



Exploration & Production

GENERAL SPECIFICATION

CORROSION

GS EP COR 353

Design and application of passive fire protection coatings

03	10/2009	General review - PFP Design and application
02	10/2005	5.2.2: Supplier to be present at start of coating application - Addition of "EP" root to GS identification
01	10/2003	General review - Modification of 4.2.1 (no more examples of surfaces to be protected) - Change of Group name and logo
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Rev.	Date	Notes

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1. Scope

This specification defines the technical requirements for the design and application of fireproofing coatings to provide structures, buildings and equipment with passive fire protection.

The document does not cover:

- Product Qualification
- Definition of equipment and structures to be protected
- Protection of cable and piping entries
- Definition of fire classifications of bulkheads and floors.

2. Reference documents

The reference documents listed below form an integral part of this General Specification. Unless otherwise stipulated, the applicable version of these documents, including relevant appendices and supplements, is the latest revision published at the EFFECTIVE DATE of the CONTRACT.

Standards

Reference	Title
ISO 4628	Paints and varnishes - Evaluation of degradation of coatings - Designation of quantity and size of defects, and of intensity of uniform changes in appearance
ISO 8421-1	Fire protection - Vocabulary

Professional Documents

Reference	Title
NFPA 33	Standard for Spray Application Using Flammable and Combustible Materials

Regulations

Reference	Title
Not applicable	

Codes

Reference	Title
Not applicable	

Other documents

Reference	Title
Not applicable	

Total General Specifications

Reference	Title
GS EP COR 230	External laminated glass fibre/resin based coating for risers of sea line
GS EP COR 231	External elastomer based coating for risers of sea line
GS EP COR 350	External protection of offshore and coastal structures and equipment by painting
GS EP SAF 337	Passive fire protection: Basis of design

3. Types of structures and equipment to be protected

In this General Specification, the term “structure” refers to main load bearing elements of the structure, the mechanical characteristics of which need to be maintained in the event of fire to maintain the integrity of the construction.

Further information on the definition of PFP can be found in [ISO 8421-1](#).

The structures to be protected shall be determined according to General Specification [GS EP SAF 337](#).

Structures and equipment considered are:

- Concrete and metallic structures
- Onshore and offshore structures
- Onshore and offshore equipment whether thermally insulated or not
- Buildings such as but not limited to living quarters, cabins, plant rooms, temporary shelters (TSR) and control rooms.

Note:

- In cases where PFP has to be provided on Valves, instrumentation and fittings connected to equipment (as defined by HSE department), fireproofing shall consist in removable boxes or blankets offering the same fire resistance as that required for the equipment.
- When risers of sea-lines have to be protected with PFP (as defined by HSE department), external laminated glass fibre/resin based coating or elastomeric based coating according to General Specifications [GS EP COR 230](#) and [GS EP COR 231](#) shall be used.

4. Application of fireproofing materials

Only Passive Fire Protection products certified by an approved third part laboratory in accordance with General Specification [GS EP SAF 337](#) shall be used.

The use of fireproofing products containing asbestos is prohibited.

4.1 Types of fireproofing material

Protection systems and materials that can be used can be classified in the following families:

- Cementitious materials: The heat generated by the fire is initially absorbed and the water contained in the material is vaporized. Consequently, the structure does not heat up. Once the water has vaporized, the material acts as a thermal screen to prevent the transmission of heat.
- Intumescent products: Under a high rise in temperature, the material swells to form a very thick "meringue" which acts as an insulating barrier protecting the structure against flames.
- Caissons: Constructed with rigid or semi-rigid panels.
- Removable "Fire blankets": These are wrapped around items with complex geometries and / or requiring frequent inspection (valves...).

4.2 Selection of the PFP system

In all cases, the materials used shall satisfy the following minimal requirements:

- Passive Fire Protection products shall be certified in accordance with General Specification **GS EP SAF 337**
- PFP products must withstand degradation due to the environment over time
- Ease of application and repair shall be considered as essential
- An anticorrosion coating shall be applied below PFP. Such corrosion protection shall be approved by the SUPPLIER of the fireproofing product in order to ensure that both products are compatible. The application of such corrosion protection shall be carried out in accordance with SUPPLIER's instructions and General Specification **GS EP COR 350**.
- In the event of deterioration, repairs must be as easy as practically possible to perform and fully restore the integrity of the PFP.

Mechanical reinforcement may be incorporated in the PFP in accordance with SUPPLIER's recommendations.

When joints are provided to take account of differential thermal expansion of equipment, PFP shall be implemented in such a way as to allow for, and not be damaged by such expansion.

The upper parts of beams supporting gratings or piping shall not be protected by PFP.

5. Certification of personnel

5.1 Operators

Operators shall be individually certified by an approved organization (ACQPA, FROSIO, or equivalent) for anticorrosion coating application and qualified by the PFP product SUPPLIER.

5.2 Inspectors

Inspectors shall be individually certified by an approved organization (ACQPA, FROSIO, NACE level 3, or equivalent). Specific qualification shall be performed by the PFP product SUPPLIER.

6. Application on structures

6.1 Concrete structures

PFP of reinforced concrete structures shall be provided by increasing the thickness of concrete to a sufficient thickness to reach the required fire protection performance indicated in General Specification **GS EP SAF 337**.

6.2 Metallic structures

PFP for metallic structures can be provided either with cementitious or intumescent materials. However for offshore structures, PFP shall normally be intumescent in order to gain weight.

6.2.1 Cementitious systems

In all cases, the following requirements shall be fulfilled:

- Anticorrosion coating of the base metal according to General Specification **GS EP COR 350** which shall be compatible with the PFP product. The anticorrosion system may be different from this used for the rest of the structure
- Use of mechanical reinforcements (pins, chicken wire...), positioned and installed according to PFP product SUPPLIER's instructions
- The material shall be applied according to SUPPLIER's recommendations and in such a way that there are no air pockets between the anticorrosion coated steel and the fireproofing material. The finished appearance must be smooth for steel members > 300 mm and equipment supports.

In some cases, the application of a paint topcoat compatible with the fireproofing product may be required. This shall be specified in the Project Particular Specification.

Note: Materials causing acid hydrolysis in the presence of moisture (particularly those containing magnesium oxychloride) shall be prohibited on offshore installations.

6.2.2 Intumescent products

When such products are used, the following requirements shall be fulfilled:

- Anticorrosion coating of the base metal according to General Specification **GS EP COR 350** which shall be compatible with the PFP product.
- Application of the fireproofing product according to the SUPPLIER's recommendations. The use of dual pumps is strongly recommended given the short pot life of such materials.
- Use of mechanical reinforcement: With thin fireproofing products (less than 9 mm), this requirement may be eliminated provided if allowed by the product's fire certificate.

Any paint topcoat not approved by SUPPLIER shall be proscribed, as it may prevent expansion of the fireproofing material in the event of a fire.

The thickness of PFP shall be measured during application using a wet gauge.

6.2.3 Other products

Other fireproofing products that satisfy conditions of exposure and resistance to fire requirements may be proposed by CONTRACTOR provided certification by a third part laboratory in accordance with General Specification **GS EP SAF 337** is available.

6.3 Application on equipment and vessels

6.3.1 Support structures

Metallic elements supporting equipment and vessels shall be protected in the same way as in section 6.2 above. The fireproofing product used may differ from that used to protect the main structure or vessel / equipment. In this case, sealing against water / moisture entry at the interface between the two materials must be guaranteed.

6.3.2 Piping and vessels

When PFP is required by General Specification **GS EP SAF 337** or local regulations on vessels and / or piping, then it shall be implemented as in section 6.2 above.

In addition, SUPPLIER shall specify the maximum allowable service temperature for the products to be used, and adequate third party fire certification shall be provided. As a general rule:

- Cementitious materials would typically be limited to operating temperature of 85°C
- Intumescent products would typically be limited to operating temperatures of 65°C.

If the operating temperatures are higher than the maximum temperature specified by SUPPLIER, then thermal insulation shall be used below PFP and fire certifications shall be provided for the overall thermal insulation / PFP system.

For cryogenic service, the same product selection and fire testing requirements shall apply with regards to the minimum operating temperature.

For all cases where a combined thermal insulation / PFP system needs to be used, then its design, fire performance certification (compliant with **GS EP SAF 337**), and application procedures shall be submitted to COMPANY for approval.

7. Health and Safety precautions

Operations involving the spray application of flammable and combustible materials shall comply with **NFPA 33**.

Some PFP materials and most of associated primers and topcoats contain low flash point solvents or substances hazardous to human health or environment. All substances or chemicals shall be assessed in terms of health and environment effects.

An assessment of risks shall be made prior to all delivery and all PFP preparation and application work. Suitable control measures, including low-storage temperature, natural or forced ventilation requirements, respiratory protective equipment, adequate clothing and eyes protection, etc. shall be provided and their use enforced to reduce the risks as low as practicable. In case welding is required on a face opposite to a face protected with PFP, PFP shall be removed during the work and reinstalled afterwards.

8. Technical content of bids

CONTRACTOR's bid shall include the following information:

- SUPPLIER of the selected fireproofing product and reference information
- Minimum thickness of PFP required to satisfy the requirements of General Specification **GS EP SAF 337**

- PFP application procedures approved by SUPPLIER
- Data sheets of all materials to be used
- Product safety datasheets
- Fire test certificates according to the requirements of General Specification **GS EP SAF 337**
- Applicator's quality assurance plan with organization chart
- Resources to protect items to be coated against unfavourable climatic conditions
- Schedule of the WORK.

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.

- Certification and Qualification of personnel
- Compliance of the products used, material certificates
- Inspection of the anticorrosion paint system applied
- Climatic conditions
- Inspection of fireproofing application conditions (including drying times)
- Thickness measurements
- Adhesion testing
- Final inspection of the WORK.

The inspection methods may vary from one product to another according to type. Inspection methods and acceptance criteria specific to each product shall be specified in the quality control manual.

9.2 Inspection test plan

An inspection test plan including all the points listed in section 9.1 shall be prepared and submitted to COMPANY for approval. 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 Guarantee

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 shall guarantee that the WORK is covered by performance warranties in accordance with the following requirements of the CONTRACT:

- The maximum degree of rust shall be Ri0 according to [ISO 4628](#)
- Guarantee shall cover both corrosion protection and passive fire protection performances
- Guarantee shall be provided for the duration of **10 years**
- Beginning of Warranty Period as defined is the effective date of the PROVISIONAL ACCEPTANCE CERTIFICATE for PFP works.

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 PFP 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.