PPG Protective & Marine Coatings

PPG PMC
GENERAL WORKING PROCEDURE

Cargo Tank Coating

New building

新造船货油舱涂料施工程序

（The English text of this document shall prevail over any translation thereof）
（当对本文件出现中文译文和原版英文存在理解差异或异议时，应以英文版为准）

This Document has been prepared to the best of our knowledge in order to ensure good workmanship. However, the responsibility for executing the work stays with the yard / (sub) contractor. The role of our Technical Service Representative is to provide onsite technical assistance and advice. The presence and / or the technical advice of the PPG Technical Service Representative shall not relieve the yard / (sub) contractor and owners of their responsibility for correct execution and quality assurance of the coating work, and PPG Industries and its affiliated companies shall at all times be hold harmless and indemnified against any third party claim.

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CARGO TANK COATING – WORKING PROCEDURE

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INTRODUCTION（介绍）

This ***WORKING PROCEDURE*** is recommended as a practical tool and guidance in order to assist the applicators (shipyard / subcontractors) in applying the specified coating system in accordance with the technical recommendations and specified standards.
本施工程序是根据我们的成熟经验编制的实用工具，建议/帮助施工方（船厂/承包商）按有关标准及技术建议施工配套的油漆体系。

All coating work must be performed in accordance with the contractual specification, PPG PMC (Protective and Marine Coatings) technical data sheets and recommended working procedures.
所有的涂装工作必须按合同规格书/配套，庞贝捷工业及船舶涂料相关技术说明书及推荐的程序施工；

All technical recommendations as stated in the relevant Product Data Sheets (PDS) must be strictly followed. For details regarding minimum / maximum over-coating intervals, required temperatures and application requirements please refer to the latest Product & System Data Sheets.
相关产品说明书中的技术建议必须严格遵守，具体详情如最小/最大涂装间隔期，施工时的温度要求，需参考最新的说明书要求。
(Please refer to the latest PPG PMC System & Product Data Sheets for further information)
(进一步信息也需参照庞贝捷工业及船舶涂料相关配套/产品说明书要求)

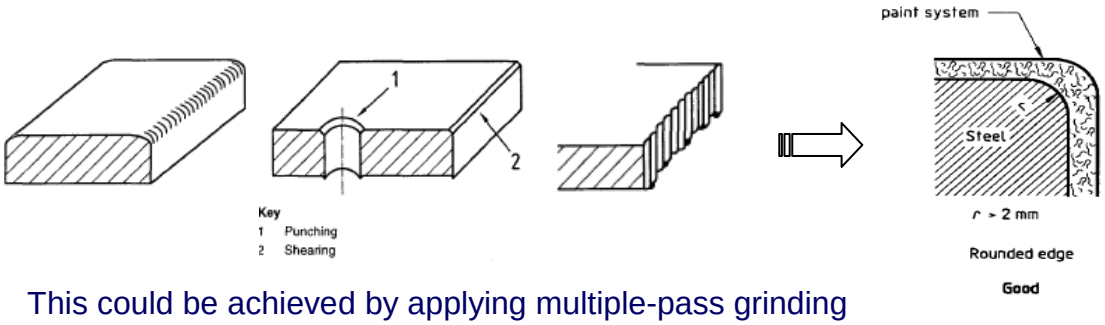
SCOPE OF APPLICATION （适用范围）

Normally the specified Cargo Tank coating system is applied after full blasting of the existing shop primer system during the ship's Newbuilding period. The Cargo Tank coating system can be applied following the required / specified standards.
However, in order to achieve an optimal result in accordance with the application requirements of the PPG PMC Cargo Tank coating system, the following practical Working Procedure is recommended:
在新造船阶段，按常规油漆是施工在经过 100%喷砂后的表面，此前钢板可能做过预处理/车间底漆。虽然，货油舱油漆可按照已有的要求/规格标准施工。但为达到最佳效果，需遵循庞贝捷工业及船舶涂料货油舱配套油漆的施工要求，切实可行的施工程序建议如下：

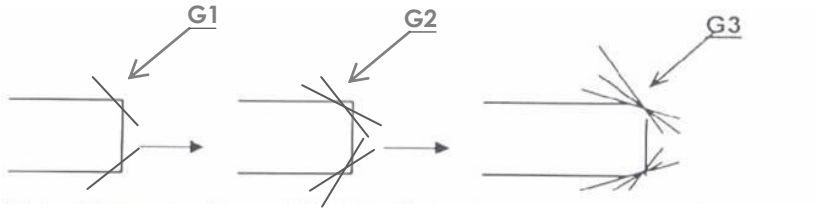
I CONDITION OF STEELWORK PRIOR TO SURFACE PREPARATION
喷砂前的钢结构处理

1.1. All surfaces to be dry and free from oil contamination prior to any surface preparation.
在表面处理前，施工表面要干燥，无油污。

1.2. All sharp edges to be ground off to approximately 2 mm radius as equivalent to condition *'Good'* in accordance with the ISO 12944-3:1998, *or* grade P3 in accordance to ISO 8501-3:2006.
所有锐边打磨至半径大于 2mm 的圆角，根据 ISO12944-3：1988 达到等效的“好”的状态，或达到 ISO8501-3：2006 P3 级。



This could be achieved by applying multiple-pass grinding
这可以通过多道反复打磨来实现
(i.e. 2 – 3 passes), or other alternative methods (i.e. one pass grinding and removing the burr to achieve the required edge profile / smoothness).
(例如 2-3 道)，或其它替代方法（例如一道打磨后除去表面毛刺达到所需的边角形状，光顺度）



Note: G1, G2 & G3 means the edge is treated by 1, 2 or 3 passes with grinder and removal of burr
备注：G1，G2&G3 是指通过动力工具打磨和处理毛刺，锐角被处理了 1，2，或 3 次

1.3. All welding spatter and slag to be removed.
去除所有的焊渣和飞溅。

1.4. All corners cut outs to be cleaned of all welding and burn slag.
所有切割边缘的熔渣需清除干净。

1.5. Any undercuts/blowholes to welds requiring re-welding are to be done prior to grit blasting.
喷砂前任何电焊咬口，气孔需重焊。

1.6. All plate laminations are to be removed with a grinding machine before surface preparation (grit blasting).
所有毛刺应在表面处理（喷砂前）用打磨机磨掉。

1.7. All welding and burning in confines of tank or adjacent areas of tank should be completed prior to commencement of surface preparation (grit blasting).
开始喷砂之前，舱内及周边相邻部位的烧焊和火工工程必须完全结束。

1.8. All welding lugs, brackets, etc. to be removed. After removal, such areas are to be ground to provide a smooth surface, as indeed will any other areas of damage, which may have occurred during erection.
所有电焊接地片、接地支架须切除并打磨光顺，其它在合拢后产生的结构问题亦同样处理。

1.9. Weld seams, if necessary, to be ground so as to eliminate sharp profiles.
焊缝的突出部分须打磨光顺。

II MOISTURE CONTROL & VENTILATION (during grit blasting and coating)
通风及湿度控制（喷砂及油漆施工中）

The contractor shall provide sufficient ventilation, heating and dehumidification equipment such that at all stages during the contract i.e. grit-blasting, paint application and curing, the conditions in the tank are maintained in accordance with the following:
承包商须提供足够的通风、加热及除湿设备，以确保在工程的各个阶段如喷砂、喷漆及固化时，舱内能始终保持如下状态：

2.1 The tank must be kept in a condensation free condition.
舱内始终保持无结露状态。

2.2 The steel temperature must be above the minimum required as stated in the latest product data sheet, and at least 3°C above the dew point.
钢板温度不得低于产品说明书所规定的最低温度，并必须至少高于露点温度 3 度。

2.3 During grit blasting and application of the system the relative humidity must be below 80% (quality of blast standards will be maintained for longer periods when humidity is lower than 50%).
在喷砂及涂装过程中，舱内的相对湿度必须低于 80%。（如低于 50%，则喷过砂的表面不易返锈。）

2.4 During application and curing of the coating system including the final touch-up, the tank must be maintained in a well-ventilated, condensation free condition in accordance with the latest relevant product data sheet information.
油漆施工与固化，包括最后一道油漆的施工及固化过程以及修补油漆过程中，舱内须按最新版的产品说明书的要求继续保持良好通风及无结露状态。

2.5 All ventilation ducting must be arranged to give maximum efficiency.
通风管道须布置合理以求取得最佳效果。

2.6 Rain shelters must be erected in way of tank coamings and tank cleaning apertures to prevent inflow of rain and dust and other contaminants.
在舱口及甲板开口处应设置遮雨棚，以防止雨水、尘埃及其它杂物进入舱内。

2.7 To make sure that the conditions in the tanks are stable, a slight overpressure of dry air must be maintained.
舱内应稍呈正压状态，以确保其条件保持稳定。

2.8 In cold conditions it may be necessary to partially insulate the outside of the tank to keep the minimum required steel temperature. This depending on; outside temperature - capacity of dehumidifier and heater, please refer to water ballast tank coating in winter conditions.
在低温条件下施工时，可通过舱外铺设保温层的方法，使舱内保持所需的温度（最低固化所需温度见产品说明书）。保温层的铺设与否取决于舱外温度、除湿机及加热机的数量和功率。

III SCAFFOLDING & STAGING 脚手架/台

3.1 If required a suitable staging to be constructed to ensure that maximum safe access to all surfaces subject to repairs is obtained. Care to be taken to ensure that staging boards and staging pole ends do not mask areas to be treated.
脚手架的搭设应能保证施工人员能安全地到达任何一个作业面。特别注意脚手架、脚手板不要接触舱壁表面。

3.2 It is recommended that distance between staging and substrate should be to a minimum of 30 centimetres and maximum of approx. 50 cm.
建议脚手架与舱壁之间的距离应为 30 – 50 厘米。

3.3 All contact between scaffolding poles and steel surfaces should be point contact only i.e. spade ends to be fitted.
脚手架与底材之间仅限于点接触，端头需加垫片。

3.4 All staging must be capable of being cleaned satisfactorily.
所有脚手架应能做到易于清洁。

3.5 Tubular staging poles must be plugged or capped prior to grit blasting, and remain plugged until upper areas are accepted.
喷砂前脚手架钢管两端应用塞子封堵，直到上部完工。

3.6 Corrugated bulkheads must be staged to give adequate safe access to recessed areas to enable surface preparation, paint application and inspection to be carried out.
槽型舱壁必须搭设工作平台，以便施工人员能安全地到达各个凹面进行表面处理、涂装及检验工作。

IV GRIT BLASTING 喷砂

4.1. The standard required for grit blasting is according to the International Standard ISO 8501-01. Immediately prior to painting, the minimum acceptable standard will be ISO Sa 2½. Hereby noted that the grades A, B, and C are acceptable. The blast profile must be in accordance with product system sheet and/or product data sheets recommendations.
喷砂标准为 ISO 8501-01。喷漆最终验收最低标准 ISO Sa2½级。钢板级别为 A,B,C 时可以接受，喷砂后的表面粗糙度（Rz）须符合产品说明书的要求。

4.2. Fresh, preferably mineral grit shall be used for all grit blasting operations. Recycled grit is not recommended.
喷砂所用矿质磨料应为出厂原装磨料，并不得循环使用。

4.3. This working procedure covers mineral abrasives such as angular corundum, aluminium silicate, slag or any slag mixtures that are suitable for removing rust, scale, old paint or shop-primer from tanks by blast cleaning.
本程序所指的矿质磨料包括有棱角的金刚砂、硅酸铝、熔渣及熔渣混合物，应能有效地清除钢材表面的锈、锈层、旧涂层及车间底漆。

4.4. The mineral abrasive may be any material meeting the requirements of this specification. It shall be composed of clean, sound, hard particles free from foreign substances such as dirt, oil, grease, toxic substances, paint, organic matter and water soluble salts.
符合本程序要求的其它矿质磨料也可使用，但它必须干净、颗粒完整、坚硬，并不含任何杂质、油脂、有毒物、漆皮、有机物及水溶性盐。

4.5. Rust scale, mill scale, foreign matter and soluble salts are to be removed from the surface, in accordance with ISO Sa 2½. This includes also the complete removal of the existing shop primer. All scallop edges, lightening holes and internal surfaces of hatch coaming, back or return edges are to be taken into account. Pitting which, due to its form and/or structure can not be cleaned according to the required standard will not be included in the guarantee.
所有铁锈、氧化皮、杂物及水溶性盐必须彻底去除，以符合 ISO SA2½级。这也包括完全去除车间底漆。所有过水孔、过焊孔、减轻孔、舱口内侧及型材背面须特别留意，麻坑部位或构件因其式样或结构原因，如达不到喷砂要求将不包含在担保范围之内。

4.6. The moisture content for material delivered in bags or bulk shall not exceed 0.5% (in weight).
袋装或散装的磨料，其含水量不得超过 0.5%（重量比）。

4.7. The conductivity of the water-soluble salts in the abrasive shall not exceed 250 µS/cm (micro Siemens per centimetre).
磨料的水溶性盐的电导率不得超过 250 µS/cm。

4.8. Care is to be taken to ensure that the areas on bottom covered by scaffolding support tubes are taken into the blasting schedule.
舱底脚手架支撑点也须列入喷砂程序。

4.9. After completion of the surface preparation, cleaning will be carried out followed by inspection of the surface preparation standard and removal of grit adhering to the surfaces.
完成每一个喷砂工序后，应进行清洁，然后进行喷砂标准检查，并去除表面夹砂。

4.10. On acceptance of blast standard, final cleaning shall be carried out by stiff fibre brushing and final vacuum cleaning.
如喷砂质量符合要求，应用硬毛刷、真空吸尘作最后清洁。

4.11. Additionally, all scaffolding in tanks should be brushed and vacuum cleaned to remove all residual grit and dust.
此外，真空吸尘清除舱内所有脚手架上残留的磨料及灰尘。

V DE-HUMIDIFICATION 除湿

It is PPG PMC recommendation that de-humidifiers are employed to maintain conditions as stated in chapters 2 and 4.
为达到本程序第 2 及第 4 项之要求，我们建议使用除湿机。

VI APPLICATION PPG PMC CARGO TANK COATING SYSTEM
庞贝捷工业与船舶货油舱涂料的施工

6.1. To be applied directly to grit-blasted steel in accordance with system and relevant product data sheets.
应按有关涂料配套及产品说明书的要求，将涂料直接喷涂在喷过砂的舱壁表面。

6.2. Allowances must be made in the programme for stripe coating of all weld seams, back of bars, edges of cut outs, scallops, plate edges etc. After first coat of the system and prior the spray application of the subsequent coat a stripe coat must be applied.
所有焊缝、型材背面、自由边、过水孔、过焊孔等必须做预涂。预涂须在第一道油漆后，下一道统喷前进行。

6.3. Each coat of the system including stripe coating should be inspected and approved by the technical representative of all parties involved.
每道涂层包括预涂都须经过庞贝捷涂料现场服务工程师及相关各方代表的检验，认可后方可进行下道涂料的施工。

6.4. Each coat of the system must be a closed film and free from over-spray, curtaining, sags, holidays, grit and dirt inclusion. Any such defects are to be repaired prior to the application of the next coat of the system and within the overcoating limits of the paint. Any dust caused by the repair of defects is to be removed from the tank by vacuum cleaning.
配套中每道涂层必须是漆膜封闭，并且无漆雾、无垂流、无流挂、无漏涂，无嵌砂/灰。上述缺陷必须在涂料的复涂间隔期内、下道涂料施工前处理完毕。处理此类缺陷所产生的粉尘须用吸尘器清除干净。

6.5. The time interval between applications of the various coats of the system must be held in strict accordance with the system/product data sheets.
配套中每道涂层的复涂间隔时间应严格按照最新产品说明书中的要求。

VII INSPECTION OF PAINT SYSTEM ON UPPER AREAS
货油舱上部涂层的检验

7.1. Final touch up and stripe coating should be carried out within the overcoating times as specified in latest product data sheet. This to ensure good adhesive characteristics between touch up paint and final coat of the system.
完工修补及预涂必须在最新产品说明书中规定的复涂间隔时间内完成，以确保修补涂层与原涂层之间有良好的结合力。

7.2. It must be stressed that severe restrictions must be imposed with regard to access to tanks at this stage. If this is essential, then such personnel should wear soft footwear. Protections of applied coating in way of tread areas to be provided.
在此阶段应严格控制人员进入舱内。如必须进入，则须穿着软底鞋套。已喷过油漆的表面（舱底）须进行保护。

VIII DISMANTLING & REMOVAL OF STAGING
脚手架的拆除

8.1. Scaffolding will be dismantled only after upper areas have been fully coated and accepted.
上部涂层全部完工并验收合格后，方可拆除脚手架。

8.2. Staging will be dismantled and removed out of the tanks ensuring that no damage to the freshly applied paint film is affected.
拆除脚手架期间必须十分注意避免破坏完好涂层。

8.3. Any areas damaged during dismantling must be prepared and brought up to required standard and dry film thickness, as in accordance with this specification, and product data sheets.
拆除脚手架期间所产生的涂层损坏，必须按本程序及产品说明书的要求，处理至所需的标准及规定的膜厚。

IX APPLICATION & INSPECTION OF PAINT ON BOTTOM AREAS
货油舱底部涂层的施工及检验

Refer to chapters 1, 2, 4, 5, 6 and 7.
参照第一、二、四、五、六及七款执行。

X REMEDIAL TOUCHING UP OF PAINT FILM ON TANK BOTTOM & COATING OF VENTILATION DOORS & STRUMS 舱底漆膜及甲板管道开口涂层的修补

After re-installing of all fittings (i.e. heating coils, ladders etc) ventilation doors and strums in the tank, the contractor will carry out any remedial work to the damaged coating that may have occurred in connection with such re-installation. Care should be taken to avoid unnecessary damages to the sound coating surface. Soft footwear should be used at all times.
舱内舾装件（如加热盘管，梯子等）安装完毕后，承包商应对在此过程中，在甲板开口处等部位的涂层可能产生的损坏进行修补。必须注意避免破坏完好的涂层。进入舱内必须穿着软底鞋套。

XI STAINLESS STEEL 不锈钢

It is our recommendation that all stainless steel parts, such as heating coils - pumps - etc. are insulated to prevent any galvanic action. Galvanic action can result in heavy pitting.
我们建议所有不锈钢部件，如加热盘管、货油泵等，在对碳钢连接时都须进行绝缘处理，以防止电化学腐蚀。电化学作用会引起严重坑蚀。

XII SALT WATER TEST 海（盐）水试验

Following the minimum curing period in accordance with the system sheet and/or product data sheets, the tank coating has to be subjected to the influence of salt water to highlight by rusting any areas of defect or damage.
This may be accomplished by:
在产品说明书规定的最低完全固化时间后，货油舱涂层须进行海(盐)水试验，以发现涂层的缺陷和损坏。 海（盐）水试验有以下两种方法：

A: Butterworthing 海水喷淋

12.1. "Butterworthing" with clean seawater of total area for a period of at least 1 hour, and make sure that the entire area is wet.
用干净海水通过洗舱机喷射全舱，时间不得少于 1 小时，保证全舱潮湿。

12.2. Tank to be partially filled up with clean seawater to approximately 1.5 metre from lower level.
舱底注入约 1.5 米高的干净海水。

12.3. Keep the tank closed for a minimum of 12 hours (wet condition).
将舱关闭至少 12 小时（舱内保持潮湿状态）。

12.4. Check the tank visually and in case any repair has to be carried out wash the tank with freshwater.
检查舱内涂层状况，如有任何修补工作，必须淡水洗舱。

12.5. Thoroughly dry all surfaces.
舱内彻底干燥。

12.6. Remedial touch up work must be carried out in accordance with the contractual specification and agreed repair procedure (see also section 10).
必须根据配套及协议的修补程序做涂层锈补（参见第十款）。

B: Filling the tank 海水灌舱

12.7. Fill up the tank with clean seawater for approx. 1 hour.
舱内灌满干净海水约 1 小时。

12.8. After draining the tank, leave the tank to be partially filled with seawater to approximately 1.5 meter from lower level.
排出海水，舱内保留约 1.5 米高的干净海水。

12.9. Keep the tank closed for a minimum of 12 hours (wet condition).
将舱关闭至少 12 小时（舱内保持潮湿状态）。

12.10. Check the tank visually and in case any repair has to be carried out wash the tank with freshwater.
检查舱内涂层状况，如有任何修补工作，必须淡水洗舱；

12.11. Thoroughly dry all surfaces.
舱内彻底干燥。

12.12. Remedial touch up work must be carried out in accordance with the contractual specification and agreed repair procedure (see also section 10).
必须根据配套及协议的修补程序做涂层锈补（参见第十款）。

XIII FINAL INSPECTION 完工检查

Final inspection to be carried out by all parties involved and in case any defects are observed these should be repaired in accordance with the agreed repair procedure and re-inspected.
所有相关方做最终完工检查，如发现缺陷需要修补，必须根据配套及协议的修补程序进行，并重新检查。

NOTE 备注

For further details of how this working procedure can be adapted to best suit an individual ship-yard's coating application procedure, please consult your local PPG PMC office.
关于本施工程序，如何更好的得到执行，详情可咨询当地庞贝捷工业及船舶涂料办公室。

REFERENCES & DOCUMENTS 附件

Product Data Sheets 产品说明书 **(PDS)**

- Please refer to the PDS of the specified Cargo Tank coating system
  参照货油舱油漆配套中相关产品的说明书

Information Data Sheets 参考数据说明书 **(IDS)**

- Explanation to Product Data Sheets 产品数据说明 (1411)
- Safety indications 安全指导 (1430)
- Safety in confined spaces and health and safety explosion hazard toxic hazard 密闭空间中的健康，爆炸危害，有害物质危害下的安全 (1431)
- Safe working in confined spaces 密闭空间安全工作 (1433)
- Directives for ventilation practice 通风管理指南 (1434)
- Cleaning of steel and removal of rust 钢材表面处理 (1490)
- Specification for mineral abrasives 矿物磨料规范 (1491)

Material Safety Data Sheets 材料安全说明书 **(MSDS)**

- Material Safety Data Sheets 材料安全说明书 (MSDS)