUBLE-SIDE SKIN CONSTRUCTION**

- 5 Paragraph 5.2.2 is replaced with the following text:
- "5.2.2 In order to enable the attending surveyors to carry out the survey, provisions for proper and safe access should be agreed between the owner and the Administration, based on recommendations developed by the Organization.
- 6 Paragraph 5.2.9 is replaced with the following text:
- "5.2.9 The surveyor(s) should always be accompanied by, at least, one responsible person, assigned by the owner, experienced in tank and enclosed space inspection."
- 7 Paragraph 5.2.10 is deleted.

ANNEX B**CODE ON THE ENHANCED PROGRAMME OF INSPECTIONS
DURING SURVEYS OF OIL TANKERS****Part A****CODE ON THE ENHANCED PROGRAMME OF INSPECTIONS
DURING SURVEYS OF DOUBLE-HULL OIL TANKERS**

- 8 Paragraph 5.2.1.1 is replaced with the following text:
- "5.2.1.1 In order to enable the attending surveyors to carry out the survey, provisions for proper and safe access should be agreed between the owner and the Administration, based on recommendations developed by the Organization.
- 9 Paragraph 5.2.6 is replaced with the following text:
- "5.2.6 The surveyor(s) should always be accompanied by at least one responsible person, assigned by the owner, experienced in tank and enclosed space inspection."
- 10 Paragraph 5.2.7 is deleted.

Part B

CODE ON THE ENHANCED PROGRAMME OF INSPECTIONS DURING SURVEYS OF
OIL TANKERS OTHER THAN DOUBLE-HULL OIL TANKERS

- 11 Paragraph 5.2.1.1 is replaced with the following text:
"5.2.1.1 In order to enable the attending surveyors to carry out the survey, provisions for proper and safe access should be agreed between the owner and the Administration, based on recommendations developed by the Organization.
- 12 Paragraph 5.2.6 is replaced with the following text:
"5.2.6 The surveyor(s) should always be accompanied by at least one responsible person, assigned by the owner, experienced in tank and enclosed space inspection."
- 13 Paragraph 5.2.7 is deleted.

批 示 摘 錄

透過行政長官二零二一年十二月二十八日批示：

劉軍勵——根據第26/2009號行政法規《領導及主管人員通則的補充規定》第八條的規定，因具備適當經驗及專業能力履行職務，其擔任政府總部事務局局長的定期委任，自二零二二年二月一日起，續期一年。

二零二二年一月十九日於行政長官辦公室

辦公室主任 許麗芳

Extracto de despacho

Por despachos de S. Ex.^a o Chefe do Executivo, de 28 de Dezembro de 2021:

Lao Kuan Lai da Luz — renovada a comissão de serviço, pelo período de um ano, como directora da Direcção dos Serviços para os Assuntos da Sede do Governo, nos termos do artigo 8.º do Regulamento Administrativo n.º 26/2009 (Disposições complementares do estatuto do pessoal de direcção e chefia) por possuir experiência e competência profissional adequada para o exercício das suas funções, a partir de 1 de Fevereiro de 2022.

Gabinete do Chefe do Executivo, aos 19 de Janeiro de 2022.
— A Chefe do Gabinete, *Hoi Lai Fong*.

行 政 會 秘 書 處

批 示 摘 錄

摘錄自簽署人於二零二一年十二月十四日作出的批示：

根據現行第12/2015號法律《公共部門勞動合同制度》第四條第二款、第三款及第六條第四款的規定，吳煒秋於本秘書處擔任第四職階勤雜人員的長期行政任用合同，自二零二二年一月二十五日起續期三年。

二零二二年一月十三日於行政會秘書處

秘書長 許麗芳

SECRETARIA DO CONSELHO EXECUTIVO

Extracto de despacho

Por despacho da signatária, de 14 de Dezembro de 2021:

Ng Sim Chao — renovado o contrato administrativo de provimento de longa duração, pelo período de três anos, como auxiliar, 4.º escalão, nesta Secretaria, nos termos dos artigos 4.º, n.ºs 2 e 3, e 6.º, n.º 4, da Lei n.º 12/2015 (Regime do contrato de trabalho nos serviços públicos), em vigor, a partir de 25 de Janeiro de 2022.

Secretaria do Conselho Executivo, aos 13 de Janeiro de 2022.
— A Secretária-geral, *Hoi Lai Fong*.