

Border, distrito de Spin Boldak, província de Kandahar, Afeganistão **Data de inserção na lista:** 29/6/2012 (alterada em 25/10/2012) **Outras informações:** A Roshan Money Exchange reúne e transfere fundos para apoiar as operações militares dos Talibã e o tráfico de narcóticos no Afeganistão. Propriedade de Ahmed Shah Noorzai Obaidullah (TI.N.166.13.).

第 7/2015 號行政長官公告

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

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

國際海事組織海上安全委員會於二零零六年十二月八日透過第MSC.215(82)號決議通過了《所有類型船舶專用海水壓載艙和散貨船雙舷側處所保護塗層性能標準》,該性能標準自二零零八年七月一日起適用於澳門特別行政區;

基於此,行政長官根據澳門特別行政區第3/1999號法律第六條第一款的規定,命令公佈包含上指性能標準的第MSC.215(82)號決議的中文及英文文本。

二零一五年二月四日發佈。

行政長官 崔世安

Aviso do Chefe do Executivo n.º 7/2015

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

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

Considerando igualmente que, em 8 de Dezembro de 2006, o Comité de Segurança Marítima da Organização Marítima Internacional, através da resolução MSC.215(82), adoptou o Padrão de Desempenho para Revestimentos de Protecção para Tanques Destinados a Lastro de Água Salgada em Todos os Tipos de Navios e em Espaços no Casco Duplo de Graneleiros, e que tal Padrão de Desempenho é aplicável na Região Administrativa Especial de Macau, a partir de 1 de Julho de 2008;

O Chefe do Executivo manda publicar, nos termos do n.º 1 do artigo 6.º da Lei n.º 3/1999 da Região Administrativa Especial de Macau, a resolução MSC.215(82), que contém o referido Padrão de Desempenho, nos seus textos em línguas chinesa e inglesa.

Promulgado em 4 de Fevereiro de 2015.

O Chefe do Executivo, *Chui Sai On*.

第 MSC.215 (82) 決議

(2006年12月8日通過)

《所有類型船舶專用海水壓載艙和散貨船雙舷側處所保護塗層性能標準》

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，

注意到以海安會第MSC.216(82)號決議通過的、關於專用海水壓載艙和雙舷側處所保護塗層的、經修正的《1974年國際海上人命安全公約》(SOLAS)(以下稱“公約”)第II-1/3-2條和第XII/6條的修正案，

還注意到上述第II-1/3-2條規定，該條中所述的保護塗層須符合《所有類型船舶專用海水壓載艙和散貨船雙舷側處所保護塗層性能標準》(以下稱“保護塗層性能標準”)的要求，

認識到上述《保護塗層性能標準》無意阻礙作為替代系統的新型或新穎技術的發展，

在其第82屆會議上審議了提議的保護塗層性能標準的文本，

1. 通過《所有類型船舶專用海水壓載艙和散貨船雙舷側處所保護塗層性能標準》，其文本載於本決議的附件；

2. 請《公約》各締約政府注意，該《保護塗層性能標準》將在《公約》第II-1/3-2條和第XII/6條修正案生效之時於2008年7月1日生效；
3. 要求秘書長將本決議副本和附件中的《保護塗層性能標準》的核證無誤文本分發給所有《公約》締約政府；
4. 進一步要求秘書長將本決議及其附件分發給非《公約》締約政府的本組織所有會員；
5. 請各國政府鼓勵發展旨在作為替代系統的新穎技術，並隨時將任何有效的結果通知本組織。

附件

《所有類型船舶專用海水壓載艙和散貨船

雙舷側處所護塗層性能標準》

1 目的

本標準規定了對由海安會第MSC.216（82）號決議通過的《安全公約》第II-1/3-2條所述日期或以後簽訂合同、安放龍骨或交船的不小於500總噸的所有類型船舶專用海水壓載艙和船長為150米及以上的散貨船雙舷側處所內保護塗層的技術要求。

2 定義

下列定義適用於本標準：

2.1 壓載艙為《專用海水壓載艙防腐系統的選擇、塗裝和維護指南》（第A.798（19）號決議）和《散貨船和油船檢驗期間加強檢驗程序指南》（經修正的第A.744（18）號決議）所界定的那些壓載艙。

2.2 露點為空氣被所含潮氣飽和時的溫度。

2.3 *DFT*為乾膜厚度。

2.4 灰塵為呈現在準備塗漆的表面上的、由於噴砂清理或其他表面處理工藝產生的，或由於環境作用產生的鬆散的顆粒性物質。

2.5 邊緣打磨係指二次表面處理前對邊緣的處理。

2.6 “良好”狀況係指第A.744（18）號決議界定的有少量點鏽的

狀況。

2.7 硬塗層係指在固化過程中發生化學變化的塗層或非化學變化、在空氣中乾燥的塗層。硬塗層可用於維護目的，類型可以是無機的也可以是有機的。

2.8 *NDFT*為名義乾膜厚度。90/10規則意指所有測厚點的90%測量結果須大於或等於 $NDFT$ ，餘下10%測厚結果均須不小於 $0.9 \times NDFT$ 。

2.9 底漆係指車間底漆塗裝後在船廠塗裝的塗層系統的第一道塗層。

2.10 車間底漆係指加工前塗在鋼板表面的底漆，通常在自動化車間噴塗（在塗層系統第一道塗層之前）。

2.11 預塗係指對關鍵區域邊緣、焊縫、不易噴塗區域等位置的預先塗刷，以保證良好的塗料附着力和恰當的塗層厚度。

2.12 目標使用壽命為塗層系統設計壽命的目標值，以年計。

2.13 技術規格書為塗料生產商的产品規格書，包含與塗料及其塗裝有關的詳細技術性說明和資料。

3 總體原則

3.1 塗層系統達到其目標使用壽命的能力取決於塗層系統的類型、鋼材處理、塗裝和塗層檢查及維護。所有這些方面對塗層系統的優良性能都有影響。

3.2 表面處理和塗裝過程的檢查須由船東、船廠和塗料生產商達成一致，並提交給主管機關審查。如有要求，主管機關可參與到協議過程中。須報告這些檢查的明確證據並包括在塗層技術檔案（CTF）

中（見第3.4段）。

3.3 關於第4節所列的標準，應考慮到下列因素：

- .1 為了防止塗層系統過早老化和（或）退化，船廠有必要在塗裝作業中嚴格執行塗裝技術規範、程序和各種不同的步驟（包括但不限於表面準備）；
- .2 在船舶設計階段可採取措施以提高塗層的性能，如減少挖孔、採用圓順的外形、避免複雜的幾何結構，保證結構形狀使工具容易進入，方便塗裝部位的清潔、排水和乾燥；和
- .3 本文件規定的塗層性能標準是基於製造商、船廠和船舶經營人的經驗；並不意味着排斥其他合適的塗層系統，只要證明塗層的性能至少不低於本標準規定的性能。替代塗層系統的驗收標準見第8節。

3.4 塗層技術檔案

3.4.1 用於船舶專用海水壓載艙和雙舷側處所的塗層體系的技術規範、船廠和船東的塗裝工作記錄、塗層系統選擇的詳細標準、工作說明書、檢查、維護和修補報告均須形成文件記入“塗層技術檔案”，塗層技術檔案須由主管機關審查。

3.4.2 新造階段

塗層技術檔案至少須包括與本標準相關的下列項目，並在新船建造階段由船廠提交：

- .1 符合規定證明或型式認可證書的副本；
- .2 技術規格書副本，包括：

- .2.1 產品名稱，識別標記和（或）編號；
- .2.2 塗層系統的材料、成份和組成，顏色；
- .2.3 最小和最大乾膜厚度；
- .2.4 塗裝的方式、工具和（或）機械；
- .2.5 塗裝前的表面狀況（除鏽等級、清潔度、粗糙度等）；和
- .2.6 環境限制條件（溫度和濕度）；
- .3 船廠的塗裝作業工作記錄，包括：
 - .3.1 每個艙室塗裝的真實空間和面積（以平方米計）；
 - .3.2 塗裝的塗層系統；
 - .3.3 塗裝的時間、厚度、道數，等等；
 - .3.4 塗裝時的周圍環境條件；和
 - .3.5 表面處理的方式；
- .4 船舶建造期間塗層系統的檢查和修補程序；
- .5 塗層檢查人員簽署的塗裝日誌 – 聲明塗層按照規範塗裝，已得到塗料供應商代表的認可，並詳細說明與規範的差異（檢查日誌和不符合規定報告格式，見附件2）；
- .6 船廠核實過的檢查報告，包括：
 - .6.1 檢查的完成日期；
 - .6.2 檢查結果；
 - .6.3 備註（如有的話）；和

.6.4 檢查人員簽名；

.7 營運期內塗層系統的保養和修補程序。

3.4.3 營運中的維護、修補和局部重塗

營運中的維護、修補和局部重塗事項須按照塗層維護和修補指南中有關章節要求記錄在塗層技術檔案中。

3.4.4 重塗

如果全面重塗，須將第3.4.2段規定的條目記錄在塗層技術檔案中。

3.4.5 在船舶壽命期內，塗層技術檔案須保存在船上並及時補充有關材料。

3.5 健康和 safety

船廠負責執行國家規定，確保勞動者的健康和 safety，減少火災和爆炸的危險。

4 塗層標準

4.1 性能標準

本標準基於這樣的技術條件和要求，即為使塗層達到15年的目標使用壽命；這是從最初的塗裝開始，塗層系統維持“良好”狀態的持續時間。塗層的實際使用壽命可能有異，取決於很多的變化因素，包括在使用中遇到的真實條件。

4.2 標準適用範圍

所有類型船舶的專用海水壓載艙和船長為150米或以上散貨船的雙舷側處所內的保護塗層須至少符合本標準的要求。

4.3 特殊應用

4.3.1 本標準覆蓋了船體鋼結構保護塗層的要求。注意到安裝在塗有防腐塗料的艙內的一些其他獨立構件。

4.3.2 建議在儘可能的範圍內，對永久性檢驗通道部分，如扶手、獨立平台、梯子等非結構整體部分，應用本標準。對非船體結構整體部分的構件也可以使用其他防腐等效方法，只要這些方法對周圍結構的保護塗層性能沒有影響。和船體結構成為一體的通道，如作為步道的縱向加強肋、縱樑等，應完全符合本標準。

4.3.3 建議管子、測量裝置等支撐件參照第4.3.2段所述對非結構整體構件的要求塗裝。

4.4 塗層的基本要求

4.4.1 表1中列出了所有類型船舶專用海水壓載艙和船長為150米或以上的散貨船雙舷側處所保護塗層在建造時的塗裝要求，作為滿足第4.1段所規定的性能標準的要求。

4.4.2 塗料生產商應提供滿足表1所列要求的保護塗層系統的規範。

4.4.3 主管機關須核實保護塗層的技術規格書和符合規定證明或型式認可證書。

4.4.4 船廠須依據核實的技術規格書和工廠自己查證的塗裝程序塗裝保護塗層。

表1 - 所有類型船舶的專用海水壓載艙和船長為150米或以上的散貨船雙舷側處所塗層系統的基本要求

	特點/參考標準	要求
1 塗層系統的設計		
.1	塗層系統的選擇	<p>塗層系統的選擇須由各有關方面結合塗層的使用條件和有計劃的保養加以考慮。其中須考慮下列事項：</p> <ul style="list-style-type: none"> .1 與受熱表面相關艙室的位置； .2 壓載和排壓載作業的頻率； .3 要求的表面條件； .4 要求的表面清潔度和乾燥度； .5 輔助陰極保護裝置，如果有的話。（如果塗層有輔助的陰極保護，塗層須與輔助陰極保護系統相兼容）。 <p>塗層生產商應提供成文的、有令人滿意的性能記錄和技術規格書的產品。生產商應具有提供適當技術幫助的能力。性能記錄、技術規格書和技術幫助（如有的話）須記錄在塗層技術檔案中。</p> <p>在陽光曝曬甲板下面或在加熱艙室周圍的艙壁上應用的塗料須具有耐反覆加熱和（或）冷卻而不變脆的性能。</p>

.2	塗層類型	<p>環氧基系統。</p> <p>其他塗層系統的性能要通過附件 1 的試驗程序。</p> <p>建議多道塗層系統，每道塗層的顏色要有對比。</p> <p>面塗層須為淺色，便於營運中檢查。</p>
.3	塗層合格預試驗	<p>在本標準生效日之前，依據附件 1 的試驗程序或等效的方法進行實驗室試驗的環氧基系統，如至少滿足對鏽蝕和鼓泡的要求或有文件記錄，或經現場暴露試驗 5 年後塗層的最終狀況不低於“良好”，可以接受。</p> <p>所有其他系統，要求按照附件 1 的試驗程序或等效的試驗程序進行試驗。</p>
.4	工作規範	<p>須至少進行兩道預塗和兩道噴塗。僅在焊縫區能證明塗層可滿足名義總乾膜厚度 (NDFT) 要求的範圍內，可減少第二道預塗，以避免不必要的塗層過厚。任何減少第二道預塗的範圍都須詳細地全部記錄在塗層技術檔案中。</p> <p>預塗須採用刷塗或輥塗的方法。輥塗僅用於流水孔、老鼠洞等部位。</p> <p>須根據塗料生產商的建議，使每一道主塗層在下一道主塗層塗裝前適當固化。表面污染物如鏽、油脂、灰</p>

		塵、鹽、油等須在塗裝前根據塗料生產商的建議採用適當的方法去除。須去除埋在塗層中的磨料嵌入物。工作規範須包括塗料商規定的塗層覆塗時間間隔和可踩踏時間間隔。
.5	NDFT (名義 總乾膜 厚度)	對環氧類塗層為在 90/10 原則下達到 NDFT 320 µm，其他系統應滿足塗料生產商的規範。 總乾膜厚度最大值應符合塗料生產商的詳細規範。 須小心避免塗膜過厚。塗裝中須定期檢查濕膜厚度。 稀釋劑須限於使用塗料商推薦的類型和用量。
2 初次表面處理		
.1	噴砂處 理和粗 糙度	Sa 2.5 級，粗糙度介於 30-75 µm。 在下列情況下不得進行噴砂： .1 相對濕度超過 85%；或 .2 鋼板的表面溫度不到露點溫度以上 3°C。 在表面處理結束時，在進行底漆塗裝前，須依據塗料商的建議檢查鋼板表面的清潔度和粗糙度。
.2	水溶性 鹽限制 (相當	≤50 mg/m ² 氯化鈉

	於氯化 鈉)	
.3	車間底 漆	<p>無緩蝕劑的含鋅矽酸鋅基塗料或等效的塗料。</p> <p>車間底漆與主塗層系統的相容性須由塗料生產商確認。</p>
3 二次表面處理		
.1	鋼板狀 況	<p>鋼板表面須加以處理，去除毛邊，打磨焊道，去除焊接飛濺物和其他的表面污染物，以使選擇的塗層能夠均勻塗佈，達到所要求的名義總乾膜厚度（NDFT）和有足夠的附着力。</p> <p>塗裝前邊緣須處理成半徑至少為 2 mm 的圓角，或經過三次打磨，或至少經過等效的處理。</p>
.2	表面處 理	<p>被破壞的車間底漆和焊縫處達到 Sa 2.5；</p> <p>如車間底漆按第 1.3 項所述試驗程序未通過塗層合格證明預試驗，完整底漆至少要去除 70%，達到 Sa 2。</p> <p>如果由環氧基的主塗層和車間底漆組成的整體塗層系統按第 1.3 項的試驗程序通過了合格證明預試驗，則當使用同樣的環氧塗層系統時，可保留完整的車間底漆。保留的車間底漆須用掃掠式噴砂、高壓水洗或等效的方法清潔。</p>

		<p>如果一種矽酸鋅車間底漆作為環氧塗層系統的一部分已通過第 1.3 項的塗層合格預試驗，該底漆可和其他的通過第 1.3 項塗層合格預試驗的環氧塗層組合使用，只要該底漆的兼容性得到生產商的確認，並通過附件 1 的附錄 1 第 1.7 段所述的無浪運動條件下的試驗。</p>
.3	合攏後的表面處理	<p>對大接縫為 St 3，或更好，或可行時為 Sa 2.5。小面積破壞區域不大於總面積的 2%時為 St 3。相鄰接的破壞區域的總面積超過 25 m² 或超過艙室總面積 2%，須為 Sa 2.5。</p> <p>塗層搭接處表面要處理成斜坡狀。</p>
.4	粗糙度要求	<p>全面或局部噴砂處理，30-75 μm，其他的處理按照塗料生產商的建議。</p>
.5	灰塵	<p>顆粒大小為“3”、“4”或“5”的灰塵分佈量為 1 級。在不用放大鏡時在待塗表面可見的更小顆粒的灰塵應去除。</p>
.6	噴砂/打磨後水溶性鹽限制（相當於氯化鈉）	<p>≤50 mg/m² 氯化鈉</p>
.7	油污	<p>無油污。</p>

4 其他		
.1	通風	為使塗料適當地乾燥和固化，必須予以充足的通風。應根據塗料生產商的建議，在整個塗裝過程中和塗裝完成後的一段時間內保持通風。
.2	環境條件	<p>須按照生產商的規範，在控制濕度和表面的條件下進行塗裝。此外，下述情況下不得進行塗裝：</p> <p>.1 相對濕度超過 85%，或</p> <p>.2 鋼材表面溫度不到露點溫度以上 3°C。</p>
.3	塗層檢驗	<p>須避免破壞性檢驗。</p> <p>為了質量控制，每道塗層乾膜厚度都要進行測量。最後一道塗層塗裝後須使用適當的測厚計確定總乾膜厚度（見附件 3）。</p>
.4	修補	任何缺陷區域，如針孔，氣泡，露底等，須做標記，並適當修復受影響的區域。所有這類修補須再次檢查並以文件記錄。

5 塗層系統認可

塗層系統合格預試驗（表1，第1.3項）的結果須以文件記錄。如結果令人滿意，須由獨立於塗料生產商的第三方簽發一份符合規定證明或型式認可證書。

6 塗層檢查要求

6.1 通則

6.1.1 為保證符合本標準，下列事項須由具有NACE檢查員2級、FROSIO檢查員III級資格或主管機關承認的同等資格的塗層檢查人員完成。

6.1.2 塗裝檢查人員須檢查整個塗裝過程的表面處理和塗裝施工，作為最低要求，應至少進行第6.2節中的檢查項目，保證符合本標準。檢查重點須放在表面處理和塗裝施工各階段的起始，因為不恰當的工作在以後的塗裝過程中很難糾正。須採用非破壞性的方法檢查代表性結構件的塗層厚度。檢查人員須證實所進行的全部測量過程是恰當的。

6.1.3 檢查的結果須由檢查人員進行記錄，並須放入塗層技術檔案（CTF）中（參考附件2 – 檢查日誌和不符合報告的樣本）。

6.2 檢查項目

建造階段		檢查項目
初次表面處理	1	在噴砂開始前和天氣發生突變時，須測量鋼板表面溫度、相對濕度和露點，並記錄。
	2	須測量鋼板表面的可溶性鹽份並檢查油、油脂和其他污染物。
	3	車間底漆塗裝過程中須監控鋼板表面的清潔度。
	4	須確認車間底漆的材料滿足表 1 第 2.3 項的要求。
厚度		如證明硅酸鋅車間底漆與主塗層體系相兼容，則應確認車間底漆厚度和固化情況與規定值一致。

分段組裝	1	分段建造完成後，二次表面處理開始前，須目視檢查鋼板表面處理，包括檢查邊緣的處理。 去除任何油、油脂或其他可見的污染物。
	2	噴砂/打磨/清潔後，在塗裝前須目視檢查處理好的表面。 完成噴砂、清潔後，系統第一道塗層塗裝前，須檢查鋼板表面殘留可溶性鹽水平，每個分段至少取一點。
	3	在塗層塗裝和固化階段，須監測鋼板表面溫度、相對濕度和露點，並記錄。
	4	須按表 1 中的塗裝過程步驟進行檢查。
	5	須按附件 3 的規定和列出的要求進行乾膜厚度（DFT）測量，驗證塗層達到了規定的厚度。
合攏	1	目視檢查鋼板表面狀況，表面處理情況，驗證表 1 中其他要求是否達到，商定的規範是否得到執行。
	2	塗裝前測量和塗裝中定期測量鋼板表面溫度、相對濕度和露點，並做記錄。
	3	須按表 1 中的塗裝過程步驟進行檢查。

7 驗證要求

在審核執行本性能標準船舶的塗層技術檔案之前，須由主管機關進行下列各項工作：

- .1 核查技術規格書和符合規定證明或型式認可證書符合本塗層性能標準；
- .2 核查代表性包裝桶上的塗料標識與技術規格書和符合規定證明或型式認可證書標識的塗料一致；
- .3 按第6.1.1段的資質標準核查檢查員的資質；
- .4 核查檢查員關於表面處理和塗層的塗裝報告，表明符合塗料商的技術規格書和符合規定證明或型式認可證書；和
- .5 監督塗層檢查要求的執行。

8 替代系統

8.1 所有根據表1塗裝的非環氧基塗層系統都界定為替代系統。

8.2 本性能標準是基於公認的和常用的塗層系統。這並不意味着排斥其他證明具有等效性能的可供選擇的系統，如非環氧基的體系。

8.3 接受其他塗層系統將需要有材料證明其耐腐蝕性能至少與本標準要求相當。

8.4 文件證明材料須至少包括塗層系統具有相當於符合第4節塗層標準的令人滿意的性能，目標使用壽命為15年，或者經實際場地暴露試驗5年後塗層狀況不低於“良好”或者通過實驗室試驗。實驗室的試驗須按照附件1規定的試驗程序進行。

附件1

所有類型船舶專用海水壓載艙和散貨船雙舷側處所 的塗層的合格性試驗程序

1 範圍

本程序提供了第5和8.3段所涉及的試驗程序的詳細步驟。

2 定義

塗層規範係指塗層系統的規範，它包括塗層系統類型、鋼板處理、表面處理、表面清潔度、環境條件、塗裝程序、驗收標準和檢查。

3 試驗

塗層規範須通過下列試驗加以驗證。試驗程序須遵守本附件的附錄1（模擬壓載艙條件試驗）和附錄2（冷凝艙試驗）：

- .1 附錄1和附錄2適用於專用海水壓載艙的保護塗層。
- .2 附錄2適用於船長為150米及以上散貨船的雙舷側處所（非專用海水壓載艙）的保護塗層。

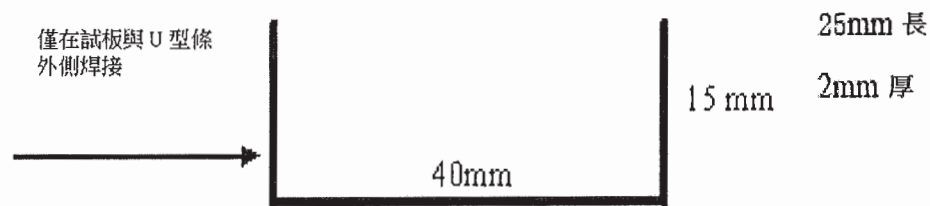
附錄1

模擬壓載艙條件試驗

1 試驗條件

模擬壓載艙條件試驗須滿足下列各項條件：

- .1 試驗期為180天。
- .2 5塊試驗樣板。
- .3 每塊樣板尺寸為200 mm × 400 mm × 3 mm。其中的兩塊樣板（樣板3#和4#）焊上U型條，U型條距一條短邊120 mm，距長邊各80 mm。



試板按本標準的表1.1、1.2和1.3處理，塗層系統的塗裝按表1的第1.4和1.5項進行。車間底漆露天老化至少2個月並用低壓水清洗或其他溫和的方法清潔。不應採用掃掠式噴射或高壓水清洗，或其他去除底漆的方法。露天老化方法和程度須考慮底漆是15年目標使用壽命系統的基礎。為了鼓勵創新，替代的處理方法、塗層系統和乾膜厚度經明確界定後可以採

用。

.4 試驗樣板的背面須適當塗裝，以避免對試驗結果產生影響。

.5 為模擬真實壓載艙的條件，一個試驗循環為二個星期裝載天然或人工海水，一個星期空載。海水溫度保持在大約35°C。

.6 樣板1：模擬上層甲板的狀況，試板50°C加熱12小時，20°C冷卻12小時。周期性地用天然或人工海水潑濺試驗樣板，模擬船舶縱搖和橫搖運動。潑濺間隔為3秒或更短，板上有橫貫試板寬度，深到底材的劃線。

.7 樣板2：固定鋅犧牲陽極以評估陰極保護效果。試驗樣板上距離陽極100 mm處開有直徑8 mm的至底材的圓形人工漏塗孔，以評估陰極保護的效果。試驗樣板循環浸泡在天然或人工海水中。

.8 樣板3：背面冷卻，形成一個溫度梯度，以模擬一個頂邊壓載艙的冷卻艙壁；用天然或人工海水潑濺，模擬船舶縱搖和橫搖運動。溫度梯度大約為20°C，潑濺間隔為3秒或更短。板上有劃破塗層至底材的、有一定長度的橫向橫貫寬度的劃線。

.9 樣板4：天然或人工海水循環潑濺，模擬船前後顛簸和搖擺的運動，潑濺間隔為3秒或更短。板上有橫貫試板寬度且深至底材的劃線。

.10 樣板5：應在乾燥且溫度為70°C條件下暴露180天，模擬雙層底加熱的燃料艙和壓載水艙之間的隔板。

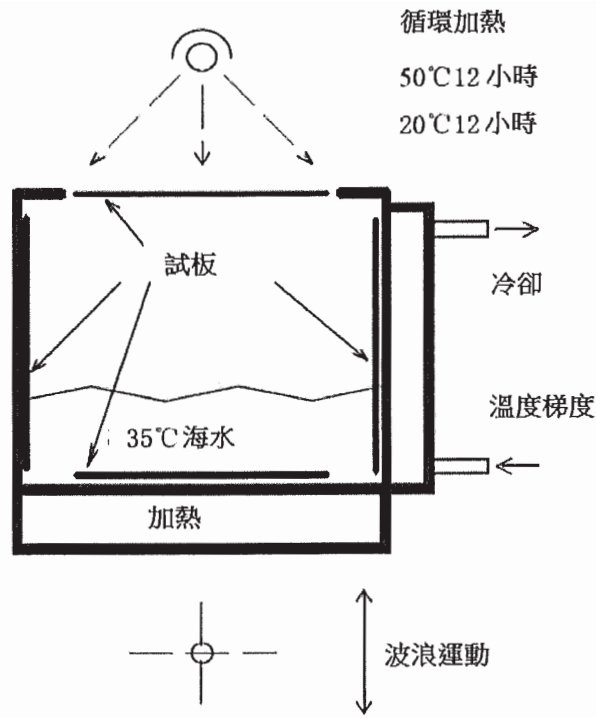


圖1

壓載艙塗層試驗的波浪艙

2 試驗結果

2.1 試驗前，須報告塗層系統的下列測量數據：

- .1 該塗料的基料和固化劑組分的紅外（IR）鑑定；
- .2 該塗料的基料和固化劑組分的比重，和
- .3 針孔數量，以90 V低電壓探測器。

2.2 試驗後，須報告下列測量數據：

- .1 起泡和鏽蝕；

- .2 乾膜厚度 (DFT) (比較樣塊法)；
- .3 附着力；
- .4 按板厚調整後的柔韌性 (3 mm板，300 μm 塗層，150 mm圓柱軸有2%延伸修正後)，僅作為一種參考數據；
- .5 陰極保護的重量損失/電流需要/人工漏塗處的剝離；
- .6 劃痕附近的腐蝕蔓延。測量每塊樣板沿劃痕兩邊的腐蝕蔓延並確定腐蝕蔓延的最大值，三個最大值的平均值作為驗收值。

3 驗收標準

3.1 第2節的試驗結果須滿足下列標準：

項目	依據表 1 塗裝的環氧基體系的驗收標準	替代系統的驗收標準
樣板起泡	沒有	沒有
樣板鏽蝕	Ri 0 級 (0%)	Ri 0 級 (0%)
針孔數量	0	0
附着力	> 3.5 MPa 基材和塗層間或各道塗層之間的脫開面積在 60%或以上。	> 5.0 MPa 基材和塗層間或各道塗層之間的脫開面積在 60%或以上。
內聚力	≥ 3.0 MPa 塗層中的內聚破壞面積在 40%或以上	> 5.0 MPa 塗層中的內聚破壞面積在 40%或以上

按重量損失 計算的陰極 保護需要電 流	< 5 mA/m ²	< 5 mA/m ²
陰極保護；人 工漏塗處的 剝離	< 8 mm	< 5 mm
劃痕附近的 腐蝕蔓延	< 8 mm	< 5 mm
U 型條	若在角上或焊縫處有缺陷、開 裂或剝離都將判定系統不合 格。	若在角上或焊縫處有 缺陷、開裂或剝離都 將判定系統不合格。

3.2 在本標準生效前，受試環氧基系統只要滿足上表中的鼓泡和鏽蝕標準。

3.3 按表1塗裝的受試環氧基系統須滿足上表對環氧基體系的標準。

3.4 不一定是環氧基的替代系統和（或）不一定按表1塗裝的替代系統須滿足上表對替代系統的要求。

4 試驗報告

試驗報告須包括下列內容：

- .1 生產商名稱；
- .2 試驗日期；

- .3 塗料和底漆的產品名稱/標識；
- .4 批號；
- .5 鋼板表面處理的數據，包括：
 - .5.1 表面處理方式；
 - .5.2 水溶性鹽含量；
 - .5.3 灰塵；和
 - .5.4 磨料嵌入物；
- .6 塗層體系的塗裝數據，包括下列數據：
 - .6.1 車間底漆；
 - .6.2 塗層道數；
 - .6.3 塗裝間隔；
 - .6.4 試驗前的乾膜厚度（DFT）；
 - .6.5 稀釋劑；
 - .6.6 濕度；
 - .6.7 氣溫；和
 - .6.8 鋼板溫度；
- .7 按第2節試驗的試驗結果；和
- .8 按第3節判斷的結果。

附錄2

冷凝艙試驗

1 試驗條件

冷凝艙試驗依據適用標準進行。

- .1 暴露時間為180天。
- .2 具備兩塊試板。
- .3 每塊試板尺寸為150 mm × 150 mm × 3 mm。試板的處理應按性能標準表1第1、2和3段，塗層系統的塗裝按照表1第1.4和1.5段，車間底漆至少露天老化2個月並用低壓水清洗或其他溫和的方法清潔。不應採用掃掠式噴射或高壓水清潔，或其他的底漆去除方法。須考慮露天老化方法和程度，因為底漆是15年目標使用壽命體系的基礎。為了鼓勵創新，替代的處理方法、塗層系統和乾膜厚度清楚詳細說明後可以採用。
- .4 試板的反面須適當塗裝，以避免對試驗結果產生影響。

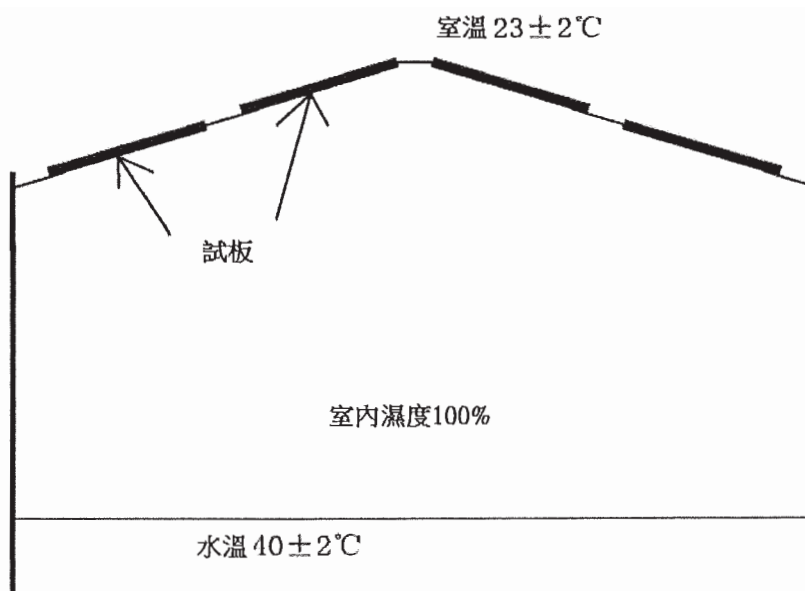


圖2

冷凝艙試驗

2 試驗結果

依據附錄1的第2節（2.2.5和2.2.6除外）。

3 驗收標準

3.1 基於第2節試驗的結果須滿足下列衡準：

項目	依據表1塗裝的環氧基系統的驗收衡準	替代系統的驗收衡準
樣板起泡	沒有	沒有
樣板鏽蝕	Ri 0 級（0%）	Ri 0 級（0%）
針孔數量	0	0
附着力	> 3.5 MPa 基材和塗層間或各道塗層之間的脫開面積在 60%或以上。	> 5.0 MPa 基材和塗層間或各道塗層之間的脫開面積

		在 60%或以上。
內聚力	> 3.0 MPa 塗層中的內聚破壞面積在 40%或以上	> 5.0 MPa 塗層中的內聚破壞面 積在 40%或以上

3.2 在本標準生效前，受試環氧基系統僅需滿足上表對鼓泡和鏽蝕的標準。

3.3 按表1塗裝的受試環氧基系統須滿足上表對環氧基系統的標準。

3.4 不一定是環氧基和（或）不一定按表1塗裝的替代系統須滿足上表所示的對替代系統的要求。

4 試驗報告

依照附錄1第4節。

附件2

檢查日誌和不符合規定報告樣本

檢查日誌

編頁號：

船名：	艙/櫃編號：	數據庫：
結構部位：		
表面處理		
處理方法：	面積 (m ²)	
磨料：	顆粒度：	
表面溫度：	大氣溫度：	
相對濕度 (最大值)：	露點：	
達到的標準：		
邊緣圓度：		
檢查意見：		
工號：	日期：	簽名：

不符合規定報告

編頁號：

船名（編號）：	艙/櫃編號：	數據庫：
結構部位：		
檢查發現的應糾正問題的描述		
發現情況的描述：		
參考文件（檢查日誌）：		
已採取的行動：		
工號：	日期：	簽名：

附件3

乾膜厚度測量

1 乾膜厚度（DFT）驗證檢查點的選取方式：

- .1 平板區域每5平方米測量一個數據；
- .2 2~3米間隔測量一個數據，儘可能地靠近壓載艙邊界，但距壓載艙邊界的邊緣不少於15 mm；
- .3 縱向和橫向扶強材：

如下所示取一組測量點，每2~3米測量一組數據，在主支撐構件間不得少於2組；

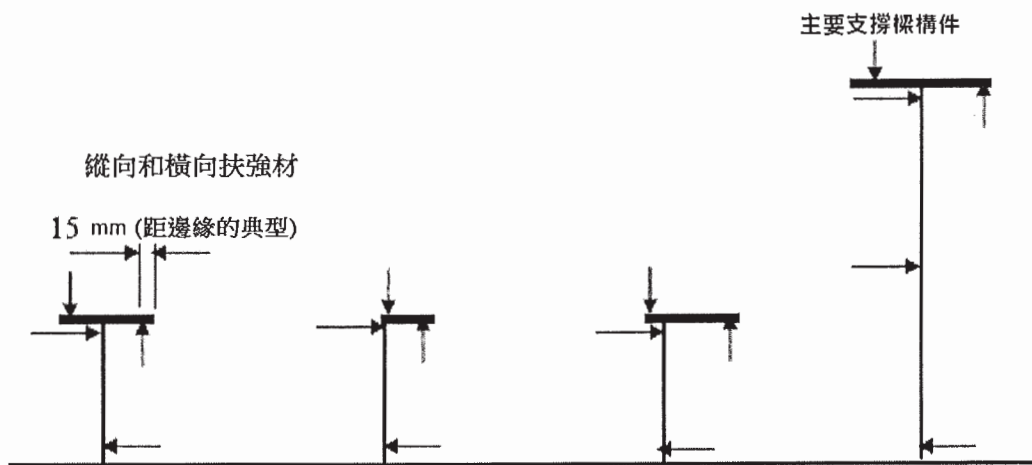


圖3

註：圖中箭頭指示關鍵區域，應理解為指示兩側。

- .4 每組主支撐構件測三個數據，其他的每組構件如圖中箭頭所示測二個數據；
- .5 主支撐構件（縱桁和橫材）每2~3米（如圖3所示）進行一組數據的測量，但不得少於3組；
- .6 開口周圍每一邊測一個數據；
- .7 每平米測五個數據，但複雜區域測量不得少於三個數據（如主支撐構件的大肘板）；和
- .8 塗層檢查員可對認為必要的任何區域額外取點，以驗證塗層厚度。

RESOLUTION MSC.215(82)

(adopted on 8 December 2006)

**PERFORMANCE STANDARD FOR PROTECTIVE COATINGS
FOR DEDICATED SEAWATER BALLAST TANKS IN ALL TYPES OF SHIPS
AND DOUBLE-SIDE SKIN SPACES OF BULK CARRIERS**

THE MARITIME SAFETY COMMITTEE,

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

NOTING the amendments to regulations II-1/3-2 and XII/6 of the International Convention for the Safety of Life at Sea (SOLAS), 1974, as amended (hereinafter referred to as “the Convention”), adopted by resolution MSC.216(82), concerning protective coatings of dedicated seawater ballast tanks and double-side skin spaces,

NOTING ALSO that the aforementioned regulation II-1/3-2 provides that the protective coatings referred to therein shall comply with the requirements of the Performance standard for protective coatings for dedicated seawater ballast tanks in all types of ships and double-side skin spaces of bulk carriers (hereinafter referred to as “the Performance standard for protective coatings”),

RECOGNIZING that the Performance standard for protective coatings referred to above is not intended to inhibit the development of new or novel technologies which provide for alternative systems,

HAVING CONSIDERED, at its eighty-second session, the text of the proposed Performance standard for protective coatings,

1. ADOPTS the Performance standard for protective coatings for dedicated seawater ballast tanks in all types of ships and double-side skin spaces of bulk carriers, the text of which is set out in the Annex to the present resolution;
2. INVITES Contracting Governments to the Convention to note that the Performance standard for protective coatings will take effect on 1 July 2008 upon entry into force of the amendments to regulations II-1/3-2 and XII/6 of the Convention;
3. REQUESTS the Secretary-General to transmit certified copies of this resolution and the text of the Performance standard for protective coatings contained in the Annex to all Contracting Governments to the Convention;
4. FURTHER REQUESTS the Secretary-General to transmit copies of this resolution and the Annex to all Members of the Organization which are not Contracting Governments to the Convention;
5. INVITES Governments to encourage the development of novel technologies aimed at providing for alternative systems and to keep the Organization advised of any positive results.

ANNEX

PERFORMANCE STANDARD FOR PROTECTIVE COATINGS FOR DEDICATED SEAWATER BALLAST TANKS IN ALL TYPES OF SHIPS AND DOUBLE-SIDE SKIN SPACES OF BULK CARRIERS

1 PURPOSE

This Standard provides technical requirements for protective coatings in dedicated seawater ballast tanks of all type of ships of not less than 500 gross tonnage and double-side skin spaces arranged in bulk carriers of 150 m in length and upwards for which the building contract is placed, the keels of which are laid or which are delivered on or after the dates referred to in SOLAS regulation II-1/3-2 as adopted by resolution MSC.216(82).

2 DEFINITIONS

For the purpose of this Standard, the following definitions apply.

2.1 *Ballast tanks* are those as defined in the Guidelines for the selection, application and maintenance of corrosion prevention systems of dedicated seawater ballast tanks (resolution A.798(19)) and the Guidelines on the enhanced programme of inspections during surveys of bulk carriers and oil tankers (resolution A.744(18), as amended).

2.2 *Dew point* is the temperature at which air is saturated with moisture.

2.3 *DFT* is dry film thickness.

2.4 *Dust* is loose particle matter present on a surface prepared for painting, arising from blast-cleaning or other surface preparation processes, or resulting from the action of the environment.

2.5 *Edge grinding* is the treatment of edges, before secondary surface preparation.

2.6 "*GOOD*" condition is the condition with minor spot rusting as defined in resolution A.744(18).

2.7 *Hard coating* is a coating that chemically converts during its curing process or a non-convertible air drying coating which may be used for maintenance purposes. It can be either inorganic or organic.

2.8 *NDFT* is nominal dry film thickness. A 90/10 practice means that 90% of all thickness measurements shall be greater than, or equal to, NDFT and none of the remaining 10% measurements shall be below 0.9 x NDFT.

2.9 *Primer coat* is the first coat of the coating system applied in the shipyard after shop-primer application.

2.10 *Shop-primer* is the prefabrication primer coating applied to steel plates, often in automatic plants (and before the first coat of a coating system).

2.11 *Stripe coating* is painting of edges, welds, hard to reach areas, etc., to ensure good paint adhesion and proper paint thickness in critical areas.

2.12 *Target useful life* is the target value, in years, of the durability for which the coating system is designed.

2.13 *Technical Data Sheet* is paint manufacturers' Product Data Sheet which contains detailed technical instruction and information relevant to the coating and its application.

3 GENERAL PRINCIPLES

3.1 The ability of the coating system to reach its target useful life depends on the type of coating system, steel preparation, application and coating inspection and maintenance. All these aspects contribute to the good performance of the coating system.

3.2 Inspection of surface preparation and coating processes shall be agreed upon between the shipowner, the shipyard and the coating manufacturer and presented to the Administration for review. The Administration may, if it so requires, participate in the agreement process. Clear evidence of these inspections shall be reported and be included in the Coating Technical File (CTF) (see paragraph 3.4).

3.3 When considering the Standard provided in section 4, the following is to be taken into account:

- .1 it is essential that specifications, procedures and the various different steps in the coating application process (including, but not limited to, surface preparation) are strictly applied by the shipbuilder in order to prevent premature decay and/or deterioration of the coating system;
- .2 the coating performance can be improved by adopting measures at the ship design stage such as reducing scallops, using rolled profiles, avoiding complex geometric configurations and ensuring that the structural configuration permits easy access for tools and to facilitate cleaning, drainage and drying of the space to be coated; and
- .3 the coating performance standard provided in this document is based on experience from manufacturers, shipyards and ship operators; it is not intended to exclude suitable alternative coating systems, providing a performance at least equivalent to that specified in this Standard is demonstrated. Acceptance criteria for alternative systems are provided in section 8.

3.4 Coating Technical File

3.4.1 Specification of the coating system applied to the dedicated seawater ballast tanks and double-side skin spaces, record of the shipyard's and shipowner's coating work, detailed criteria for coating selection, job specifications, inspection, maintenance and repair shall be documented in the Coating Technical File, and the Coating Technical File shall be reviewed by the Administration.

3.4.2 *New construction stage*

The Coating Technical File shall contain at least the following items relating to this Standard and shall be delivered by the shipyard at new ship construction stage:

- .1 copy of the Statement of Compliance or Type Approval Certificate;

- .2 copy of the Technical Data Sheet, including:
 - .2.1 product name and identification mark and/or number;
 - .2.2 materials, components and composition of the coating system, colours;
 - .2.3 minimum and maximum dry film thickness;
 - .2.4 application methods, tools and/or machines;
 - .2.5 condition of surface to be coated (de-rusting grade, cleanliness, profile, etc.); and
 - .2.6 environmental limitations (temperature and humidity);
- .3 shipyard work records of coating application, including:
 - .3.1 applied actual space and area (in square metres) of each compartment;
 - .3.2 applied coating system;
 - .3.3 time of coating, thickness, number of layers, etc.;
 - .3.4 ambient condition during coating; and
 - .3.5 method of surface preparation;
- .4 procedures for inspection and repair of the coating system during ship construction;
- .5 coating log issued by the coating inspector, stating that the coating was applied in accordance with the specifications to the satisfaction of the coating supplier representative and specifying deviations from the specifications (example of daily log and non-conformity report see annex 2);
- .6 shipyard's verified inspection report, including:
 - .6.1 completion date of inspection;
 - .6.2 result of inspection;
 - .6.3 remarks (if given); and
 - .6.4 inspector signature; and
- .7 procedures for in-service maintenance and repair of the coating system.

3.4.3 *In-service maintenance, repair and partial re-coating*

In-service maintenance, repair and partial re-coating activities shall be recorded in the Coating Technical File, in accordance with the Guidelines for coating maintenance and repair.

3.4.4 *Re-coating*

If a full re-coating is carried out, the items specified in paragraph 3.4.2 shall be recorded in the Coating Technical File.

3.4.5 The Coating Technical File shall be kept on board and maintained throughout the life of the ship.

3.5 **Health and safety**

The shipyard is responsible for the implementation of national regulations to ensure the health and safety of individuals and to minimize the risk of fire and explosion.

4 COATING STANDARD

4.1 Performance standard

This Standard is based on specifications and requirements which intend to provide a target useful coating life of 15 years, which is considered to be the time period, from initial application, over which the coating system is intended to remain in “GOOD” condition. The actual useful life will vary, depending on numerous variables including actual conditions encountered in service.

4.2 Standard application

Protective coatings for dedicated seawater ballast tanks of all ship types and double-side skin spaces arranged in bulk carriers of 150 m in length and upwards shall at least comply with the requirements in this Standard.

4.3 Special application

4.3.1 This Standard covers protective coating requirements for the ship’s steel structure. It is noted that other independent items are fitted within the tanks to which coatings are applied to provide protection against corrosion.

4.3.2 It is recommended that this Standard is applied, to the extent possible, to those portions of permanent means of access provided for inspection not integral to the ship’s structure, such as the rails, independent platforms, ladders, etc. Other equivalent methods of providing corrosion protection for the non-integral items may also be used, provided they do not impair the performance of the coatings of the surrounding structure. Access arrangements that are integral to the ship structure, such as increased stiffener depths for walkways, stringers, etc., are to fully comply with this Standard.

4.3.3 It is also recommended that supports for piping, measuring devices, etc., be coated in accordance with the non-integral items indicated in paragraph 4.3.2.

4.4 Basic coating requirements

4.4.1 The requirements for protective coating systems to be applied at ship construction for dedicated seawater ballast tanks of all ship types and double-side skin spaces arranged in bulk carriers of 150 m in length and upwards meeting the performance standard specified in paragraph 4.1 are listed in table 1.

4.4.2 Coating manufacturers shall provide a specification for the protective coating system to satisfy the requirements of table 1.

4.4.3 The Administration shall verify the Technical Data Sheet and Statement of Compliance or Type Approval Certificate for the protective coating system.

4.4.4 The shipyard shall apply the protective coating in accordance with the verified Technical Data Sheet and its own verified application procedures.

Table 1 – Basic coating system requirements for dedicated seawater ballast tanks of all type of ships and double-side skin spaces of bulk carriers of 150 m and upwards

	Characteristic/ Reference standards	Requirement
1 Design of coating system		
.1	Selection of the coating system	<p>The selection of the coating system shall be considered by the parties involved with respect to the service conditions and planned maintenance. The following aspects, among other things, shall be considered:</p> <ul style="list-style-type: none"> .1 location of space relative to heated surfaces; .2 frequency of ballasting and deballasting operations; .3 required surface conditions; .4 required surface cleanliness and dryness; and .5 supplementary cathodic protections, if any (where coating is supplemented by cathodic protection, the coating shall be compatible with the cathodic protection system). <p>Coating manufacturers shall have products with documented satisfactory performance records and technical data sheets. The manufacturers shall also be capable of rendering adequate technical assistance. Performance records, technical data sheet and technical assistance (if given) shall be recorded in the Coating Technical File.</p> <p>Coatings for application underneath sun-heated decks or on bulkheads forming boundaries of heated spaces shall be able to withstand repeated heating and/or cooling without becoming brittle.</p>
.2	Coating type	<p>Epoxy-based systems.</p> <p>Other coating systems with performance according to the test procedure in annex 1.</p> <p>A multi-coat system with each coat of contrasting colour is recommended.</p> <p>The top coat shall be of a light colour in order to facilitate in-service inspection.</p>
.3	Coating pre-qualification test	<p>Epoxy-based systems tested prior to the date of entry into force of this Standard in a laboratory by a method corresponding to the test procedure in annex 1 or equivalent, which as a minimum meets the requirements for rusting and blistering; or which have documented field exposure for 5 years with a final coating condition of not less than "GOOD" may be accepted.</p> <p>For all other systems, testing according to the procedure in annex 1, or equivalent, is required.</p>
.4	Job specification	<p>There shall be a minimum of two stripe coats and two spray coats, except that the second stripe coat, by way of welded seams only, may be reduced in scope where it is proven that the NDFT can be met by the coats applied, in order to avoid unnecessary over-thickness. Any reduction in scope of the second stripe coat shall be fully detailed in the CTF.</p> <p>Stripe coats shall be applied by brush or roller. Roller to be used for scallops, ratholes, etc., only.</p> <p>Each main coating layer shall be appropriately cured before application of the next coat, in accordance with coating manufacturer's recommendations. Surface contaminants such as rust, grease, dust, salt, oil, etc., shall be removed prior to painting with proper method according to the paint manufacturer's recommendation. Abrasive inclusions embedded in the coating shall be removed. Job specifications shall include the dry-to-recoat times and walk-on time given by the manufacturer.</p>

.5	NDFT (nominal total dry film thickness)	<p>NDFT 320 µm with 90/10 rule for epoxy-based coatings; other systems to coating manufacturer's specifications.</p> <p>Maximum total dry film thickness according to manufacturer's detailed specifications.</p> <p>Care shall be taken to avoid increasing the thickness in an exaggerated way. Wet film thickness shall be regularly checked during application.</p> <p>Thinner shall be limited to those types and quantities recommended by the manufacturer.</p>
2 PSP (Primary surface preparation)		
.1	Blasting and profile	<p>Sa 2.5 with profiles between 30-75 µm</p> <p>Blasting shall not be carried out when:</p> <ul style="list-style-type: none"> .1 the relative humidity is above 85%; or .2 the surface temperature of steel is less than 3°C above the dew point. <p>Checking of the steel surface cleanliness and roughness profile shall be carried out at the end of the surface preparation and before the application of the primer, in accordance with the manufacturer's recommendations.</p>
.2	Water soluble salt limit equivalent to NaCl	≤ 50 mg/m ² of sodium chloride.
.3	Shop primer	<p>Zinc containing inhibitor free zinc silicate based or equivalent.</p> <p>Compatibility with main coating system shall be confirmed by the coating manufacturer.</p>
3 Secondary surface preparation		
.1	Steel condition	<p>The steel surface shall be prepared so that the coating selected can achieve an even distribution at the required NDFT and have an adequate adhesion by removing sharp edges, grinding weld beads and removing weld spatter and any other surface contaminant.</p> <p>Edges shall be treated to a rounded radius of minimum 2 mm, or subjected to three pass grinding or at least equivalent process before painting.</p>
.2	Surface treatment	<p>Sa 2.5 on damaged shop primer and welds.</p> <p>Sa 2 removing at least 70% of intact shop primer, which has not passed a pre-qualification certified by test procedures in 1.3.</p> <p>If the complete coating system comprising epoxy-based main coating and shop primer has passed a pre-qualification certified by test procedures in 1.3, intact shop primer may be retained provided the same epoxy coating system is used. The retained shop primer shall be cleaned by sweep blasting, high-pressure water washing or equivalent method.</p> <p>If a zinc silicate shop primer has passed the pre-qualification test of 1.3 as part of an epoxy coating system, it may be used in combination with other epoxy coatings certified under 1.3, provided that the compatibility has been confirmed by the manufacturer by the test in accordance with 1.7 of appendix 1 to annex 1 without wave movement.</p>

.3	Surface treatment after erection	Butts St 3 or better or Sa 2,5 where practicable. Small damages up to 2% of total area: St 3. Contiguous damages over 25 m ² or over 2% of the total area of the tank, Sa 2½ shall be applied. Coating in overlap shall be feathered.
.4	Profile requirements	In case of full or partial blasting 30-75 µm, otherwise as recommended by the coating manufacturer.
.5	Dust	Dust quantity rating "1" for dust size class "3", "4" or "5". Lower dust size classes to be removed if visible on the surface to be coated without magnification.
.6	Water soluble salts limit equivalent to NaCl after blasting/grinding	≤ 50 mg/m ² of sodium chloride.
.7	Oil contamination	No oil contamination.
4 Miscellaneous		
.1	Ventilation	Adequate ventilation is necessary for the proper drying and curing of coating. Ventilation should be maintained throughout the application process and for a period after application is completed, as recommended by the coating manufacturer.
.2	Environmental conditions	Coating shall be applied under controlled humidity and surface conditions, in accordance with the manufacturer's specifications. In addition, the coating shall not be applied when: .1 the relative humidity is above 85%; or .2 the surface temperature is less than 3°C above the dew point.
.3	Testing of coating	Destructive testing shall be avoided. Dry film thickness shall be measured after each coat for quality control purpose and the total dry film thickness shall be confirmed after completion of final coat, using appropriate thickness gauges (see annex 3).
.4	Repair	Any defective areas, e.g., pin-holes, bubbles, voids, etc., shall be marked up and appropriate repairs effected. All such repairs shall be re-checked and documented.

5 COATING SYSTEM APPROVAL

Results from prequalification tests (table 1, paragraph 1.3) of the coating system shall be documented and a Statement of Compliance or Type Approval Certificate shall be issued if found satisfactory by a third party, independent of the coating manufacturer.

6 COATING INSPECTION REQUIREMENTS

6.1 General

6.1.1 To ensure compliance with this Standard, the following shall be carried out by qualified coating inspectors certified to NACE Coating Inspector Level 2, FROSIO Inspector Level III or equivalent as verified by the Administration.

6.1.2 Coating inspectors shall inspect surface preparation and coating application during the coating process by carrying out, as a minimum, those inspection items identified in section 6.2 to ensure compliance with this Standard. Emphasis shall be placed on initiation of each stage of surface preparation and coatings application as improper work is extremely difficult to correct later in the coating progress. Representative structural members shall be non-destructively examined for coating thickness. The inspector shall verify that appropriate collective measures have been carried out.

6.1.3 Results from the inspection shall be recorded by the inspector and shall be included in the CTF (refer to annex 2 (Example of daily log and non-conformity report)).

6.2 Inspection items

Construction stage	Inspection items
Primary surface preparation	1 The surface temperature of steel, the relative humidity and the dew point shall be measured and recorded before the blasting process starts and at times of sudden changes in weather.
	2 The surface of steel plates shall be tested for soluble salt and checked for oil, grease and other contamination.
	3 The cleanliness of the steel surface shall be monitored in the shop-primer application process.
	4 The shop-primer material shall be confirmed to meet the requirements of 2.3 of table 1.
Thickness	If compatibility with the main coating system has been declared, then the thickness and curing of the zinc silicate shop primer to be confirmed to conform to the specified values.
Block assembly	1 After completing construction of the block and before secondary surface preparation starts, a visual inspection for steel surface treatment including edge treatment shall be carried out. Any oil, grease or other visible contamination shall be removed.
	2 After blasting/grinding/cleaning and prior to coating, a visual inspection of the prepared surface shall be carried out. On completion of blasting and cleaning and prior to the application of the first coat of the system, the steel surface shall be tested for levels of remaining soluble salts in at least one location per block.
	3 The surface temperature, the relative humidity and the dew point shall be monitored and recorded during the coating application and curing.
	4 Inspection shall be performed to the steps in the coating application process mentioned in table 1.
	5 DFT measurements shall be taken to prove that the coating has been applied to the thickness as specified and outlined in annex 3.
Erection	1 Visual inspection for steel surface condition, surface preparation and verification of conformance to other requirements in table 1, and the agreed specification shall be performed.
	2 The surface temperature, the relative humidity and the dew point shall be measured and recorded before coating starts and regularly during the coating process.
	3 Inspection shall be performed to the steps in the coating application process mentioned in table 1.

7 VERIFICATION REQUIREMENTS

The following shall be carried out by the Administration prior to reviewing the Coating Technical File for the ship subject to this Standard:

- .1 check that the Technical Data Sheet and Statement of Compliance or Type Approval Certificate comply with this Standard;
- .2 check that the coating identification on representative containers is consistent with the coating identified in the Technical Data Sheet and Statement of Compliance or Type Approval Certificate;
- .3 check that the inspector is qualified in accordance with the qualification standards in paragraph 6.1.1;

- .4 check that the inspector's reports of surface preparation and the coating's application indicate compliance with the manufacturer's Technical Data Sheet and Statement of Compliance or Type Approval Certificate; and
- .5 monitor implementation of the coating inspection requirements.

8 ALTERNATIVE SYSTEMS

8.1 All systems that are not an epoxy-based system applied according to table 1 are defined as an alternative system.

8.2 This Standard is based on recognized and commonly used coating systems. It is not meant to exclude other, alternative, systems with proven equivalent performance, for example, non-epoxy-based systems.

8.3 Acceptance of alternative systems will be subject to documented evidence that they ensure a corrosion prevention performance at least equivalent to that indicated in this Standard.

8.4 As a minimum, the documented evidence shall consist of satisfactory performance corresponding to that of a coating system which conforms to the coating standard described in section 4, a target useful life of 15 years in either actual field exposure for 5 years with final coating condition not less than "GOOD" or laboratory testing. Laboratory test shall be conducted in accordance with the test procedure given in annex 1.

ANNEX 1

**TEST PROCEDURES FOR COATING QUALIFICATION
FOR DEDICATED SEAWATER BALLAST TANK OF ALL TYPES OF SHIPS AND
DOUBLE-SIDE SKIN SPACES OF BULK CARRIERS****1 Scope**

These Procedures provide details of the test procedure referred to in paragraphs 5 and 8.3.

2 Definitions

Coating specification means the specification of coating systems which includes the type of coating system, steel preparation, surface preparation, surface cleanliness, environmental conditions, application procedure, acceptance criteria and inspection.

3 Testing

Coating specification shall be verified by the following tests. The test procedures shall comply with appendix 1 (Test on simulated ballast tank conditions) and appendix 2 (Condensation chamber tests) to this annex as follows:

- .1 for protective coatings for dedicated seawater ballast tanks, appendix 1 and appendix 2 shall apply; and
- .2 for protective coatings for double-side spaces of bulk carriers of 150 m in length and upwards other than dedicated seawater ballast tanks, appendix 2 shall apply.

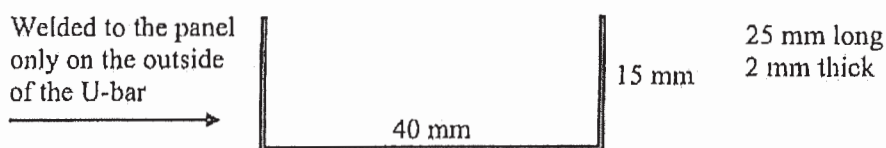
APPENDIX 1

TEST ON SIMULATED BALLAST TANK CONDITIONS

1 Test condition

Test on simulated ballast tank conditions shall satisfy each of the following conditions:

- .1 The test shall be carried out for 180 days.
- .2 There are to be 5 test panels.
- .3 The size of each test panel is 200 mm x 400 mm x 3 mm. Two of the panels (Panel 3 and 4 below) have a U-bar welded. The U-bar is welded to the panel in a 120 mm distance from one of the short sides and 80 mm from each of the long sides.



The panels are to be treated according to this Standard, table 1.1, 1.2 and 1.3, and coating system applied according to table 1, paragraphs 1.4 and 1.5. Shop primer is to be weathered for at least 2 months and cleaned by low pressure washing or other mild method. Blast sweep, high pressure washing or other primer removal methods are not to be used. Weathering method and extent shall take into consideration that the primer is to be the foundation for a 15 year target useful life system. To facilitate innovation, alternative preparation, coating systems and dry film thicknesses may be used when clearly defined.

- .4 The reverse side of the test piece shall be painted appropriately in order not to affect the test results.
- .5 To simulate the condition of an actual ballast tank, the test cycle runs for two weeks with natural or artificial seawater and one week empty. The temperature of the seawater is to be kept at about 35°C.
- .6 Test panel 1: This panel is to be heated for 12 h at 50°C and cooled for 12 h at 20°C in order to simulate upper deck condition. The test panel is cyclically splashed with natural or artificial seawater in order to simulate a ship's pitching and rolling motion. The interval of splashing is 3 s or faster. The panel has a scribe line down to bare steel across the width.
- .7 Test panel 2: This panel has a fixed sacrificial zinc anode in order to evaluate the effect of the cathodic protection. A circular 8 mm artificial holiday down to bare steel is introduced on the test panel 100 mm from the anode in order to evaluate the effect of the cathodic protection. The test panel is cyclically immersed with natural or artificial seawater.

- .8 Test panel 3: This panel is to be cooled on the reverse side, in order to give a temperature gradient to simulate a cooled bulkhead in a ballast wing tank, and splashed with natural or artificial seawater in order to simulate a ship's pitching and rolling motion. The gradient of temperature is approximately 20°C and the interval of splashing is 3 s or faster. The panel has a scribe line down to bare steel across the width.
- .9 Test panel 4: This panel is to be cyclically splashed with natural or artificial seawater in order to simulate a ship's pitching and rolling motion. The interval of splashing is 3 s or faster. The panel has a scribe line down to bare steel across the width.
- .10 Test panel 5: This panel is to be exposed to dry heat for 180 days at 70°C to simulate boundary plating between heated bunker tank and ballast tank in double bottom.

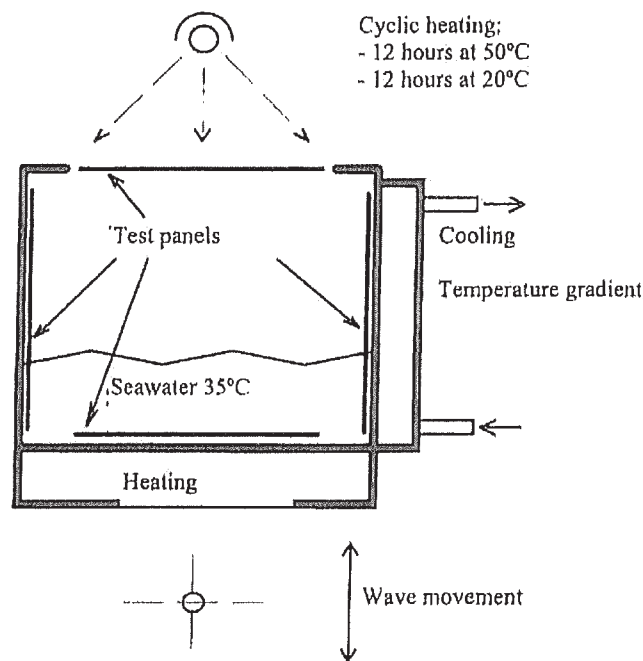


Figure 1
Wave tank for testing of ballast tank coatings

2 Test results

- 2.1 Prior to the testing, the following measured data of the coating system shall be reported:
 - .1 infrared (IR) identification of the base and hardener components of the coating;
 - .2 specific gravity of the base and hardener components of the paint; and
 - .3 number of pinholes, low voltage detector at 90 V.

2.2 After the testing, the following measured data shall be reported:

- .1 blisters and rust;
- .2 dry film thickness (DFT) (use of a template);
- .3 adhesion value;
- .4 flexibility modified according to panel thickness (3 mm steel, 300 μm coating, 150 mm cylindrical mandrel gives 2% elongation) for information only;
- .5 cathodic protection weight loss/current demand/disbondment from artificial holiday; and
- .6 undercutting from scribe. The undercutting along both sides of the scribe is measured and the maximum undercutting determined on each panel. The average of the three maximum records is used for the acceptance.

3 Acceptance criteria

3.1 The test results based on section 2 shall satisfy the following criteria:

Item	Acceptance criteria for epoxy-based systems applied according to table 1	Acceptance criteria for alternative systems
Blisters on panel	No blisters	No blisters
Rust on panel	Ri 0 (0%)	Ri 0 (0%)
Number of pinholes	0	0
Adhesive failure	> 3.5 MPa Adhesive failure between substrate and coating or between coats for 60% or more of the areas.	> 5 MPa Adhesive failure between substrate and coating or between coats for 60% or more of the areas.
Cohesive failure	≥ 3 MPa Cohesive failure in coating for 40% or more of the area.	> 5 MPa Cohesive failure in coating for 40% or more of the area.
Cathodic protection current demand calculated from weight loss	< 5 mA/m ²	< 5 mA/m ²
Cathodic protection; disbondment from artificial holiday	< 8 mm	< 5 mm
Undercutting from scribe	< 8 mm	< 5 mm
U-bar	Any defects, cracking or detachment at the angle or weld will lead to system being failed.	Any defects, cracking or detachment at the angle or weld will lead to system being failed.

3.2 Epoxy-based systems tested prior to the date of entry into force of this Standard shall satisfy only the criteria for blistering and rust in the above table.

3.3 Epoxy-based systems tested when applied according to table 1 shall satisfy the criteria for epoxy-based systems as indicated in the above table.

3.4 Alternative systems not necessarily epoxy-based and/or not necessarily applied according to table 1, shall satisfy the criteria for alternative systems as indicated in the above table.

4 Test report

The test report shall include the following information:

- .1 name of the manufacturer;
- .2 date of tests;
- .3 product name/identification of both paint and primer;
- .4 batch number;
- .5 data of surface preparation on steel panels, including the following:
 - .5.1 surface treatment;
 - .5.2 water soluble salts limit;
 - .5.3 dust; and
 - .5.4 abrasive inclusions;
- .6 application data of coating system, including the following:
 - .6.1 shop primed;
 - .6.2 number of coats;
 - .6.3 recoat interval;
 - .6.4 dry film thickness (DFT) prior to testing;
 - .6.5 thinner;
 - .6.6 humidity;
 - .6.7 air temperature; and
 - .6.8 steel temperature;
- .7 test results according to section 2; and
- .8 judgment according to section 3.

APPENDIX 2

CONDENSATION CHAMBER TEST

1 Test condition

Condensation chamber test shall be conducted in accordance with applicable standards.

- .1 The exposure time is 180 days.
- .2 There are to be 2 test panels.
- .3 The size of each test panel is 150 mm x 150 mm x 3 mm. The panels are to be treated according to this Performance Standard, table 1, paragraphs 1, 2 and 3 and coating system applied according to table 1, paragraphs 1.4 and 1.5. Shop primer is to be weathered for at least 2 months and cleaned by low pressure washing or other mild method. Blast sweep, high pressure washing or other primer removal methods are not to be used. Weathering method and extent shall take into consideration that the primer is to be the foundation for a 15 year target life system. To facilitate innovation, alternative preparation, coating systems and dry film thicknesses may be used when clearly defined.
- .4 The reverse side of the test piece shall be painted appropriately in order not to affect the test results.

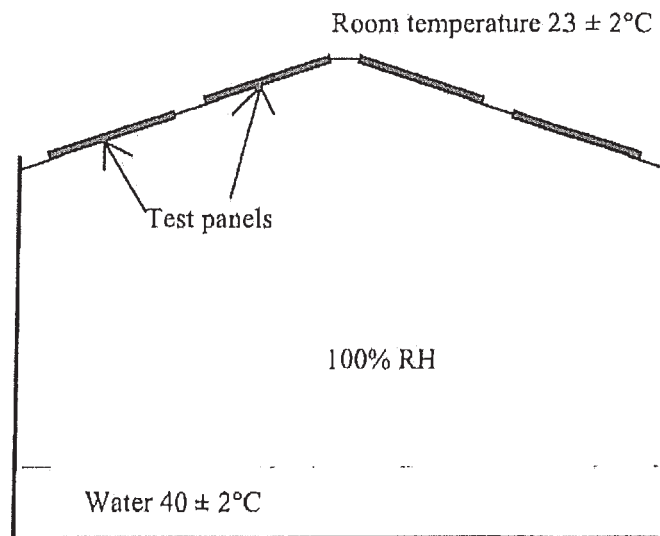


Figure 2
Condensation chamber

2 Test results

According to section 2 (except for 2.2.5 and 2.2.6) of appendix 1.

3 Acceptance criteria

3.1 The test results based on section 2 shall satisfy the following criteria:

Item	Acceptance criteria for epoxy-based systems applied according to table 1	Acceptance criteria for alternative systems
Blisters on panel	No blisters	No blisters
Rust on panel	Ri 0 (0%)	Ri 0 (0%)
Number of pinholes	0	0
Adhesive failure	> 3.5 MPa Adhesive failure between substrate and coating or between coats for 60% or more of the areas.	> 5 MPa Adhesive failure between substrate and coating or between coats for 60% or more of the areas.
Cohesive failure	> 3 MPa Cohesive failure in coating for 40% or more of the area.	> 5 MPa Cohesive failure in coating for 40% or more of the area.

3.2 Epoxy-based systems tested prior to the date of entry into force of this Standard shall satisfy only the criteria for blistering and rust in the above table.

3.3 Epoxy-based systems tested when applied according to table 1 shall satisfy the criteria for epoxy-based systems as indicated in the above table.

3.4 Alternative systems not necessarily epoxy-based and/or not necessarily applied according to table 1 shall satisfy the criteria for alternative systems as indicated in the above table.

4 Test report

According to section 4 of appendix 1.

ANNEX 2

EXAMPLE OF DAILY LOG AND NON-CONFORMITY REPORT

DAILY LOG

Sheet No:

Ship:		Tank/Hold No:		Database:					
Part of structure:									
SURFACE PREPARATION									
Method:					Area (m ²):				
Abrasive:					Grain size:				
Surface temperature:					Air temperature:				
Relative humidity (max):					Dew point:				
Standard achieved:									
Rounding of edges:									
Comments:									
Job No.:			Date:			Signature:			
COATING APPLICATION:									
Method:									
Coat No.	System	Batch No.	Date	Air temp.	Surf temp.	RH%	Dew point	DFT* Meas.	Specified
* Measured minimum and maximum DFT. DFT readings to be attached to daily log									
Comments:									
Job No:			Date:			Signature:			

NON-CONFORMITY REPORT

Sheet No:

Ship:	Tank/Hold No:	Database:
Part of structure:		
DESCRIPTION OF THE INSPECTION FINDINGS TO BE CORRECTED		
Description of findings:		
Reference document (daily log):		
Action taken:		
Job No.:	Date:	Signature:

ANNEX 3

DRY FILM THICKNESS MEASUREMENTS

1 The following verification check points of DFT are to be taken:

- .1 one gauge reading per 5 m² of flat surface areas;
- .2 one gauge reading at 2 to 3 m intervals and as close as possible to tank boundaries, but not further than 15 mm from edges of tank boundaries;
- .3 longitudinal and transverse stiffener members:

One set of gauge readings as shown below, taken at 2 to 3 m run and not less than two sets between primary support members;

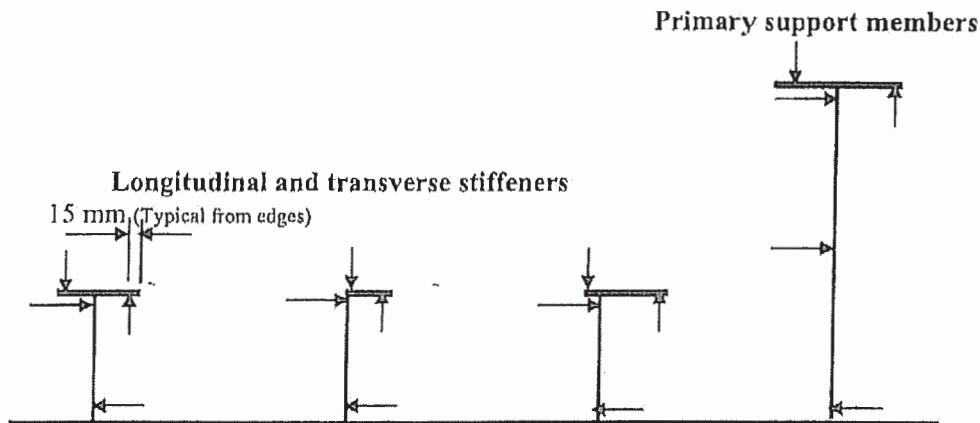


Figure 3

Note: Arrows of diagram indicate critical areas and should be understood to mean indication for both sides.

- .4 three gauge readings for each set of primary support members and two gauge readings for each set of other members as indicated by the arrows in the diagram;
- .5 for primary support members (girders and transverses), one set of gauge readings for 2 to 3 m run as shown in figure 3 above, but not less than three sets;
- .6 around openings one gauge reading from each side of the opening;
- .7 five gauge readings per square metre (m²), but not less than three gauge readings taken at complex areas (i.e., large brackets of primary support members); and
- .8 additional spot checks are to be taken to verify coating thickness for any area considered necessary by the coating inspector.