

GP 14-03-01	Fireproofing	October 2004
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Fireproofing

GP 14-03-01

Scope

[I] This Global Practice (GP) covers fireproofing of vessels. It includes spheres, heat exchangers, structural support members, and electrical and instrumentation installations.

[I] An asterisk (*) indicates that additional information is furnished in the job specification.

This Practice is appropriate for attachment to inquiry or purchase documents.

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1. Required References

[I] This Section lists Practices and Standards that are generically referenced and assumed to be a part of this document. Unless otherwise specified herein, use the latest edition.

1.1. Global Practices–ExxonMobil Engineering Practices

GP 03-02-03	Firewater Systems
GP 03-02-04	Pressure Relieving Systems
GP 04-01-01	Concrete Design and Construction
GP 14-01-01	External Insulation
GP 19-01-01	Paint and Protective Coatings
GP 19-03-01	Guniting for Linings and Fireproof Coatings

1.2. ACI–American Concrete Institute

ACI 318/318R	Building Code Requirements for Structural Concrete and Commentary
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1.3. API–American Petroleum Institute

API PUBL 2218	Fireproofing Practices in Petroleum and Petrochemical Processing Plants
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1.4. ASTM–American Society for Testing and Materials

ASTM E 1529	Standard Test Methods for Determining Effects of Large Hydrocarbon Pool Fires on Structural Members and Assemblies
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1.5. ISO–International Organization for Standardization

ISO 8501-1	Preparation of Steel Substrates Before Application of Paints and Related Products - Visual Assessment of Surface Cleanliness - Part 1: Rust Grades and Preparation Grades of Uncoated Steel Substrates and of Steel Substrates After Overall Removal of Previous Coatings
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1.6. NACE–NACE International

NACE NO. 2	Near-White Metal Blast Cleaning SSPC SP 10-2000
NACE NO. 3	Commercial Blast Cleaning SSPC-SP 6-2000

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1.7. NFPA–National Fire Protection Association

NFPA 58	Liquefied Petroleum Gas Code (National Fire Codes, vol. 2)
NFPA 251	Standard Methods of Tests of Fire Endurance of Building Construction and Materials (National Fire Codes, vol. 6)

1.8. SSPC–Standards Painting and Coating

SSPC PA 2	Measurement of Dry Coating Thickness with Magnetic Gages (Steel Structures Painting Manual, Ch 5 - Paint Application Specs.)
SSPC SP 6	Commercial Blast Cleaning NACE No. 3-2000 (Steel Structures Painting Manual, Ch 2 - Surface Preparation Specs.)
SSPC SP 10	Near-White Metal Blast Cleaning NACE No.2-2000 (Steel Structures Painting Manual, Ch 2 - Surface Preparation Specs.)
SSPC VIS 1	Visual Standard for Abrasive Blast Cleaned Steel (Standard Reference Photographs) Editorial Changes September 1,2000 (Steel Structures Painting Manual, Ch 2 - Surface Preparation Specs.)

1.9. UL–Underwriter's Laboratory

UL 1709	UL Standard for Safety Rapid Rise Fire Tests of Protection Materials for Structural Steel
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2. Definitions

Term	[I] Description
Combustible Liquids	Combustible liquids have a flash point of 100°F (38°C) or higher.
Equipment With High Fire Potential	Equipment with high fire potential includes any of the following: (1) Pumps with a rated capacity over 150 gpm (34 m³/h) handling light ends (see definition below). (2) Pumps with a rated capacity over 200 gpm (45 m³/h) handling flammable liquids or combustible liquids when handled at temperatures above or within 15°F (8°C) of their closed cup flash point. (3) Gas compressors over 200 hp (150 kW) handling flammable materials. (4) Fired heaters handling flammable or combustible liquids in the tubes. (5) Vessels, heat exchangers (including air-cooled) and other equipment containing flammable liquids at or above 600°F (315°C), or above their auto-ignition temperature, whichever is less. (6) * When specified by the Owner's Engineer, reactors that operate at or above 500 psig (3450 kPa) pressure or are capable of producing exothermic or runaway reactions.
Fire Hazardous Area	A fire hazardous area shall include any of the following: (1) The area within 30 ft (9.0 m) horizontally and 40 ft (12.0 m) vertically of equipment that has a high fire potential. (2) The area within 30 ft (9.0 m) horizontally and 40 ft (12.0 m) vertically of the edge of a drainage ditch or swale that serves to transport spills from high fire potential equipment to a remote impounding basin. (3) For tanks, spheres and spheroids, containing flammable material, the fire hazardous area shall extend to the dike wall, or 30 ft (9.0 m) from the storage vessel, whichever is greater. (4) For rotating equipment, the 30 ft (9.0 m) horizontal and 40 ft (12.0 m) vertical distance shall be taken from the expected source of leakage.

Term	[I] Description
	(5) For marine docks where flammable liquids are handled, the fire hazardous area shall extend 100 ft (30 m) horizontally from the manifolds or loading connections on the pier deck. (6) When deficiencies in equipment spacing (e.g. pumps are located under piperack) and/or unit drainage (e.g. drainage flows under piperack), the Owner's Engineer should evaluate if expanding the fire hazardous area is warranted.
Fire Rated Cable	* Fire rated cable has successfully passed an Owner approved fire test. Such cable maintains conductor continuity and insulation integrity, when subjected to 2000°F (1100°C) with a heat flux of at least 50,000 Btu/hr-ft ² (160 kW/m ²) for at least 15 minutes. Fire test conditions shall be as specified in UL 1709, or an equivalent test method.
Flammable Liquids	Flammable liquids are low-flash liquids [flash point below 100°F (38°C)] and combustible liquids when handled at temperatures above or within 15°F (8°C) of their closed cup flash points.
Flammable Materials	Flammable materials include flammable liquids, hydrocarbon vapors, and other vapors, such as hydrogen and carbon disulfide. Such materials are readily ignitable when released to the atmosphere.
High Temperature Rated Wiring Insulation	High temperature rated wiring insulation is insulation suitable for a maximum rated conductor temperature of 390°F (200°C) and higher. Examples are silicone rubber and mineral insulation (MI).
Light Ends	Flammable liquids having a Reid Vapor Pressure of 15 psia (103.4 kPa) or greater
Low Temperature Rated Wiring Insulation	Low temperature rated wiring insulation is insulation suitable for a maximum rated conductor temperature below 390°F (200°C). Examples are polyvinyl chloride and polyethylene.
Steel Jacket Material	*Used to cover fireproofing, steel jacket material refers to stainless steel, aluminum coated or galvanized coated steel, as specified by the Owner's Engineer.

3. Fireproofing Materials and Methods

3.1. Concrete and Guniting Coatings for Structural Steel and Vessels

3.1.1. Concrete and Guniting

- 1) * [S] Unless otherwise specified, concrete and Guniting are the basic materials for fireproofing. Alternative fire protection coatings that meet the requirements of Section 3.3, Items (1) and (2) may be used when approved by the Owner's Engineer.



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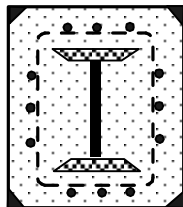
- 2) [S] Concrete and Gunitite used for fireproofing shall be mixed to provide a minimum compressive strength of 4000 psi (27.5 MPa). The maximum water to concrete weight ratio shall be 0.5. Water used in preparing and applying the concrete/Gunitite shall be potable.

[S] Unless otherwise noted in this Practice, the design, testing and application of concrete and Gunitite used for fireproofing shall meet the requirements of [GP 04-01-01](#) and [GP 19-03-01](#).

Structural Steel and Vessels

- 1) [S] Structural steel columns and beams to be fireproofed shall be covered with a minimum thickness of 2 in. (50 mm) concrete "solid blocked" (see Figure 1). The use of block-outs (voids) in structural shapes to reduce the concrete volume is not acceptable. "Contoured" concrete on structural steel columns and beams is considered an alternative fireproofing method and is subject to the requirements of Section 3.3, Items (1) and (2).

Figure 1: Solid Blocked Concrete Fireproofing



NOTE: Entire void space (designated by the gray area) is concrete filled with support steel embedded.

- 2) [S] Vessel skirts and other steel support members to be fireproofed shall be covered with a minimum thickness of 2 in. (50 mm) Gunitite or concrete.
- 3) [S] Reinforced concrete structures, with at least a 2-in. (50-mm) concrete covering over reinforced steel, are adequately fire resistant. Additional fireproofing is not required.
- 4) [S] Steel vessels to be fireproofed shall be covered on the outside surfaces with a minimum thickness of 1½-in. (38-mm) Gunitite or concrete.

3.1.3. Penetration Reduction

[R] When concrete/Gunitite and lightweight cementitious fire resistant coatings are used to fireproof steel, the following steps shall be taken to reduce penetration of moisture to the steel surface:

- 1) All seams and joints between the fireproofing coating and the steel surface shall be tapered and caulked with a synthetic rubber such as butyl or silicone.
- 2) When fireproofing is applied to horizontal beams that carry piping or platforms, the following shall apply:
- a) Fireproofing shall extend up to the underside of the top flange, with the edges sloped downward to avoid water entry (see Figure 2). For galvanized beams, no further protection is required before fireproofing.

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