

DEP SPECIFICATION

PASSIVE FIRE PROTECTION FOR ONSHORE FACILITIES

DEP 34.19.20.11-Gen.

February 2011

(DEP Circular 03/12 has been incorporated)

(Amendment A02 has been incorporated - February 2013)

DESIGN AND ENGINEERING PRACTICE

DEM1



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1. INTRODUCTION

1.1 SCOPE

This DEP specifies requirements and gives recommendations for the design and application/installation of passive fire protection (PFP) of steel. The zones where PFP are required are called Fire Protection Zones (FPZ). For designs inside the USA the concept of Potential Fire Source is used.

This DEP applies to steel supporting structures and piping and equipment in process areas and processing plants as well as to storage facilities, jetties and pipe bridges (including those outside the battery limits) in oil/gas/petrochemical installations.

The aim of this DEP is to ensure that the degree of PFP applied is effective and practical in terms of maintainability and reduction of risks.

This DEP is applicable for pool fires only. For other fire scenarios, like jet fires, a separate design case shall be performed according to DEP 80.47.10.30-Gen., sections 2.2.1.2 and 3.1.1.

This DEP contains mandatory requirements to mitigate process safety risks in accordance with Design Engineering Manual DEM 1 – Application of Technical Standards.

This DEP is a revision of the DEP of the same number dated January 2010; a summary of the main changes since the previous edition is given in (1.5).

1.2 DISTRIBUTION, INTENDED USE AND REGULATORY CONSIDERATIONS

Unless otherwise authorised by Shell GSI, the distribution of this DEP is confined to Shell companies and, where necessary, to Contractors and Manufacturers/Suppliers nominated by them. Any authorised access to DEPs does not for that reason constitute an authorization to any documents, data or information to which the DEPs may refer.

This DEP is intended for use in facilities related to oil and gas production, gas handling, oil refining, chemical processing, gasification and distribution. This DEP may also be applied in other similar facilities.

When DEPs are applied, a Management of Change (MOC) process should be implemented; this is of particular importance when existing facilities are to be modified.

If national and/or local regulations exist in which some of the requirements could be more stringent than in this DEP, the Contractor shall determine by careful scrutiny which of the requirements are the more stringent and which combination of requirements will be acceptable with regards to the safety, environmental, economic and legal aspects. In all cases the Contractor shall inform the Principal of any deviation from the requirements of this DEP which is considered to be necessary in order to comply with national and/or local regulations. The Principal may then negotiate with the Authorities concerned, the objective being to obtain agreement to follow this DEP as closely as possible.

1.3 DEFINITIONS

1.3.1 General definitions

The **Contractor** is the party that carries out all or part of the design, engineering, procurement, construction, commissioning or management of a project or operation of a facility. The Principal may undertake all or part of the duties of the Contractor.

The **Manufacturer/Supplier** is the party that manufactures or supplies equipment and services to perform the duties specified by the Contractor.

The **Principal** is the party that initiates the project and ultimately pays for it. The Principal may also include an agent or consultant authorised to act for, and on behalf of, the Principal.

The word **shall** indicates a requirement.

The capitalised term **SHALL [PS]** indicates a process safety requirement.

The word **should** indicates a recommendation.

1.4 CROSS-REFERENCES

Where cross-references to other parts of this DEP are made, the referenced section number is shown in brackets. Other documents referenced by this DEP are listed in (5).

1.5 SUMMARY OF MAIN CHANGES

This DEP is a revision of the DEP of the same number dated January 2010. Most changes are the result of implementing the segregation of requirements in the DEM1 listed DEPs, and the incorporation of internal Shell standards. The standards which are incorporated are Shell Canada Std. 20-1.01 'Fireproofing design' and 20-3.01 'Fireproofing installation'. The definition of the fire hazardous area is not incorporated from the Shell Canada Standard; this is defined according to DEP 80.47.10.30-Gen., section 3.2.

The changes are listed below.

Old section	New section	Change
Title		Changed title to reflect content and to be aligned with DEP 80.47.10.30-Gen.
General		Deleted all non SI units (non SI units are in brackets)
General		Deleted duplications
3.1		2 nd paragraph changed SHALL[PS] into shall
3.2		4 th paragraph changed SHALL[PS] into shall
3.6		1 st paragraph changed SHALL[PS] into shall
4	4	Restructured chapter 4
	4.1.1	Added warranty requirements
	4.1.2	Added contractor responsibility requirements
	4.1.6	Added delivery and storage
	4.1.4	Added material selection requirements
4.1.1	4.1.4	6 th paragraph changed SHALL[PS] into shall
4.1.2		Deleted reference to design class III
4.1.2	4.1.5	2 nd paragraph changed SHALL[PS] into shall
4.2.3.1	4.5	Added concrete mix design report
4.2.3.3	4.2.4	Added clearance of mesh reinforcement to steel surface
4.2.3.3	4.2.4	2 nd paragraph changed SHALL[PS] into shall
4.2.3.4	4.2.1	5 th and 6 th paragraph changed SHALL[PS] into shall
4.4.4	4.4.2	Added manufacturers requirements for proprietary fireproofing systems.
Appendix A		Section A3 changed SHALL[PS] into shall

Amendment A02

1.6	1.6	Added updated feedback procedures.
4.2.1	4.2.1	Changed USC units to (3045 psi) and (4350 psi) respectively.

5.	5.	Added DEP feed back form to References section: DEP 00.00.05.80-Gen.
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1.6 COMMENTS ON THIS DEP

Amendment A02

Comments on this DEP may be submitted to the Administrator using one of the following options:

Shell DEPs Online (Users with access to Shell DEPs Online)	Enter the Shell DEPs Online system at https://www.shelldeps.com Select a DEP and then go to the details screen for that DEP. Click on the "Give feedback" link, fill in the online form and submit.
DEP Feedback System (Users with access to Shell Wide Web)	Enter comments directly in the DEP Feedback System which is accessible from the Technical Standards Portal http://www.shell.com/standards . Select "Submit DEP Feedback", fill in the online form and submit.
DEP Standard Form (Other users)	Use DEP Standard Form 00.00.05.80-Gen. to record feedback and email the form to the Administrator at standards@shell.com .

Feedback that has been registered in the DEP Feedback System by using one of the above options will be reviewed by the DEP Custodian for potential improvements to the DEP.

1.7 DUAL UNITS

Amended per Circular 03/12

Dual units have been incorporated throughout this DEP.

This DEP contains both the International System (SI) units, as well as the corresponding US Customary (USC) units, which are given following the SI units in brackets. When agreed by the Principal, the indicated USC values/units may be used.

1.8 PROJECT DOCUMENTATION REQUIREMENTS

For projects to ensure compliance with this DEP proper documentation is required in the Definition and Execution phases of the project (see Appendix A).

2. GENERAL

2.1 OBJECTIVES

Passive Fire Protection (PFP) is a measure intended to improve the fire resistance of structures that support pressure vessels, piping and other equipment located in the FPZ. PFP is provided by the application of concrete or other approved protection materials to structural steel supports.

PFP offers protection against the adverse thermal effects of fire for a defined period and defined degree of exposure. It should not be considered as a replacement for active fire fighting or lead to relaxation of normal design requirements (spacing and layout considerations) and precautions in operation and maintenance.

2.2 GENERAL REQUIREMENTS

The extent of PFP requirements SHALL [PS] be established on the basis of a fire safety assessment executed for the particular plant or unit as per DEP 80.47.10.30-Gen., section 2.

The zones where PFP are required are called Fire Protection Zones (FPZ). For designs inside the USA the concept of Potential Fire Source is used. The extent of the fireproofing around equipment and structures SHALL [PS] be indicated on layout and construction drawings.

The aim of this DEP is to ensure that the degree of PFP applied is effective and practical in terms of maintainability and reduction of risks. As there is a wide variation in the design of structures, this DEP shall be considered at all times when prescribing the fireproofing of structures not specifically mentioned in (3).

2.3 FIRE SEVERITY

Unless otherwise specified, the severity of the fire shall be based on hydrocarbon pool fires. For hydrocarbon pool fire exposures, the fire temperature profile shall be based on UL-1709. The hydrocarbon fire test as defined in UL 1709 is applicable to all fireproofing systems applied on steel supports and structures.

2.4 FIRE RESISTANCE DURATION

The required protection time resulting from this and/or other local conditions shall be established based on the requirements of DEP 80.47.10.30-Gen., section 3.1.1. A minimum of 30 minutes protection time SHALL [PS] be provided, however longer protection times may be warranted or required depending on the equipment, function and available fire fighting measures.

3. PASSIVE FIRE PROTECTION OF TYPICAL EQUIPMENT AND STRUCTURES IN FIRE PROTECTION ZONES

3.1 STRUCTURES SUPPORTING EQUIPMENT AND PIPING

The extent of PFP around equipment and structures SHALL [PS] be indicated on layout and construction drawings and shall be submitted to the Principal for review and comments.

PFP on pressure equipment legs or lugs shall not contact pressure retaining parts. There shall be a 25 to 50 mm (1 to 2 inch) gap between the fireproofing and the pressure retaining part.

Bolted moment connections of fireproofed main pipe racks may remain un-fireproofed (exposed) when shop applied concrete PFP is specified and the unit has moderate or lower fire hazard level as specified in DEP 80.47.10.30-Gen., sections 3.2.2 and 4.1.2.1.

Size of PFP block outs around moment connections shall be minimized if the block outs will remain exposed. Weatherproofing details shall be developed for all block outs that will remain open and shall be submitted to the Principal for review and comment.

Structural members having only a bracing function should not be fireproofed. Bracing required for load cases that are considered to be included with the base fire case as well as for primary stability of the structure shall be fireproofed.

3.2 COLUMN AND VESSEL SKIRTS

Skirts of columns and vessels SHALL [PS] be fireproofed if they are located within the FPZ (as identified in DEP 80.47.10.30-Gen., section 3.2 and the fire safety assessment. PFP SHALL [PS] be directly applied on skirts and vessel supports as indicated in Appendix E.

The skirt PFP shall stop well below the tangent line for hot or cold insulated vessels. See Appendix F for separation distances between the ring angle (drip angle) and the vessel tangent line. Alternatively, heat transfer and thermal stress calculations shall be made to where smaller separation distances are to be specified. The un-fireproofed portion of the skirt SHALL [PS] be covered with fire-resistant insulation.

The above applies to the normal situation where there are no flanged pipe connections within the circumference of the skirt. However, if this is the case then fireproofing shall also be applied inside the skirt.

Fireproofing shall be considered for steel saddles that support horizontal heat exchangers, condensers, coolers, drums and receivers that have diameters greater than 750 mm (30 inches) if the narrow vertical distance between the concrete pier and the shell of the vessel exceeds 300 mm (12 inches).

The skirt PFP separation distance shall be calculated. Heat transfer and thermal stress calculations shall also determine the type and amount of reinforcement required.

Reference is made to standard drawing S 20.002.

3.3 CABLES AND INSTRUMENTATION LOCATED WITHIN A FPZ

For fireproofing of cables reference is made to DEP 80.47.10.30-Gen., sections 3.1, 3.3.8 and 3.3.9.

3.4 PROCESS UNIT PIPE RACKS AND PIPE SUPPORT COLUMNS

Piping supported from spring hangers or rods shall be protected against failure of the spring hanger or rod by a fireproofed bracket or beam located beneath the pipe. Sufficient clearance shall be provided between the beam and the pipe to permit free vertical movement. Where, however, failure of the hanger rod will not lead to collapse of the piping, these stops are not required (Appendix D).