



Document No.	GIS 52-201
Applicability	Group
Date	12 December 2005

Guidance on Industry Standard for Installation of Passive Fire Protection (PFP)

GIS 52-201

**BP GROUP
ENGINEERING TECHNICAL PRACTICES**

Foreword

This is the first issue of Engineering Technical Practice (ETP) BP GIS 52-201. This Guidance on Industry Standard (GIS) is based on parts of heritage documents from the merged BP companies as follows:

Amoco

A NM-F-00-C	Non-metallic Materials—Fireproofing—Installation Specification.
PTA NM-F-00-C	Non-metallic Materials—Fireproofing—Installation Specification.

Arco

Standard 803 Rev. 3	Fireproofing.
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1. Scope

This GIS defines minimum technical requirements for installation of passive fire protection (PFP) on structures, piping, equipment, and control systems.

2. Normative references

The following normative documents contain requirements that, through reference in this text, constitute requirements of this technical practice. For dated references, subsequent amendments to, or revisions of, any of these publications do not apply. However, parties to agreements based on this technical practice are encouraged to investigate the possibility of applying the most recent editions of the normative documents indicated below. For undated references, the latest edition of the normative document referred to applies.

The most recent edition, except as otherwise specified, of the following standards, codes, and specifications are cited in this specification.

American Concrete Institute (ACI)

ACI 301	Specifications for Structural Concrete for Buildings.
ACI 304	Recommended Practice for Measuring, Mixing, Transporting, and Placing Concrete.

American Society of Testing and Materials (ASTM)

ASTM C33	Standard Specification for Concrete Aggregates.
ASTM C150	Standard Specification for Portland Cement.
ASTM C330	Standard Specification for Lightweight Aggregates for Structural Concrete.

BP Engineering Technical Practices (ETPs)

GP 06-60	Guidance on Practice for Onshore and Offshore Paints and Coatings
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Underwriters Laboratories (UL)

UL 1709	Fire Resistant Directory Volume 1.
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3. Symbols and abbreviations

For the purpose of this GIS, the following symbols and abbreviations apply:

MSDS	Material safety data sheet.
SWG	Standard wire gage.

4. General

4.1. Proposal

- a. Gun applied fireproofing
 1. Acceptable exterior finished surface of gun applied (wet gun or dry gun) fireproofing shall be determined before contract is issued.
 2. Two samples shall be prepared.



3. One sample shall be given to BP.
4. One sample shall be kept to determine proper texture and smoothness of finished surface.
- b. Samples for gunned dense concrete and commercial lightweight concrete fireproofing shall have rubber or wood float finished surface, squared corners, and straight edges.
- c. Definition of areas in which water spray may contact either dense or lightweight concrete shall be obtained from BP before completion of bid. Identified areas shall have entire surface made waterproof with coating of weatherproof mastic.

On large fireproofing installations or if working with a new contractor, consider requiring the installation contractor to construct a mock-up of the installation before start of work. Requiring a mock-up can ensure the contractor understands the job requirement in advance and provides a benchmark for judging the work.

4.2. Structures

- a. Structures as identified by engineering documents shall be fireproofed using materials specified.
- b. Dense concrete shall not be substituted for lightweight concrete, subliming mastic, or intumescent coatings.
- c. See Figures 1 through 7 for typical examples.

4.3. Piping and equipment

- a. Fireproofing of piping and equipment shall be installed in accordance with this specification.
- b. Extent of fireproofing required will be given by BP through drawings, instructions, typical examples, and this GIS.
- c. Provisions shall be made to provide window for spring position indicator on all piping hangers of this type.
- d. Fireproofing of non-insulated, flangeless (wafer type) valves having exposed bolts shall be accomplished by strapping stainless steel shield around outside diameter of mating flanges and securing with two stainless steel bands. See Figure 9 for details.

4.4. Welding of fireproofing supports

- a. Welding on equipment shall not be performed without BP approval.
- b. Procedures for welding on equipment shall be subject to BP approval.

4.5. Fireproofing performance and rating

- a. Structures and supports protected by fireproofing materials of any type, except concrete, shall have minimum rating in accordance with UL 1709 of 2 hours. (ASTM E119 no longer applies).
- b. Fireproofing on cable trays, emergency shutdown systems, and isolation and depressurisation systems shall provide 30 minutes of protection in accordance with UL 1709 listing.
- c. Concrete fireproofing has no UL 1709 rating. Concrete used for fireproofing shall:
 1. Have 50 mm (2 in) minimum thickness.
 2. Provide uniformly thick coverage on flanges and webs of beams and columns.



4.6. Performance assurance for non concrete fireproofing

- a. Raw materials for fireproofing shall bear UL label.
- b. Materials that are not listed by UL and do not have design number starting with “XR” shall not be used for fireproofing, unless there is special need to use certain type of material for specific application where UL listed (XR) products cannot be used for technical reasons. In such isolated instances, BP Fire Protection Specialist shall be consulted for concurrence.
- c. Application of non concrete fireproofing shall be made in accordance with UL design listed for particular material. Design number shall start with letters “XR”, followed by three numbers.
- d. Non concrete fireproofing shall be applied only by those who are certified by manufacturer of material as qualified applicators.
- e. Sample application
 1. Before proceeding with work, applicator shall apply sample application approximately 2,25 m² (25 ft²) on flat surface or 2 m (6 ft) long on typical beam or column.
 2. After acceptance of this sample by manufacturer and BP for appearance and proper thickness, sample shall be used as a guide for application of rest of fireproofing.
 3. Sample shall include trowelled smooth vertical and overhead surfaces.
- f. Manufacturer’s representative shall be present during first full day of application of primer and first two days of application of fireproofing material. Any deviation from UL design shall be corrected immediately. Manufacturer’s representative shall be available for consultation at anytime during entire application period.

4.7. Certification and guarantee

- a. Upon completion of project, applicator shall furnish, in duplicate, manufacturer’s official certification form, properly completed, to provide record of installation for code or insurance requirements.
- b. Manufacturer shall guarantee that material is free from defects in composition that would affect use and purpose of material to meet requirements of this GIS. Faulty material shall be replaced without cost to BP.
- c. Manufacturer/applicator shall recommend to BP proper methods for handling and transporting pre fireproofed columns and beams and attest to transportability of such.

5. Installation details

Installation methods for concrete fireproofing can greatly affect constructability, cost, and schedule on a project. The following paragraphs give guidance for method of installation selection.

5.1. Concrete fireproofing

5.1.1. General

- a. Either dense or lightweight concrete may be used for fireproofing, reinforced with 12 gage wire mesh as specified in 5.1.4.
- b. Cement
 1. Cement shall be Portland, Type I.



2. If special needs demand fireproofing with moderate or high sulphate resistance or high early strength, Type II, V, or III, respectively, may be used.
3. Cement shall be tested in accordance with ASTM C150.
- c. Concrete fireproofing materials classified as dense shall be 64 kg to 68 kg per m³ (140 lb to 150 lb per ft³).
- d. Dense concrete shall be installed to minimum 50 mm (2 in) thickness.
- e. Quartz gravel shall not be used as coarse aggregate in fireproofing concrete.
- f. Fine and coarse (preferably calcareous) aggregates shall be tested in accordance with ASTM C33. Maximum aggregate size shall be limited to 12 mm (1/2 in).
- g. Lightweight aggregates
 1. Lightweight aggregates shall be tested in accordance with ASTM C330.
 2. Maximum aggregate size shall be limited to 12 mm (1/2 in).
 3. Lightweight aggregates should be obtained from reliable sources and from producers equipped to supply uniform product.

There is considerable variation between the different types of lightweight aggregates and also variation in any given type, depending on the source.

- h. Potable water shall be used in mixing concrete and shall be clean and free of deleterious amounts of acids, alkalis, or organic materials.
- i. Minimum water content, consistent with satisfactory placement, shall be used to avoid shrinkage cracking. Air entraining admixes may be used to reduce water content.
- j. Substrates shall be prepared and coated in accordance with BP GP 06-60.
- k. Details of installation on structures using dense concrete shall be comply with Figures 1, 2, 3, and 4.
- l. Details for installation using dense concrete on horizontal equipment and pipe supports shall be comply with Figure 2.
- m. Concrete shall be cast in place, gun applied (wet or dry), or trowelled on.
- n. Concrete shall be placed in accordance with ACI 304. Paragraph 7.6 of ACI 301 shall govern when ambient temperature exceeds 32°C (90°F) or is less than 5°C (40°F).
- o. Concrete shall be cured with BP approved membrane curing compound.
- p. If forms are removed within 5 days of pouring, concrete surfaces shall be given sprayed on coat of A.C. Horn Company's "Horn Cure" or approved equivalent curing compound.
- q. Reinforcing wire and steel standoff for structural concrete fireproofing shall be galvanised, stainless steel, or carbon steel with epoxy or vinyl corrosion resistant coating. Coating shall allow bending or flexing of wire during installation.
- r. Concrete fireproofing applied to vessel skirts and similar equipment shall be reinforced with 5 mm (3/16 in) diameter split pin refractory anchor welding studs located on 300 mm (12 in) triangular pitch pattern or wire mesh. Stud tines (original length equal to concrete thickness) shall then be bent apart to form 90° vees.
- s. Exposed joints between steel and concrete shall be caulked water-tight with Carboline Acrilast 570, Tremco Inc. Monoacrylic Terpolymer, or Dow Corning 790 Silicone or other elastomeric or silicone approved by BP.
- t. Caulk shall adhere to both steel and concrete and form seal that will remain water tight over seasonal changes in temperature. Cut back asphalt shall not be used.

