GENERAL SPECIFICATION

CORROSION

GS EP COR 351

External protection of structures and equipment by painting
Floating structures

09	10/2012	General review
08	01/2012	Painting system review according to the “REACH” legislation and approved PAZFLOR and CLOV projects derogation for International paint
07	01/2011	New paint supplier - Change of policy for 316 & 316L in § 3.2.2 - Supplementary requirements to ISO 20340 removed from § 4.3
06	10/2009	General and standard list review
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Rev.	Date	Purpose of the revision

Owning entity: DEV/TEC	Managing entity: DEV/TEC/COR

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1. Scope

This General Specification defines the technical requirements for the execution of painting works for floating structures and equipment. The specification is based on the use of high durability painting systems for facilities whose design life is anticipated to be more than 15 years.

This specification does not cover painting systems for temporary equipment or equipment with design life less than 10 years, and for which alternative painting systems shall be submitted to Company for approval.

2. Reference documents

The reference documents listed below form an integral part of this General Specification.

External Documents

Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published at the effective date of this document.

Reference	Title
ACQPA	"Association pour la Certification et la Qualification en Peinture Anticorrosion". Certified systems by ACQPA
ASTM D 4752	Standard test method for measuring MEK resistance of ethyl silicate (inorganic) Zinc-rich primer by solvent rub
ASTM D 4940	Standard test method for conductimetric analysis of water soluble ionic contamination of Blasting abrasives
ISO 12944 (Parts 1; 2; 3; 4; 7; 8)	Paints and varnishes - Corrosion protection of steel structures by paint systems - Parts 1; 2; 3; 4; 7; 8
ISO 16276 (Parts 1; 2)	Corrosion protection of steel structures by protective paint systems - Assessment of, and acceptance criteria for, the adhesion/cohesion (fracture strength) of a coating - Parts 1; 2
ISO 19840	Paints and varnishes corrosion protection of steel structures by protective paint systems. Measurement of, and acceptance criteria for the thickness of dry films on rough surfaces
ISO 20340	Paints and varnishes - Performance requirements for protective paint systems for offshore and related structures
ISO 4628 (Parts 1; 2; 3; 4; 5; 6)	Evaluation of paint and varnish defects. Designation of intensity, quantity and size of common types of defect - Parts 1; 2; 3; 4; 5; 6
ISO 8501 (Parts 1; 2; 3)	Preparation of steel substrates before application of paints and related products. Visual assessment of surface cleanliness - Parts 1; 2; 3

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Reference	Title
ISO 8502 (Parts 1; 2; 3; 4; 6; 9)	Preparation of steel substrates before application of paints and related products. Tests for the assessment of surface cleanliness - Parts 1; 2; 3; 4; 6; 9
ISO 8503 (Parts 1; 2; 3; 4)	Preparation of steel substrates before application of paints and related products. Surface profile of abrasive blast-cleaned steel - Parts 1; 2; 3; 4
ISO 8504 (Parts 1; 2; 3)	Preparation of steel substrates before application of paints and related products. Methods for surface preparation - Parts 1; 2; 3
RAL 840 HR	Colors standard

Total General Specifications

Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published in the applicable yearly collection.

Reference	Title
GS EP COR 350	External protection of offshore and coastal structures and equipment by painting
GS EP COR 352	Internal protection of equipment by painting
GS EP COR 355	External protection of piping and equipment by thermal spray coating

3. Surfaces to be painted

All surfaces shall be painted using the relevant specified system, except when stipulated hereafter.

3.1 Items not to be painted

Unless otherwise specified, the following surfaces shall not be painted:

- Galvanised steel gratings
- Concrete structures
- Plastic and plastic coated materials provided their resistance to UV has been demonstrated, and colour coding is not necessary
- Non ferrous materials such as 90-10 and 70-30 copper nickel alloys, monel, aluminium bronze, and nickel alloys when not thermally insulated
- Machined surfaces.

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3.2 Case of stainless steels

Stainless steels shall be painted when requested in the present specification. Only piping, pipelines and vessels or other pressure containing equipment are concerned.

3.2.1 Under thermal insulation

For temperatures ranging from 25 to 150°C (maximum operating temperature), system P05 second shall be used, whatever the stainless steel type.

Below 25°C, system P05 shall be applied whatever the stainless steel type.

3.2.2 Without thermal insulation

The following shall apply:

Stainless steel type	General case	Paint system
AISI 304, 304L and 321	Painted in all cases	P05 for T < 80°C P05 second for 80°C < T < 150°C
AISI 316 and 316L	Painted for all process piping (> 2”) and equipment Painted only if T > 50°C for other equipment	P05 for T < 80°C P05 second for 80°C < T < 150°C
AISI 904, duplex, Superduplex	Painted for T > 100°C	P05 second for T < 150°C
All stainless steels shall be protected from iron contamination (projections from power tooling & welding of neighbouring carbon steels) when construction works are likely to continue after pickling and passivating. **If Contractor cannot demonstrate that he can adequately protect stainless steels, then all stainless steels shall be painted.**		

In all cases, system P13 shall be applied for T>150°C. TSA (Thermally Sprayed Aluminium) according to GS EP COR 355 can also be used as an alternative.

Zinc containing paints are prohibited on stainless steel.

All stainless steels shall be painted on areas facing carbon steel pipe supports.

3.3 Painting of fastenings

For bolting, the following applies:

- Stainless steel: Not painted
- Carbon steel: Primer of system P06 (30 microns of epoxy) applied before assembly and the remaining layers (intermediate and finish coat) applied after installation.

For dudgeons, painting (system P06) will be applied after installation.

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4. Painting systems

Painting systems are defined according to the following parameters:

- Type of substrate
- Atmosphere or environment
- Minimum and maximum Operating temperatures.

4.1 Definition of atmosphere or environment

The marine atmosphere applies to floating structures. It is characterized by the presence in the air of sea water spray, more or less saline mist and by the absence of dust.

Immersion applies to the external side of hulls and appurtenances, tanks and ballasts.

4.1.1 Coding system

Part 1: Atmosphere or environment

MA	Marine
IM	Immersed

Part 2: Substrate

AF	Carbon steel or cast iron
AI	Stainless steels and special alloys
AG	Galvanized steels
AB	Galvanized or cadmium-plated bichromated steels
PL	Plastics
BE	Concretes and similar products

Part 3: Operating temperatures

SNNN/SNNN: two-part code comprising a sign (S) and three digits (NNN) indicating the minimum and maximum Operating temperatures.

4.1.2 Identification of systems

Systems are identified as follows:

MA	AF	+121/+300	
Parameter 1	Parameter 2	Parameter 3	System number

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4.2 Approved systems

The painting systems approved by Company are given in Appendix 4. It is emphasised that these painting systems, where relevant, have been subject to certification by ACQPA, according to Company policy and have therefore been subject to extensive corrosion testing.

For painting systems which cannot be certified through the ACQPA procedures (especially high temperature painting systems), the approved panting systems are the result of Company experience and operational feedback.

For Suppliers already approved as per Appendix 1, new systems can be submitted for approval to Company at any time and at Suppliers expenses. In that case, a full qualification program shall be submitted to Company for approval together with the name of the third party and independent laboratory which is proposed to perform the test program. Company reserves the right to amend the qualification program proposed and to witness the testing at any stage. As a basis for durability testing, ISO 20340 applies with 3mm maximum corrosion from scribe line for all paint systems to be qualified for C5M atmospheres. Other testing will be required depending on the concerned area (atmosphere, immersed or not, temperature etc.).

Each year, approved paint Supplier will fill in the tables of Appendix 4, thereby proposing the painting systems for the new revision of the present specification. A meeting will be held between Supplier and Company in order to discuss new proposals and to finalise the list of approved painting systems for the coming year. Following this, Supplier will then issue a statement certifying that no alternative painting system (already qualified or not) than these agreed during the meeting will be submitted for Company projects or maintenance works unless previously discussed with, and duly authorized by, TEC/COR according to the requirements outlined in the next section of the present specification.

Supplier's painting systems will not be included in the present specification unless such statement has been issued.

4.3 Approval of alternative painting systems

For **Suppliers already approved** as per Appendix 1, new systems can be submitted for approval to Company at any time and at Suppliers expenses. In that case, a full qualification program shall be submitted to Company, with sufficient time to allow for the testing to be carried out, for approval together with the name of the third party and independent laboratory which is proposed to perform the test programme. Company reserves the right to amend the qualification program proposed and to witness testing at any stage. Accelerated corrosion testing shall be carried out according to the latest version of ISO 20340 with 3 mm maximum corrosion from scribe line for all paint systems to be qualified for C5M atmospheres. Other tests may be required depending on the specific industrial application.

In parallel, Contractor shall present a full contingency plan describing all the painting systems to be used, should qualification tests fail. Qualification of alternative systems will not be considered by Company unless the contingency plan is submitted.

In Any case, if Contractor wishes to use any painting system which is not listed in the present General Specification, a formal derogation shall be requested from TEC/COR, outlining the reasons for a new painting system to be used, as well as the steps to be taken, including planning, to qualify the alternative system. If Contractor eventually fails to fulfil its qualification

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programme in time, then the proposed painting system will be refused by Company without any further discussion, and the contingency plan will be used.

5. Certification of personnel

5.1 Operators

Operators shall be individually certified by an approved organization (ACQPA, FROSIO, etc.).

5.2 Inspectors

Inspectors shall be individually certified by an approved organization (ACQPA, FROSIO, NACE International minimum level 3 with peer review, etc).

6. Technical content of tenders

Tenders shall specify the following:

- Proposed paint system(s) for each category / location of the item to be painted
- Product data sheets
- Proposed qualification program if any
- List of derogations to the present General Specification, if any. Derogations will not be granted for painting systems after Contract award
- Terms and conditions of guarantee
- A statement showing that all parties involved (Contractor, Supplier, and Applicator) will be carrying out the work according to the present specification, or if relevant, to the project particular specification, including derogations duly agreed by TEC/COR before Contract award. This statement shall also show that the guarantee is jointly underwritten by all parties and specify the durations and performance levels of the guarantee. This statement can consist in either a certificate of homologation by OHGPI (Organisme d'Homologation des Garanties en Peinture Industrielles) or a letter signed by the head office of each party involved.
- Maximum thickness tolerable for each coat and for the each full painting system
- Surface preparation and painting procedures
- Inspection test plan with acceptance criteria and frequency of inspection
- A list of inspection and painting equipment to be used
- Colours to be used for each item of equipment and for the different coats, in accordance with the colour chart chosen for the project by Company
- Methods of protection of items to be painted against adverse weather conditions
- Certificates (ACQPA, FROSIO, NACE, or equivalent) of Operators and Inspectors
- Approval certificate and/or test certificates for coatings in contact with specific products (food products, jet fuel, etc.) or IMO certificates for coatings to be used in ballast tanks.

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7. Surface preparation

7.1 Design and preparation before blasting of surfaces to be painted

All structures and equipment shall be designed according to ISO 12944 international standard for high durability painting systems.

All sharp edges shall be rounded (minimum radius > 2 mm).

The design of the item to be painted shall be such that it creates no interstice and inaccessible area.

All oil or grease shall be removed by washing the item to be painted with appropriate solvents or any other suitable means before beginning of blast-cleaning operations. This includes bolt holes in piping assemblies.

Weld spatter and remains of temporary welds, deposits or surface defects shall be eliminated by appropriate means; removal by deep grinding is subject to Company approval.

All mating surfaces of equipment subject to outdoor exposure shall be coated with the full coating system prior to assemly (saddles, skirts, base plates, olted components, flanges, etc.).

Contractor shall protect all equipment that is not to be painted or may be affected by the presence of abrasives or paint. Special attention shall be paid to avoid splashes of zinc paint on equipment made of austenitic steels.

7.2 Quality of abrasives

Abrasives shall be sealed in watertight packaging. Any product delivered in defective packaging shall be rejected. Products must be stored sheltered from the elements.

Conductivity of abrasives shall be less than 150.10^{-6} SIEMENS/cm and as per ASTM D 4940.

The use of copper slag or silica sand is **strictly** prohibited.

7.3 Blast cleaning of carbon steel (AF)

All surfaces to be coated shall be blast-cleaned (ISO 8504) according to:

- The grade of cleanliness (ISO 8501 standard)
- The surface profile Ra (ISO 8503 standard: roughness meter with adapted cut-off or visio tactile surface profile comparator)

specified for each system in Appendix 3.

After blast-cleaning, all dust must be removed using a vacuum cleaner before application of the paint in order to achieve the maximum dust level specified for each system in Appendix 3 (ISO 8502-3).

All blast-cleaned surfaces shall be coated before the deterioration of the "grade of cleanliness". In any case, any surface that has been blast-cleaned shall be coated on the same day.

Before painting works commence, checks for the contamination of the surface by salts shall be carried out (ISO 8502-6 & ISO 8502-9).

The blast cleaning procedure shall be submitted to Company for approval.

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7.4 Blast cleaning of carbon steel (AF) on automatic production lines

In addition to the requirements of § 7.3:

- All surfaces shall be blast-cleaned to grade of cleanliness Sa 3 (ISO 8501-1).
- Contractor shall ensure that the grit selected can achieve the required surface profile. This requirement includes determination of grit mix, as well as quantity and frequency of grit renewal. Surface profile shall be checked twice per shift and the results shall be recorded.
- Dust level shall be thoroughly checked (ISO 8502-3).

The blast cleaning procedure shall be submitted to Company for approval.

7.5 Blast cleaning of stainless steels (AI)

Stainless steels shall be segregated, carbon steel supports for storage shall be systematically painted, and lifting equipment shall prevent iron contamination.

Stainless steel surfaces to be coated shall be etched or degreased and blast-cleaned with a non-ferrous and chlorine-free abrasive.

The blast cleaning procedure to be submitted to Company shall include:

- Abrasive composition to obtain a surface roughness of Ra = 10 microns (8 microns acceptable locally)
- Dust level (maximum level 2 maximum according to ISO 8502-3)
- Substrate contamination checks. Ferrous contamination / direct colorimetry method using Prussian blue (potassium ferricyanide) - no surface pollution is acceptable.

7.6 Surface preparation of galvanised steel (AG)

Galvanized steel to be coated shall be cleaned, degreased and etched using the product specified for painting systems P05 (see Appendix 3).

7.7 Preparation of zinc or cadmium plated bichromated surfaces (AB)

Zinc or cadmium-plated bichromated surfaces shall be cleaned and degreased.

8. Paint application

8.1 Procurement and storage

The quantities of paint and thinners required to perform the entire job shall be procured before the work commences, except in cases where the shelf life of the product is less than the anticipated duration of the work.

Thinners, solvents, etc. shall be stored in a suitably ventilated fireproofed building, separate from other painting consumables.

The products shall be delivered in their original sealed packaging and stored in such conditions as to avoid their degradation (controlled temperature, etc.). The packaging shall be clearly marked with the product description, the batch number, the fabrication date and the expiry date.

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The shelf life from the fabrication dates are:

- For zinc ethyl silicate: 6 months
- For other products: 1 year
- Specific cases: according to Manufacturer's recommendation with Company approval.

8.2 Samples for QA/QC purposes

From each batch of products used during the work, the Contractor shall take two samples to be made available to Company.

8.3 Qualification of application procedure for each system

One month before work commences, all the selected systems shall be applied on test plates representative of the structure to be painted. The products used shall be sampled from the same batches than these intended for the works.

The system shall be applied in the presence of the Supplier of the paint and the Company representative, in climatic conditions that are as similar as possible to worst case conditions that can be foreseen during the work on the construction site. Application shall be performed by the painting specialist who will be responsible for application during the work, using the same equipment that will be used during the work.

When the painting systems are fully cured, visual inspection and adhesion testing shall be carried out to confirm that the performance of the painting systems meet those specified for each system in Appendix 4.

8.4 Kick off meeting

A technical kick off meeting shall be organized by the Contractor in the presence of Company specialists (TEC/COR) and Supplier to review all the details regarding the work, application procedures, and inspection test plan. All the documentation shall be submitted to Company for review at least two (2) weeks prior to this meeting.

Supplier shall provide Contractor with technical assistance. All recommendations made by Supplier other then these outlined in datasheets or in the present specification shall be supported by a written statement from Supplier head office.

8.5 Application

Paint shall always be applied to surfaces that are dry, clean and degreased, for both coating on substrate and previous coat.

Painting works shall not proceed if:

- Temperature of the substrate is less than 3°C above the dew point
- The relative humidity is more than 85% RH (90% RH for inorganic zinc silicates)
- The weather is rainy or foggy, except under shelter, and subject to verification of the atmospheric conditions

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- The minimum or maximum temperature of the ambient atmosphere and the substrate are outwith the limits given in the product data sheets (usually 10°C for epoxy based paint and 5°C for acryl-polyurethane topcoat.

Contractor shall keep a daily record of the dew point, relative humidity, ambient atmosphere and substrate temperatures (all measured before the work commences and twice per shift and when ambient conditions are obviously changing) to ensure that conditions are acceptable. These records shall be kept and made available to Company.

Application shall be by airless spray.

Stripe coats shall be applied by brush to all angles, corners, sharp edges, bolt or rivet heads, etc. with the same product than this to be applied on the surface to be painted. The only exception is inorganic zinc silicates where stripe coats shall be applied using the Repair system or secondary surface preparation primer i.e. zinc rich epoxy.

Different colours shall be used for all successive coats of the paint system. The finishing coat of the required colour shall be sufficiently opaque to cover the shade of the undercoat.

The thickness of each coat, including frequency and tolerance shall be checked by the Contractor according to ISO 19840. The values shall be recorded and made available to Company.

8.5.1 Zinc ethyl silicate

During application, the product shall be stirred at all times.

If relative humidity is below 65%, the painted surface shall be sprayed with fresh water for at least two hours after application to enhance curing.

Before the subsequent coat is applied, this primer shall be subjected to a MEK test as per ASTM D 4752 to ensure that hydrolysis is complete. If complete hydrolysis is not obtained within eight days of application, the coating shall be completely removed and re-applied.

8.5.2 Zinc or cadmium-plated bichromated bolting

All surfaces of the bolting assemblies, including threads shall be coated. The topcoat shall be applied after assembly is completed.

8.5.3 Painting of fastenings

For bolting, the following applies:

- Stainless steel: Not painted
- Carbon steel: Primer of system P06 (30 microns of epoxy) applied before installation and the remaining layers (intermediate and finish coat) applied after installation.

For dudgeons, painting (system P06) will be done after installation.

8.6 Repairs

Any defect shall be repaired before the application of further coats. Subject to the agreement of Company, and after determining the type and size of the defects, the following methods of repair shall be applied:

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8.6.1 Major defects

The paint shall be removed completely by abrasive blast-cleaning and the entire system shall be re-applied.

8.6.2 Minor defects (localized appearance, mechanical damage, scratches, etc.)

Subject to the agreement of the Supplier of the product, the system shall be removed by localized blast-cleaning, the edges of the sound coating shall be feathered back about 50 mm, and the Repair system or secondary surface preparation shall be applied.

9. Checks, inspection and acceptance

9.1 Checks

Throughout the duration of the work, Contractor's Quality Control department shall check the following points and record the results in its daily quality control report.

- Construction quality:
  - Rounding of corners, sharp edges to 2 mm radius minimum
  - Form, quality and continuity of welds.
- Surface preparation quality:
  - Grade of cleanliness: Sa 3 according to ISO 8501
  - Cleanliness: no grease or oil, dust level 2 maximum according to ISO 8502-3
  - Anchoring profile: G medium according to ISO 8503.
- Contamination including chlorides: according to ISO 8502-6 and ISO 8502-9, 30 mg/m² maximum, **except for immersed areas where 20 mg/m² maximum is required.**
- Climatic conditions for application all measured before the work commences and twice per shift and when the ambient conditions are obviously changing): temperature of substrate at least 3°C above dew point, maximum humidity 85% RH (90% for inorganic zinc silicates), ambient temperature (>10°C for epoxy, >5°C for polyurethane), weather conditions.
- State of curing of primer and of each coat.
- For inorganic zinc silicate: record of spraying with fresh water to enhance hydrolysis (if relevant) and results of MEK test: Level 5 according to ASTM D 4752.
- Interval between coats (in accordance with Supplier product datasheets).
- Wet film thickness for each coat immediately after application.
- Number of coats, DFT of each coat and of the final system according to ISO 19840.
- Appearance and colour.

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- Adherence

  The tests shall be carried out only when the system is completely dry and fully cured.

  - Systems with DFT less than 200 µm: cross-cut test class 0 according to ISO 16276-2
  - Systems with DFT above 200 µm: pull-off test according to ISO 16276-1: Unless specified in the system sheet in Appendix 3, the minimum values acceptable are 3 MPa for checks made with mechanical equipment (type Ersad, Satec, or equivalent) and 5 MPa for checks made with hydraulic equipment (Type PAT or equivalent). The equipment must be fitted with a gauge indicating the pulling force.

  The adhesion tests shall be performed with cyano-acrylate glue as LOCTITE 496 or equivalent.

- Visual inspection results: no defects such as "orange peel", cracking, bubbling, pinholes, runs and sags, blistering, etc.

9.2 Inspection test plan

An inspection test plan including all the points in section 9.1 shall be prepared and submitted to Company. The Inspection Test Plan shall clearly indicate frequency of testing for each check.

9.3 Company inspection

Company Inspector shall have free access to storage areas, workshops, yards where the works will be performed. Contractor shall also provide Company Inspector with all office facilities necessary for the execution of his work (telephone, fax, handling equipment, measuring instruments with valid calibration certificates, etc.).

Upon arrival of Company Inspector on site, Contractor shall supply him with all relevant documentation regarding the works to be carried out.

9.4 Provisional acceptance

For provisional acceptance, Company shall check that all inspections set out in section 9.1 have been carried out and that all results are satisfactory.

9.5 Guarantees

The Work shall be covered by a specific guarantee given by Contractor to complete Guarantees and warranties defined in the Engineering, Procurement, Supply, Construction and Commissioning Contract (EPSCC 1113 - Article 20 “GUARANTEES AND WARRANTIES”).

Contractor guarantees that the Work shall be covered by performance warranties in accordance with the following requirements of the Contract:

- The maximum degree of rust shall be Ri2 according to ISO 4628
- The maximum degree of cracking, blistering, or flaking shall be 3S3 according to ISO 4628.

Guarantee shall be provided for the duration as defined for each paint system in Appendix 4.

Beginning of Warranty Period as defined for each paint system in Appendix 3 starts from the effective date of the PROVISIONAL ACCEPTANCE CERTIFICATE for painting works.

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9.6 Final acceptance

At the end of the Warranty Period a joint inspection of Work by Company and Contractor shall be carried out before issuance of the FINAL ACCEPTANCE CERTIFICATE for painting works to determine if any claims are raised.

10. Technical file

Contractor shall hand over a technical file to Company at the end of the works which shall include:

- All inspection reports
- Provisional acceptance reports
- Guarantee certificates
- Insurance certificates for the guarantee.

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Bibliography

ISO 9223 Corrosion of metals and alloys. Atmospheres' corrosivity. Classification

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Appendix 1 Approved list of Suppliers

Supplier	Code	Phone No.	Fax No.	Remarks
CARBOLINE	**C**	+33 1 60 06 55 66	+33 1 60 06 55 70	Carboline.France @stoncor.com
CHUGOKU	**Ch**	+31 167 526 100	+31 167 522 059	x.hagenaars@cmpeurope.eu
HEMPEL	**H**	+33 3 44 08 28 90	+33 3 44 08 28 99	jmb@hempel.com dbo@hempel.com
INTERNATIONAL COATINGS	**I**	+33 2 35 22 13 72	+33 2 35 22 13 78	Frederic.coulon@akzonobel.com
JOTUN	**J**	+33 1 45 19 38 87	+33 1 45 19 38 94	Xavier.dubois@jotun.com
PPG	**P**	+33 1 70 03 11 11	+33 1 70 03 11 06	Pascal.digonnet@ppg.com

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Appendix 2 List of systems

Floating structures

Important warning:

- **Intervals between coats are given for 20°C and a relative humidity of 60%**
- **For inorganic zinc silicates, interval considers water spray for 2 hours after application if RH below 65%**
- **Systems have been certified by ACQPA where relevant (website www.acqpa.com)**
- **Temperatures indicated are minimum /maximum operating temperatures**
- **Painting system with minimum level of solvent shall be preferred**
- **Lead chromates in paint are strictly forbidden.**

Note: Coating systems P xx and P1XX series can be found in GS EP COR 350 and GS EP COR 352.

Structure	Code	System No.	Remarks
Shop-primed surfaces			
	MA AF -010/+400	P 208	
Hull			
Quickwork Bottom Boot top	MA AF -010/+080	P 201	Additional protection by cathodic protection required
Topsides			
Topsides Calm buoy	MA AF -010/+080	P 202	

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Appendix 2

Structure	Code	System No.	Remarks
Superstructures			
Bridge house Stack/Funnel Helideck	MA AF -010/+080 MA AF -010/+080	P 203 P 03	
Deck			
Cargo gear	MA AF -010/+080	P 204	
Galvanized surfaces	MA AG -010/+080	P 05	All galvanized surfaces, **except** gratings, stairs and associated galvanized fasteners
Cd/bi Cr surfaces	MA AB -010/+080	P 06	Above 80°C, system adapted to adjacent surfaces systems
Zn/bi Cr surfaces	MA AB -010/+080	P 06	
Tanks			
Crude oil tanks	MA AF -010/+080	P 206	Extend 2 m down from the roof and 1 m up from the bottom
			Additional protection by sacrificial anodes required
Slops tanks	MA AF -010/+080	P 206	Additional protection by sacrificial anodes required
Permanent ballast tanks	MA AF -010/+080	P 206	Additional protection by sacrificial anodes required
Voids/cofferdam	MA AF -010/+080	P 207	
Storage			
Gas-oil	MA AF -010/+050	P 106	
Jet fuel/jet A1		P 109	Report from authorized organization
Drinking water tank	MA AF -010/+050	P 105	Health and safety reports
Galvanized surfaces	MA AG -010/+080	P 05	All galvanized surfaces, **except** gratings, stairs and associated galvanized fasteners
Cd/bi Cr surfaces	MA AB -010/+080	P 06	Above 80°C, system adapted to adjacent surfaces systems
Zn/bi Cr surfaces	MA AB -010/+080	P 06	

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Appendix 2

Structure	Code	System No.	Remarks
Piping			
Uninsulated: t < 80°C	MA AF -010/+080	P 01	
81 < t < 150°C	MA AF +081/+150	P 10	Including adjacent surfaces
151 < t < 400°C	MA AF +151/+400	P 11	Including adjacent surfaces
Insulated: t < 90°C	MA AF -030/+089	P 12	
90 < t < 200°C	MA AF +090/+200	P 13	
Galvanized surfaces	MA AG -010/+080	P 05	All galvanized surfaces, **except** gratings, stairs and associated galvanized fasteners
Cd/bi Cr surfaces	MA AB -010/+080	P 06	Above 80°C, system adapted to adjacent surfaces systems
Zn/bi Cr surfaces	MA AB -010/+080	P 06	
Machinery			
t < 80°C	MA AF -010/+080	P 14	Supplier's system applied if approved by Total E&P
Shops/Stores			
Workshop Air conditioned rooms	MA AF -010/+080	P 205	
Floors		P 17	Sub-concrete coat (others: system P02)

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Appendix 3 Construction principles and precautions

1. Floating structures - Construction principles

Construction phases	Coating tasks
Plate rolling	
	Blast-cleaning Shop primer *
Prefabrication of subsystems (hull components or bulkheads with stiffeners)	
	Surface preparation Application of coating system
Assembly subassemblies	
	Preparation of surface around welds and burnt and damaged areas Application of coating system
Final repairs	
	Surface preparation around damaged areas and support zones (keel blocks) Application of coating system

Important: The shop primer is for temporary protection. It shall be completely removed before application of coating.

2. Floating structures - Precautions

2.1 Initial coating of as-rolled plate

All plates shall be shop-primed after blast-cleaning to grade of cleanliness SA 3 according to P 208 systems (shop primer based on zinc ethyl silicate or epoxy or other).

2.2 Corner edges

All corner edges shall be chamfered before applying coatings (minimum radius > 2 mm).

2.3 Surface preparation

The zinc ethyl silicate or epoxy or other based shop primer (P 208 system) shall be carefully removed before applying the final coating system.

Secondary surface preparation shall be at least grade of degree of cleanliness SA 21/2 (ISO 8501-1:1988) with surface profile specified in paint system description in Appendix 4.

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Appendix 4 Suppliers' systems

Binders coding

Binders	Codes	Remarks
Zinc ethyl silicate	ESI	
Rich Zinc epoxy	EPRZ	[Zn] > 80%
Epoxy	EP	
Phenolic Epoxy	EPPH	
Modified Epoxy	EPM	
Ester Epoxy	EPES	
Glass flake Epoxy	EPGF	
Polyurethane	PUR	
Silicone	SI	
Vinyl-ester	VY	

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