



نگهداشت و افزایش تولید میدان نفتی بینک
سطح الارض و ابنیه تحت الارض

عمومی و مشترک



شماره پیمان:

053-073-9184

SPECIFICATION FOR FIREPROOFING

نسخه	سریال	نوع مدرک	رشته	تسهیلات	صادرکننده	بسته کاری	پروژه
D03	0006	SP	ST	000	PEDCO	GNRAL	BK

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1.0 INTRODUCTION

Binak oilfield in Bushehr province is a part of the southern oilfields of Iran, is located 20 km northwest of Genaveh city.

With the aim of increasing production of oil from Binak oilfield, an EPC/EPD Project has been defined by NIOC/NISOC and awarded to Petro Iran Development Company (PEDCO). Also PEDCO (as General Contractor) has assigned the EPC-packages of the Project to "Hirgan Energy - Design and Inspection" JV.

GENERAL DEFINITION

The following terms shall be used in this document.

CLIENT:	National Iranian South Oilfields Company (NISOC)
PROJECT:	Binak Oilfield Development – General Facilities
EPD/EPC CONTRACTOR(GC):	Petro Iran Development Company (PEDCO)
EPC CONTRACTOR:	Joint Venture of : Hirgan Energy – Design & Inspection(D&I) Companies
VENDOR:	The firm or person who will fabricate the equipment or material.
EXECUTOR:	Executor is the party which carries out all or part of construction and/or commissioning for the project.
THIRD PARTY INSPECTOR (TPI):	The firm appointed by EPD/EPC CONTRACTOR(GC) and approved by CLIENT (in writing) for the inspection of goods.
SHALL:	Is used where a provision is mandatory.
SHOULD:	Is used where a provision is advisory only.
WILL:	Is normally used in connection with the action by CLIENT rather than by an EPC/EPD CONTRACTOR, supplier or VENDOR.
MAY:	Is used where a provision is completely discretionary.

2.0 SCOPE

This specification defines the extent of use and procedures for installation of fireproofing of the steel structures and equipment's. Fireproofing is one of the available options to limit damage caused by fire. It offers protection against the adverse thermal effects of fire for a limited period and limited degree of exposure.

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This Specification covers the minimum requirements for design of all steel sections in this project.

The standard fireproofing material is concrete with or without admixtures. Alternative materials are available but they shall only be used if approved by the AR. Such materials may be preferred for existing structures whose strength or space limitation do not allow the use of concrete.

If fireproofing is required for inside buildings, consideration shall be given to the use of lightweight fireproofing materials subject to approval of the AR*(Authorized Representative of the COMPANY /GC).

This general specification covers all project fireproofing requirements unless specified otherwise.

Fireproofing minimum rating for industrial plants shall correspond to 2 hours of fire resistance. Fireproofing minimum rating for buildings shall be defined according to part 4.6.

Hazardous areas are to be considered those areas which are located in hazard sources consisting of vessels, pumps, heat exchangers, fired heaters, tanks and other equipment containing hydrocarbons or other combustible liquids and/or vapors.

The height of fireproofing shall be up to 7.5 m above ground. Inside the above-mentioned zones, exclusively the main self-supporting structures of the following assemblies shall be fireproofed. (exclusions are connections, cross beams, bracings, etc.):

- a) Piping
- b) Air coolers (both self-supporting and resting on pipeways)
- c) Horizontal vessels

3.0 NORMATIVE REFERENCES

3.1 LOCAL CODES AND STANDARDS

- IPS-E-CE-260 Engineering standard for fireproofing
- IPS-C-CE-260 Construction standard for fireproofing
- IPS-M-CE-105 Material standard for building materials
- IPS-M-CE-165 Material standard for concrete, mortars & admixtures
- IPS-C-TP-101 Construction standard for surface preparation
- IPS-C-TP-102 Construction standard for painting
- IPS-E-SF-380 Engineering standard for fire Protection in Buildings

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3.2 INTERNATIONAL CODES AND STANDARDS

- ASTM A185 Steel welded wire fabric, plain, for concrete reinforcement
- ASTM C33 Specification for concrete aggregates
- ASTM C55 Specification for concrete building brick
- ASTM C73 Specification for calcium silicate face brick (sand-lime brick)
- ASTM C94 Specification for ready-mixed concrete
- ASTM C126 Specification for ceramic glazed structural clay facing tile, facing brick, and solid masonry units
- ASTM C150 Specification for Portland Cement
- ASTM E119 Fire test of building construction and materials
- ASTM E605 Test methods for thickness and density of sprayed fire-resistive material applied to structural members
- BS 3921 Specification for clay bricks
- BS 5075 Specification for super-plasticizing admixtures
- BS 6755 Testing of valves, Part 2
- BS 476 Specification for fire type-testing requirements
- BS 476 Methods for determination of the fire resistance of load bearing elements of construction
- ACI 318 Building Code Requirements for Reinforced Concrete
- API 2218 Fireproofing Practice in Petroleum and Petrochemical Processing Plant
- NFPA 251 Standard Methods of Tests of Fire Endurance of Building Construction and Materials
- API 2510 Design and Construction of Liquefied Petroleum Gas Installations
- UL 1709 Standard for Safety for Rapid Rise Fire Tests of Protection Materials for Structural Steel
- ISO 22899-1 Determination of the resistance to jet fires of passive fire protection materials – part 1 : General Requirements

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3.3 THE PROJECT DOCUMENTS

- BK-GNRAL-PEDCO-000-PR-DB-0001 Process Basis of Design
- BK-GNRAL-PEDCO-000-PR-DC-0001 Process Design Criteria
- BK-GNRAL-PEDCO-000-ST-SP-0001 Specification for Concrete Work
- BK-GNRAL-PEDCO-000-ST-DW-0001 Standard Details for Fire Proofing

3.4 ENVIRONMENTAL DATA

Refer to "Process Basis of Design; Doc. No. BK-GNRAL-PEDCO-000-PR-DB-0001".

3.5 ORDER OF PRECEDENCE

In case of any conflict between the contents of this document or any discrepancy between this document and other project documents or reference standards, this issue must be reported to the CLIENT. The final decision in this situation will be made by CLIENT.

4.0 RANGE OF FIREPROOFING USED

This specification covers the requirements for materials and methods for fireproofing of structures, equipment supports and cables in all areas subject to fire hazard .

All fireproofing shall be carried out before completion of the installation and/or painting of the vessel/steel structures.

In industrial plants where inflammable materials are handled, fireproofing shall be applied as follows:

4.1 STEEL STRUCTURES

For fireproofing purposes, steel structures are divided into two basic categories:

- Structures supporting equipment handling inflammable materials whether or not in fire hazardous areas.
- Structures supporting equipment not handling inflammable materials, located in fire hazardous areas.

4.1.1. Supporting Structures for Equipment Handling Inflammable Materials

Fireproofing shall cover all structures in any way bearing the equipment load. In particular, fireproofing shall cover columns, including baseplates beams of the frame, and all load-bearing beams, excluding only the level supporting beams.

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Wind braces shall not be fireproofed either. Superstructures erected to support monorails shall not be fireproofed.

Where bridge-cranes are present, the supporting beams for the crane guide rails shall be fireproofed.

4.1.2. Supporting Structures for Equipment Not Handling Inflammable Materials

As a general rule, structures in this category shall not be fireproofed, unless such a structure is located, partially or totally, in a fire hazardous area.

Structures located inside fire hazardous areas shall be fireproofed in any case not over 7.5 meters from 0.0 grade.

If the first level of supporting equipment is located below 7.5 meters elevation, columns shall be fireproofed up to said level. Equipment frame beams shall also be fireproofed. Wind braces shall not be fireproofed.

4.2 PIPE SUPPORTS

As a general rule pipe supports, whether column or rack construction, shall not be fireproofed unless they fall within one of the following categories:

4.2.1. Pipe Supports located in fire hazardous areas

All pipe racks if constructed with structural steel in process areas and the main interconnecting pipe way along the tankage area shall be fireproofed in any case, not over 7.5 meters from 0.0 grade.

Fireproofing shall include the columns and transverse beams except for the surfaces on which pipes lie.

Lengthwise beams connecting racks to one another and wind brace members shall not be fireproofed.

Pipe-racks connecting the common pipe way and the process unit pipe-racks shall also be fireproofed (vertical column only).

Secondary pipe supports including pipe stanchions in process area, all pipe supports in utility and offsite areas, except for main interconnecting pipe way, all pipe bridges across roads and supports for flare lines, do not need to be fireproofed.

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4.2.2. Pipe Supports Also Bearing Air Fan Coolers

For structures supporting hydrocarbon handling equipment, fireproofing shall be provided not over 7.5 meters from 0.0. grade.

Accordingly fireproofing measures shall cover columns, including base-plates, transverse beams and lengthwise beams bearing air cooler loads. Other lengthwise connecting beams and wind bracing members shall not be fireproofed.

4.2.3. Pipe Supports Located Beneath Air-Fan Coolers

If the structural members of air-fan coolers have been fireproofed, then pipe supports located beneath them shall also be fireproofed up to 7.5 meters from 0.0 grade.

All columns and all transverse and lengthwise beams, shall be fireproofed excluding only the wind braces and secondary structures for walkway supports up to 7.5 meters from 0.0 grade.

Eventual pipe supports situated inside the above mentioned structures shall be fireproofed as indicated in part. 4.2.

4.3 VESSELS, OTHER EQUIPMENT AND RESPECTIVE SUPPORTS

Unless a specific request is made for the fireproofing of the equipment shell, only equipment saddles, skirts (both inside and outside) and supports legs shall be fireproofed.

The following criteria shall be applied:

- All supports for equipment handling inflammable material shall be fireproofed not over 7.5 meters from 0.0 grade.
- Any equipment (whether handling inflammable material or not) supported by fireproofed structures and which could damage adjacent equipment in the event of support collapse, shall also have fireproofed supports.
- Saddles of horizontal vessels when standard saddles are used shall not be fireproofed.

4.4 CABLE TRAYS

Above ground conduit banks and cable trays vital to the emergency shut-down system, which pass through areas of high fire-risk, shall be provided with a minimum of a 30 minutes fire protection.

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4.5 WEATHER PROOFING

All fireproofed structures located outdoors shall be effectively sealed and/or compacted to prevent moisture from reaching the fireproofed steel surface and to prevent moisture and wind action from damaging the fireproofing itself.

4.6 BUILDINGS

In conformity with official regulations (building standards, fire protection regulations, etc.), buildings shall be classified according to:

- Number of occupants of building (occupancy);
- Use to which building is put;
- Overall dimensions, floor space and number of floors.

In general, buildings not containing inflammable liquids and equipped with automatic water sprinkler systems, do not require fireproofing.

Roofs and wall may be considered as limiting potential fire areas when constricted of fire resistance material such as:

- Self-supporting masonry walls or reinforced concrete walls.
- Masonry walls not less than 200 mm thick and concrete walls not less than 150 mm thick in fireproofing structures.
- Reinforced concrete roofs and slabs in fireproofed structures. If process equipment is located within the building, steel supports subject to fire shall be fireproofed for a 3 hour minimum rating.

5.0 CRITERIA FOR CHOOSING MATERIAL

Criteria to be assumed for the choice of the best possible protection system, shall be based on:

- Economic convenience
- Material availability
- Official requirements
- Availability of test certificates considered valid by the authorities
- Technical possibility of performing the work

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5.1 TYPES OF MATERIAL

Fireproofing may be realized using:

- Concrete casting
- Gunite
- Sprayed mineral fibers
- Other material

5.1.1. Concrete Casting

Material qualities, thickness and performances are described in specification for concrete work Doc No.:BK-GNRAL-PEDCO-000-ST-SP-0001 and in standard drawing for fire proofing Doc No. :BK-GNRAL-PEDCO-000-ST-DW-0001.

Normally, the indicated 50 mm thickness guarantees a 2 hours resistance rating and Generally, cover of not less than 35 mm thk. guarantees a 1.5 hour resistance rating.

Reinforcing shall be of galvanized steel wire, electrically welded, 50x50 mm. mesh, 2.5 mm thickness according to API 2218.

Reinforcing wire shall be lapped 50 mm minimum at joints. Finished surfaces shall be smooth by trawling. Edges shall be chamfered.

The poured or troweled in place concrete shall have minimum cement content of 350 kg/m³.

This method is used for fireproofing of floor or other horizontal surfaces by pouring the material and troweling. This method permits easy inspection and requires neither skilled our nor any special equipment.

The application of this method shall be restricted to minor repair and to those cases where guniting or horizontal pouring is not feasible.

5.1.2. Guniting

The spray mixture used shall be one part cement and four parts sand with 12 liters of water added per bag of cement.

Reinforcing shall be of galvanized steel wire, electrically welded, 50x50 mm. mesh, 2.5 mm thickness according to API 2218.

Reinforcing wire shall be lapped 50 mm minimum at joints. Finished surfaces shall be smooth by trawling. Edges shall be chamfered.

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5.1.3. Sprayed Mineral Fibers

Thickness of material to be applied shall be defined according to prescriptions officially approved by the authorities, presented by supplier and showing, as per performed tests, the following:

- Shape dimensions
- Shape unit weight
- Fireproofing material thickness (natural or compressed)
- Tested fire rating hours
- Resistance test methods
- Public authority or official laboratory which carried out the tests
- Test certificate issued by same declaring suitability of material tested.

5.1.5. Others

Other materials may be used to protect the structures against fire:

- Masonry
- Concrete blocks
- Gypsum panels
- Lightweight concrete

In all cases, supplier shall present official certification, proving the possibilities of use of the said material, resistance rating, and installation procedure.

6.0 SURFACE PREPARATION

All surfaces to receive fireproofing shall be free from loose flaky rust, loose scale, mud, oil, grease, or other coatings that would reduce concrete bond.

Generally, steel surfaces shall be cleaned and free from all oil, loose rust or mill scale and other foreign in matter by wire brushing or by sand blasting and suitable for the application of the fireproofing material. All steel surfaces shall be prime-coated.

All painting shall be carried out in conformity with specification for painting Doc No.: BK-GNRL-PEDCO-000-PI-SP-0006 and with the paint vendor's recommendation.

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Should the structural steel be delivered in the field with a paint primer, the adhesion of the paint coat shall be verified and, if not considered suitable for fireproofing, it shall be completely eliminated.

Should fireproofing consist of concrete casting, all paint not perfectly adhering to the metal surface shall be completely eliminated.

7.0 APPLICATION

All application procedures and materials used shall be strict accordance with the VENDOR'S published manuals. Any deviations from these established methods shall be submitted to COMPANY for approval before application.

Fireproofing material and method/details shall be supported by certification issued by a recognized Testing Laboratory based on UL 1709 and have proved jet fire resistance according to ISO 22899-1.

The credibility of the performance of the PFP materials supplied by the VENDOR shall be supported by tests conducted by independent organizations.

8.0 INSPECTION

Inspection and testing shall be carried out in accordance with QC procedures recommended by the fireproofing material vendor. The SUB-CONTRACTOR shall ensure that all work is inspected at all stages for quality control, in respect to density, consistency, reinforcement strength, coverage, thickness, finish uniformity and application.

The SUB-CONTRACTOR shall ensure that all materials meet the service conditions and design requirements.

Acceptance of applied thickness shall be based upon random measurements, but in no case shall it be less than the minimum stated within the fireproofing VENDOR'S application specification and this document.

The final thicknesses shall be measured using an approved thickness gauge after a minimum 48 hours curing and drying time.

The fire protection application may be subject to rejection if the average thickness on an individual item is less than the minimum specified or an individual thickness is deficient by more than 3 mm.

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شماره پیمان: 053 – 073 – 9184	SPECIFICATION FOR FIREPROOFING							شماره صفحه : 14 از 15
	پروژه	بسته کاری	صادرکننده	تسهیلات	رشته	نوع مدرک	سریال	
	BK	GNRAL	PEDCO	000	ST	SP	0006	D03

Work shall not proceed to the next step in the system sequence (i.e. surface preparation, priming, fireproof coating) until the previous work has been inspected and approved.

9.0 REPAIR

Repair of damaged or defective areas shall be accomplished in the same manner as the original coating as specified in this document and the VENDOR'S instructions.

Repair materials and procedures shall be approved by COMPANY prior to initiating the repair work.

Surface finish of repaired material shall be identical to the adjacent original approved application.

10.0 GUARANTEE

All materials used shall be suitable for their purpose and shall be suitable for use in an industrial environment.

They must also have a minimum expected life of 10 years under these conditions.

The SUB-CONTRACTOR shall commit himself to repair any or all surfaces if they do not satisfy the aforementioned requirement at any time during the guarantee period.

Repair should include all necessary surface preparation, procurement and application of the material as per this specification at the work site and at the expense of the SUB-CONTRACTOR.

 NISOC	نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض و ابنیه تحت الارض عمومی و مشترک																									
شماره پیمان: 053-073-9184	<table><tr><th colspan="8">SPECIFICATION FOR FIREPROOFING</th></tr><tr><th>نسخه</th><th>سریال</th><th>نوع مدرک</th><th>رشته</th><th>تسهیلات</th><th>صادرکننده</th><th>بسته کاری</th><th>پروژه</th></tr><tr><td>D03</td><td>0006</td><td>SP</td><td>ST</td><td>000</td><td>PEDCO</td><td>GNRAL</td><td>BK</td></tr></table>	SPECIFICATION FOR FIREPROOFING								نسخه	سریال	نوع مدرک	رشته	تسهیلات	صادرکننده	بسته کاری	پروژه	D03	0006	SP	ST	000	PEDCO	GNRAL	BK	شماره صفحه : 15 از 15
SPECIFICATION FOR FIREPROOFING																										
نسخه	سریال	نوع مدرک	رشته	تسهیلات	صادرکننده	بسته کاری	پروژه																			
D03	0006	SP	ST	000	PEDCO	GNRAL	BK																			

ATTACHMENT-1

DECISION FLOW SCHEME FOR APPLICATION OF FIREPROOFING

Fireproofing Zone (FPZ)

