

	<p>نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض</p> <p>احداث ردیف تراکم گاز در ایستگاه جمع آوری بینک</p>							
شماره پیمان: 053 – 073 – 9184	ACTIVE FIRE PROTECTION AND SAFETY CONCEPT							شماره صفحه : 1 از 28
	پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال	
	BK	GCS	PEDCO	120	SA	DB	0001	D02

طرح نگهداشت و افزایش تولید 27 مخزن

ACTIVE FIRE PROTECTION AND SAFETY CONCEPT

نگهداشت و افزایش تولید میدان نفتی بینک

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D01	OCT. 2022	IFA	A.Saber	M.Fakharian	M.Mehrshad	
D00	SEP. 2021	IFC	M.Asgharnejad	M.Fakharian	Sh.Ghalikar	
Rev.	Date	Purpose of Issue/Status	Prepared by:	Checked by:	Approved by:	CLIENT Approval

Class:2

CLIENT Doc. Number: F0Z-708985

Status:

IDC: Inter-Discipline Check
 IFC: Issued For Comment
 IFA: Issued For Approval
 AFD: Approved For Design
 AFC: Approved For Construction
 AFP: Approved For Purchase
 AFQ: Approved For Quotation
 IFI: Issued For Information
 AB-R: As-Built for COMPANY Review
 AB-A: As-Built -Approved

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شماره پیمان: 053 – 073 – 9184	<table><tr><th colspan="8">ACTIVE FIRE PROTECTION AND SAFETY CONCEPT</th></tr><tr><th>پروژه</th><th>بسته کاری</th><th>صادر کننده</th><th>تسهیلات</th><th>رشته</th><th>نوع مدرک</th><th>سریال</th><th>نسخه</th></tr><tr><td>BK</td><td>GCS</td><td>PEDCO</td><td>120</td><td>SA</td><td>DB</td><td>0001</td><td>D02</td></tr></table>	ACTIVE FIRE PROTECTION AND SAFETY CONCEPT								پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه	BK	GCS	PEDCO	120	SA	DB	0001	D02	شماره صفحه : 2 از 28
ACTIVE FIRE PROTECTION AND SAFETY CONCEPT																										
پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه																			
BK	GCS	PEDCO	120	SA	DB	0001	D02																			

REVISION RECORD SHEET

PAGE	D00	D01	D02	D03	D04
1	X	X	X		
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3	X				
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51					
52					
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54					
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62					
63					
64					

PAGE	D00	D01	D02	D03	D04
66					
67					
68					
69					
70					
71					
72					
73					
74					
75					
76					
77					
78					
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124					
125					
126					
127					
128					
129					

	<p>نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض</p> <p>احداث ردیف تراکم گاز در ایستگاه جمع آوری بینک</p>								
شماره پیمان: 053 – 073 – 9184	ACTIVE FIRE PROTECTION AND SAFETY CONCEPT							شماره صفحه : 3 از 28	
	پروژه	بسته کاری	صادرکننده	تسهیلات	رشته	نوع مدرک	سریال		نسخه
	BK	GCS	PEDCO	120	SA	DB	0001	D02	

CONTENTS

1.0	INTRODUCTION	5
2.0	SCOPE	6
3.0	ABBREVIATION	6
4.0	PROJECT REFERENCED DOCUMENTS / DRAWINGS	7
5.0	CODES AND STANDARDS.....	7
5.1	IPS (IRANIAN PETROLEUM STANDARD)	7
5.2	NFPA (NATIONAL FIRE PROTECTION ASSOCIATION).....	7
5.3	API (AMERICAN PETROLEUM INSTITUTE).....	7
6.0	SITE CONDITION.....	8
7.0	MAIN PRINCIPLES	8
8.0	SAFETY ASSURANCE SYSTEM AND RISK ASSESSEMENT METHODOLOGY	8
8.1	OPERATING CONTROL AND MAINTENANCE PHILOSOPHY	8
8.2	RISK ASSESSEMENT	8
	MAIN CONCERNS WITH RISK ASSESSMENT.....	8
	DESCRIPTION OF THE RISKASSESSMENT STUDIES.....	9
	RISK EVALUATION	9
	RISK ASSESSMENT.....	9
	RISK REDUCTION STERATEGY.....	9
9.0	PLANT LAYOUT CONSIDERATION FOR SAFETY OF PERSONNEL	11
10.0	SAFETY PHILOSOPHY	12
10.1	HAZARDOUS AREA CLASSIFICATION.....	12
10.2	SAFETY SIGN	13
11.0	FIRE & GAS DETECTION SYSTEM	13
11.1	TOXIC GASDETECTION	14
11.2	FLAMMABLE GASDETECTION	14
11.3	FIRE DETECTION	15
11.4	MANUAL ALARM CALL POINT	15
12.0	WIND SOCK.....	15
<input type="checkbox"/>	LOCATION.....	15
<input type="checkbox"/>	FABRIC.....	15
<input type="checkbox"/>	COLOR	16
<input type="checkbox"/>	DIMENSIONS.....	16
<input type="checkbox"/>	MOVEMENT	16
13.0	ACTIVE FIRE PROTECTION SYSTEM.....	16
13.1	GENERAL	16
13.2	FIRE WATER SYSTEM	17
13.3	FIRE WATER PUMPS.....	17
13.4	FIRE WATER PNETWORK	17
13.5	FIRE WATER SPRAY SYSTEM.....	18
13.6	HYDRANT	18
13.7	MONITOR	18

	<p>نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض</p> <p>احداث ردیف تراکم گاز در ایستگاه جمع آوری بینک</p>								
شماره پیمان: 053 – 073 – 9184	ACTIVE FIRE PROTECTION AND SAFETY CONCEPT							شماره صفحه : 4 از 28	
	پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال		نسخه
	BK	GCS	PEDCO	120	SA	DB	0001		D02

13.8	FIRE SHED	19
14.0	BUILDINGS	19
14.1	FIRE EXTINGUISHERS.....	19
	PORTABLE CO2 EXTINGUISHERS	20
	WHEELED CO2 EXTINGUISHERS.....	20
	PORTABLE DRY CHEMICAL EXTINGUISHERS	21
	WHEELED DRY CHEMICAL EXTINGUISHERS.....	21
14.2	AUTOMATIC CO2 EXTINGUISHING SYSTEM	22
14.3	LOCATION OF ROOMS & REQUIRED SAFETY ITEMS.....	22
15.0	SAFETY SHOWER & EYEWASH	22
16.0	SCBA.....	23
17.0	PORTABLE GAS DETECTOR	23
18.0	ESCAPE ,EVACUATION & RESCUE (EER).....	24
19.0	HEALTH, PERSONNEL PROTECTION, TRAINING & CERTIFICATION	25
19.1	HUMAN HEALTH	25
19.1.1	AMBIENT NOISE LIMIT AND VIBRATIONS	25
19.1.2	DRINKING	26
19.1.3	HYGIENE	26
19.2	PERSONNEL PROTECTION.....	27
19.2.1	PERSONNEL SAFETY EQUIPMENT	27
19.2.2	PARTICULAR REQUIREMENTS.....	27
19.2.3	TRAINING AND CERTIFICATION	27
19.2.4	STAIRS & LADDERS	28
19.2.5	GUARDRAILS & TOE BOARDS	28

	<p>نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض</p> <p>احداث ردیف تراکم گاز در ایستگاه جمع آوری بینک</p>																									
شماره پیمان: 053 – 073 – 9184	<table><tr><th colspan="8">ACTIVE FIRE PROTECTION AND SAFETY CONCEPT</th></tr><tr><th>پروژه</th><th>بسته کاری</th><th>صادر کننده</th><th>تسهیلات</th><th>رشته</th><th>نوع مدرک</th><th>سریال</th><th>نسخه</th></tr><tr><td>BK</td><td>GCS</td><td>PEDCO</td><td>120</td><td>SA</td><td>DB</td><td>0001</td><td>D02</td></tr></table>	ACTIVE FIRE PROTECTION AND SAFETY CONCEPT								پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه	BK	GCS	PEDCO	120	SA	DB	0001	D02	شماره صفحه : 5 از 28
ACTIVE FIRE PROTECTION AND SAFETY CONCEPT																										
پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه																			
BK	GCS	PEDCO	120	SA	DB	0001	D02																			

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.

As a part of the Project, a New Gas Compressor Station (adjacent to existing Binak GCS) shall be constructed to gather of 15 MMSCFD (approx.) associated gases and compress & transfer them to Siahmakan GIS.

GENERAL DEFINITION

The following terms shall be used in this document.

CLIENT:	National Iranian South Oilfields CLIENT (NISOC)
PROJECT:	Binak Oilfield Development – Surface Facilities; New Gas Compressor Station
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 COMPANY (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 COMPANY rather than by an EPC/EPD CONTRACTOR, supplier or VENDOR.
MAY:	Is used where a provision is completely discretionary.

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شماره پیمان: 053 – 073 – 9184	ACTIVE FIRE PROTECTION AND SAFETY CONCEPT							شماره صفحه : 6 از 28	
	پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال		نسخه
	BK	GCS	PEDCO	120	SA	DB	0001		D02

2.0 SCOPE

These criteria include facilities design, equipment design and selection, and outlining appropriate procedures and work practices to be implemented in later staged of project execution.

The objective of Safety concept is to ensure that the Plant is designed in such a way that it can be constructed, operated and maintained safely, in a healthy manner and in an environmentally acceptable way by clearly addressing and taking into consideration Health, Safety and environmental aspects during the design process and verifying its implementation.

To achieve these objectives, systems shall be designed, and organization shall be put in place:

- To prevent the occurrence of hazardous events,
- And provide means to limit the consequences that might occur.
- The Safety concept:
- ensures integrity of operation, and in particular:
- avoids exposure to potential hazards,
- minimizes the potential or frequency of hazardous events,
- controls or mitigates the consequences of the hazards, including impact to environment,
- provides means to ensure suitable safety to life in hazardous occasion is available,
- Ensures the installation shall be designed to a safe standard,
- Provides safe working conditions for personnel,
- Defines the requirements regarding asset protection, and ensure they are duly taken Into consideration.

3.0 ABBREVIATION

AFP	Active Fire Protection
ALARP	As Low As Reasonably Practicable
F&G	Fire & Gas
HAZID	Hazard Identification
HAZOP	Hazard and Operability Study
HSE	Health, Environment and Safety
ISBL	Inside Boundary Limit
OSBL	Outside Boundary Limit
PFP	Passive Fire Protection
SIL	Safety Integrity Level
CGD	Catalytic Gas Detectors
IRGD	Infrared Gas Detectors

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شماره پیمان: 053 – 073 – 9184	<table><tr><th colspan="8">ACTIVE FIRE PROTECTION AND SAFETY CONCEPT</th></tr><tr><th>پروژه</th><th>بسته کاری</th><th>صادر کننده</th><th>تسهیلات</th><th>رشته</th><th>نوع مدرک</th><th>سریال</th><th>نسخه</th></tr><tr><td>BK</td><td>GCS</td><td>PEDCO</td><td>120</td><td>SA</td><td>DB</td><td>0001</td><td>D02</td></tr></table>	ACTIVE FIRE PROTECTION AND SAFETY CONCEPT								پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه	BK	GCS	PEDCO	120	SA	DB	0001	D02	شماره صفحه : 7 از 28
ACTIVE FIRE PROTECTION AND SAFETY CONCEPT																										
پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه																			
BK	GCS	PEDCO	120	SA	DB	0001	D02																			

4.0 PROJECT REFERENCED DOCUMENTS / DRAWINGS

- Specification for Passive Fire Protection
- Specification for Environmental Job
- Specification for hazardous area classification
- Material Safety Data sheets (MSDS)
- Fire water Calculation note
- Process Design Criteria

5.0 CODES AND STANDARDS

5.1 IPS (IRANIAN PETROLEUM STANDARD)

IPS-G-SF-126	GENERAL STANDARD FOR HAND AND WHEEL TYPE FIRE EXTINGUISHERS
IPS-E-PR-190	ENGINEERING STANDARD FOR LAYOUT AND SPACING
IPS-E-CE-260	ENGINEERING STANDARD FOR FIREPROOFING
IPS-E-SF-220	ENGINEERING STANDARD FOR FIRE WATER DISTRIBUTION & STORAGE FACILITIES
IPS-E-SF-380	ENGINEERING STANDARDS FOR FIRE PROTECTION IN BUILDINGS
IPS-C-SF-550	APPLICATION STANDARD FOR SAFETY BOUNDARY LIMIT
IPS-E-PR-460	ENGINEERING STANDARDS FOR PROCESS DESIGN OF FLARE AND BLOW DOWN SYSTEM
IPS-E-SF-160	ENGINEERING STANDARD FOR CO ₂ GAS FIRE EXTINGUISHING SYSTEMS.
IPS-E-EL-110	ENGINEERING STANDARD FOR HAZARDOUS AREA

5.2 NFPA (NATIONAL FIRE PROTECTION ASSOCIATION)

NFPA 10	Standard for Portable Standard for Portable Fire Extinguishers
NFPA 22	Standard for Water Tanks For Private Fire Protection
NFPA 30	Flammable and Combustible Liquid Codes
NFPA 704	Standard System for the identification of the hazards of materials for emergency response.
NFPA 12	Standard on Carbon Dioxide Extinguishing Systems
BS 5839	fire detection & alarm systems for buildings

5.3 API (AMERICAN PETROLEUM INSTITUTE)

API RP 505	Recommended Practice for classification of locations for electrical installations
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شماره پیمان: 053 – 073 – 9184	ACTIVE FIRE PROTECTION AND SAFETY CONCEPT							شماره صفحه : 8 از 28	
	پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال		نسخه
	BK	GCS	PEDCO	120	SA	DB	0001	D02	

at petroleum facilities

6.0 SITE CONDITION

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

7.0 MAIN PRINCIPLES

- Safety concept has been developed, in order to explaining how safety is taken into account in all areas according to the risks inherent to the project and main safety principles are adopted.
- For safety aspects dealt with other specific documents, the Safety concept shall only refer to these documents to avoid discrepancy that could occur during the development of the project.
- As a consequence, the Safety concept naturally evolves in the course of the project.
- In any case it shall serve as the prevailing support document in matters of the requirements and the principles applied, dealing with safety.
- At the end of the project, the Safety concept shall constitute the key document in the safety dossier that shall be handed-over to the operator for the rest of the life cycle of the installation.

8.0 SAFETY ASSURANCE SYSTEM AND RISK ASSESSEMENT METHODOLOGY

8.1 OPERATING CONTROL AND MAINTENANCE PHILOSOPHY

Applicable document is operating manual which should be prepared during the detail engineering phase.

It is assumed:

- The installation will be permanently manned, the operators will be skilled and trained, and will be capable of taking decisions and launching procedures.
- Outside operators will carry-out routine local checks; relevant procedures can be achieved through local.
- Control room; routine production operations will be normally controlled from a main control room located in safe area.
- The plant has got its own utilities and support facilities.
- The installation has got its own emergency response team, facilities and procedures, and in particular its own communications systems with others.

8.2 RISK ASSESSEMENT

MAIN CONCERNS WITH RISK ASSESSMENT

The main concerns with risk assessment shall be analyzed and necessary designs shall be carried

 NISOC	<p>نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض</p> <p>احداث ردیف تراکم گاز در ایستگاه جمع آوری بینک</p>																									
شماره پیمان: 053 – 073 – 9184	<table><tr><th colspan="8">ACTIVE FIRE PROTECTION AND SAFETY CONCEPT</th></tr><tr><td>پروژه</td><td>بسته کاری</td><td>صادر کننده</td><td>تسهیلات</td><td>رشته</td><td>نوع مدرک</td><td>سریال</td><td>نسخه</td></tr><tr><td>BK</td><td>GCS</td><td>PEDCO</td><td>120</td><td>SA</td><td>DB</td><td>0001</td><td>D02</td></tr></table>	ACTIVE FIRE PROTECTION AND SAFETY CONCEPT								پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه	BK	GCS	PEDCO	120	SA	DB	0001	D02	شماره صفحه : 9 از 28
ACTIVE FIRE PROTECTION AND SAFETY CONCEPT																										
پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه																			
BK	GCS	PEDCO	120	SA	DB	0001	D02																			

out to prevent the following hazards:

- Prevent fluid release (containment of hydrocarbons and toxic materials)
- Prevent ignition
- Prevent abnormal conditions (ex: pressure or temperature increasing / decreasing)

DESCRIPTION OF THE RISKASSESSMENT STUDIES

Risks are inherent to any natural phenomena or human activity and they cannot possibly be totally erased from the reality. Assessment is therefore based upon individual's previous experience in order to minimize risks and judgment used the As Low As Reasonably Practicable (ALARP) principle.

The purpose of this chapter is to define the qualitative risk assessment process which will be done during detail phase, based on orders of magnitude for the probability of occurrence of the risks and the magnitude of their consequences.

The objectives of the risk assessment are to compare the risks, as identified and analyzed, with the criteria for maximum acceptable risks as stipulated by the regulations.

RISK EVALUATION

The risk evaluation consists in the definition of acceptable risk levels as regards to safety to life (personnel or others), environment, loss of asset, loss of production or loss of reputation (negative impact on public).

RISK ASSESSMENT

Risk assessment is the comparison of:

- Risk calculation (both frequency and magnitude of consequences) from the risk analysis,
- With the criteria of acceptance resulting from the risk evaluation.

RISK REDUCTION STRATEGY

Any risk-reduction process is a sequenced combination of:

- Prevention of hazardous conditions,
- Control of normal and abnormal conditions,
- Mitigation of the consequence.
- In addition to the generic hazards inherent to any industrial activity, for the installations handling hydrocarbon, the hazard tree is:
- Containment of hydrocarbon: prevent fluid release,
- Prevention of ignition: prevent ignition,

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شماره پیمان: 053 – 073 – 9184	ACTIVE FIRE PROTECTION AND SAFETY CONCEPT							شماره صفحه : 10 از 28	
	پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال		نسخه
	BK	GCS	PEDCO	120	SA	DB	0001		D02

- Mitigation of consequences: control and limitation,
- Escape, evacuation & rescue: safety to life.

The following safety systems and features should be designed and implemented as part of this risk-reduction process and in accordance with the ALARP principle:

A) Containment of hydrocarbons and toxic materials:

- corrosion monitoring,
- safety rules for process, machinery, transportation and storage,
- proper design of liquid drainage system,
- Emergency-Shut-Down (ESD) and Emergency De-Pressurization (EDP) systems.

B) Prevention of ignition:

- layout allowing separation between ignition and fuel sources,
- hazardous areas classification,
- ventilation and pressurization,
- safety rules for buildings, electrical, process and machinery,
- Static electricity and lightning
- hot surface insulation,
- pressure protection and relief,
- adequate design of Pressure Protection and Relief (PPR), liquid drainage system, flares and vents,
- flammable gas detection,
- ESD and EDP systems,
- Toxic gas detection

C) Mitigation of consequences:

- spacing between equipment,
- safety rules for buildings, electrical & storage systems,
- adequate design of ventilation and pressurization systems, liquid drainage system, flares and vents,
- fire detection systems,
- ESD and EDP systems,
- Passive Fire (PFP),
- Active Fire-Fighting systems (AFF),

D) Escape, Evacuation & Rescue (EER):

- adequate layout,

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شماره پیمان: 053 – 073 – 9184	ACTIVE FIRE PROTECTION AND SAFETY CONCEPT							شماره صفحه : 11 از 28	
	پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال		نسخه
	BK	GCS	PEDCO	120	SA	DB	0001	D02	

- adequate design of ventilation & pressurization systems, smoke control,
- safety rules for buildings, electrical,
- toxic gas detection,
- ER inclusive of telecommunications,
- escape routes, muster areas,
- evacuation means,
- personnel protective devices,
- First aid and rescue equipment.
- PLANT LAYOUT & SAFETY DISTANCE
- The plant layout shall minimize the risk to personnel, protect the environment and equipment, provide adequate escape routes, provide safe access for operation and maintenance of essential equipment and maximize the response to emergencies such as fire or toxic gas.
- Access ways in the plant area provide safe and easy access for any service vehicles (mobile firefighting means, crane, heavy truck, etc.), with adequate headway and width at overhead pipeline crossing points, capacity to bear the biggest load and adequate turning bend radius.
- Piping equipment near to access roads should be protected, where necessary, against vehicle collision.
- The spaces between equipment which will be added to the plant in future expansion shall be in according to IPS-E-PR-190.
- Prevailing wind is a governing factor for plant configuration and phased construction.
- The direction of the prevailing wind has to be taken into account for the following:
- Ignition of a gas cloud: Flammable gas sources do not have to be located upstream of any ignition source
- Fire escalation: Any hazardous areas shall be located downstream of any hazardous area of lesser danger. In particular, the accommodations and non-hazardous areas shall be upstream of hydrocarbon production processing units.

9.0 PLANT LAYOUT CONSIDERATION FOR SAFETY OF PERSONNEL

- Escape Routes:
 - The primary personnel safety consideration of the plant layout is to provide an adequate number of safe exit routes from all areas under emergency condition, the operators working inside the process area shall go away from the hazard through the shortest path toward the muster areas.
 - Direction arrow markers shall be strategically positioned along escape routes where it is necessary to guide personnel to assembly points.
 - The roads should be located so that personnel have two separate paths to safe areas from any point in the plant as a minimum, and will be arranged to avoid “dead ends”.
 - Escape routes in process areas shall avoid directing personnel escaping from a non-

 NISOC	<p>نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض</p> <p>احداث ردیف تراکم گاز در ایستگاه جمع آوری بینک</p>								
شماره پیمان: 053 – 073 – 9184	ACTIVE FIRE PROTECTION AND SAFETY CONCEPT							شماره صفحه : 12 از 28	
	پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال		نسخه
	BK	GCS	PEDCO	120	SA	DB	0001	D02	

hazardous area through a hazardous area.

- The primary escape routes shall be preferably on a path frequently used and large enough for a people flow (minimum clear width 1000 mm).
- If the shortest path to the safe area is obstructed by fire, the operators can use alternative paths to move away from the hazard. These alternative paths shall be called secondary escape routes. Secondary escape routes can be infrequently used paths, large enough for a few people but never less than 800 mm in clear width.

10.0 SAFETY PHILOSOPHY

The main sources of a fire hazard are hydrocarbons in the form of flammable gas, crude oil and condensate. In the case of liquid fires the main firefighting methods are based on eliminating the fuel source if possible, cooling the equipment involved and separating the fuel from oxygen. In the case of a gas fire it is generally considered dangerous to extinguish the fire itself because this leaves escaping gas to form gas clouds with the subsequent risk of an explosion. Such an explosion could have far more devastating effect than letting the fire burn while attempting to shut off the gas leak and cool the equipment involved.

The most effective method of containing a fire situation is to have adequate separation distances between the plant/process units.

Small fires can usually be tackled in the early stages with the use of portable fire extinguishers, of which a sufficient number always are available local to the risks.

10.1 HAZARDOUS AREA CLASSIFICATION

DEFINITION OF HAZARDOUS AREAS

The segregation of ignition sources and flammable inventories shall be achieved in the design through the classification of hazardous areas. This shall be undertaken in accordance with API-RP-505.

This exercise shall classify the process into hazardous areas of progressively decreasing risk of flammable atmospheres based on the following zones:

Zone 0 – hazardous areas in which a flammable atmosphere is continuously present or present for long periods of time.

Zone 1 – hazardous areas in which a flammable atmosphere is likely to occur in normal operation.

Zone 2 – hazardous areas in which a flammable atmosphere is not likely to occur in normal operation and, if it occurs, will exist only for a short period of time

 NISOC	<p>نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض</p> <p>احداث ردیف تراکم گاز در ایستگاه جمع آوری بینک</p>								
شماره پیمان: 053 – 073 – 9184	ACTIVE FIRE PROTECTION AND SAFETY CONCEPT							شماره صفحه : 13 از 28	
	پروژه	بسته کاری	صادرکننده	تسهیلات	رشته	نوع مدرک	سریال		نسخه
	BK	GCS	PEDCO	120	SA	DB	0001	D02	

Safe Areas (Non-Hazardous Areas) – areas that do not fall into any of the above categories.

Fired equipment shall be located in non-hazardous areas. Plant roads that are around the perimeter of plots will be in non-hazardous areas and only authorized traffic will be allowed to enter the plant location.

10.2 SAFETY SIGN

The purpose of a system of safety colors and signs is to draw attention to objects and situations which affect safety and health or:

- alert persons to an existing and potential hazard;
- identify the hazard and describe the nature of hazard;
- explain the consequences of potential injury from the hazard;
- Instruct persons about how to avoid the hazard.

Safety sign shall be in accordance with IPS-G-SF-340 and the text shall be in Farsi and English. Safety signs shall be constructed from robust materials suitable for installation in an outside location.

Rooms or enclosures protected with gaseous systems shall be equipped at their entrance with warning signs located outside the rooms to inform the personnel of possible gas discharge.

Emergency signs shall be provided to inform personnel of escape routes, emergency exits and firefighting equipment locations.

11.0 FIRE & GAS DETECTION SYSTEM

The basic requirements of the fire and gas detection system are as follows:

- a) Rapid detection of the undesired event; toxic or flammable gas release and fire.
- b) On confirmed detection, simultaneously:
 - Raise Alarm
 - Isolate the source of fuel/gas
 - Isolate source of ignition
 - Exclude air where possible
 - Apply extinguish agent where appropriate
 - Protect adjacent equipment to prevent escalation of incident
 - All field equipment associated with fire and gas detection/control shall be suitable for operation within a hazardous area and the environmental conditions prevailing.
 - All components shall be accessible for maintenance and testing without disruption to routine operation of the plant, interruption of overall protection monitoring or undue

 NISOC	<p>نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض</p> <p>احداث ردیف تراکم گاز در ایستگاه جمع آوری بینک</p>								
شماره پیمان: 053 – 073 – 9184	ACTIVE FIRE PROTECTION AND SAFETY CONCEPT							شماره صفحه : 14 از 28	
	پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال		نسخه
	BK	GCS	PEDCO	120	SA	DB	0001	D02	

degradation of the system. (Including sensors, through logic and annunciation to activation).

- Upon detection of an alarm condition, suitable audible and visual alarms shall be initiated at the main fire panel.
- The system shall be self-monitoring to detect faults that may affect the operation of the system. Detection of a fault shall register an appropriate signal at the alarm panel.
- Signals from the fire and gas detection system may be used to initiate operation of firefighting equipment or systems.
- Alarm warnings will have automatic actuation. Response actions to emergencies will normally be manually activated.

11.1 TOXIC GASDETECTION

H2S Toxic Gas Detectors (TGD) shall be point detector solid-state type with short response time. They shall work in accordance with “Occupational Exposure Limits” requirements and their selection is depending on their performance in ambient conditions.

- When 10 ppm H2S is detected by fixed detectors and activate the alarms, personnel shall escape from the area to the designated muster point wearing masks
- When 20 ppm H2S is reached, personnel shall evacuate the plant

11.2 FLAMMABLE GASDETECTION

All areas containing potential sources of gas emission shall be monitored for ambient flammable gas. Number and detailed detector locations will be based on relative range of the gas or vapor to be detected.

Flammable gas detections shall not be poisoned by the surrounding atmosphere, in particular by the presence of H2S. If located outdoors the detector shall not be sensitive to the ambient humidity. The detector alarm settings shall indicate two levels detection

- Low level alarm at 20% of the lower flammability limit
- High level alarm at 50% of the lower flammability limit
- Executive control action shall be taken of confirmed high level alarm.
- Flammable gas detectors shall be located taking into account the following criteria:
- The most likely sources of leakage,
- The proximity to possible sources of ignition,
- Flammable gas detectors shall be installed in the following locations:
- Near probable leak sources which could lead to the formation of flammable gas clouds and includes like:
- Pumps / Compressors handling flammable liquids with Temp. > flash point,
- Manifolds where many control valves are grouped,

	<p>نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض</p> <p>احداث ردیف تراکم گاز در ایستگاه جمع آوری بینک</p>							
شماره پیمان: 053 – 073 – 9184	ACTIVE FIRE PROTECTION AND SAFETY CONCEPT							شماره صفحه : 15 از 28
	پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال	
	BK	GCS	PEDCO	120	SA	DB	0001	D02

11.3 FIRE DETECTION

- Fires in hydrocarbon areas predominantly involve:
- Leaking hydrocarbon material from a failure of the process equipment.
- Electrical and instrument equipment and cabling such as that contained in the switch room or local equipment room.
- Other combustible material such as paper, rag, lubricating oil and grease that may be contained in a workshop or materials store.
- Detector types shall be selected to detect the predominant characteristics of the fire behavior, and shall be provided in sufficient numbers and suitably located to provide effective monitoring.
- Due consideration shall be given to the specification and design of fire detection systems to minimize the incidence of false or spurious alarms.
- Fire and gas detector selection shall be, preferably, from the following types, depending upon the area being protected:
- Flame detection: Combined UV/IR

11.4 MANUAL ALARM CALL POINT

A system of manual call points for initiating a fire alarm shall be provided as part of the plant fire protection system. The call points will be provided in order that personnel working on the plant can raise the alarm if a hazardous situation is detected.

- Normal situation shall be:
 - Entry/exit points to building / area
 - Main roads allocated in strategic points
 - Process area
 - Utility area

12.0 WIND SOCK

• Location

Wind direction indicators (wind socks) shall be provided in strategic locations including:

- process area
- technical buildings area (near to control room)

• Fabric

Fabric for the windsock may be made of cotton, a synthetic material, or a blend of the two, and may be coated

 NISOC	<p>نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض</p> <p>احداث ردیف تراکم گاز در ایستگاه جمع آوری بینک</p>								
شماره پیمان: 053 – 073 – 9184	ACTIVE FIRE PROTECTION AND SAFETY CONCEPT							شماره صفحه : 16 از 28	
	پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال		نسخه
	BK	GCS	PEDCO	120	SA	DB	0001	D02	

- **Color**

Safety recommends alert orange, or orange and white color stripes as these are considered most visible at a distance.

- **Dimensions**

Standard windsock measurement is of 18 inches to 2 feet in diameter and around 6 to 9 feet in length. Therefore, the minimum effective length and the throat end opening diameter of the windsock are eight feet (2.5 m) and 18 inches (0.45 m) respectively.

- **Movement**

The windsock must move freely about the vertical shaft it is attached to and when subjected to wind of 5.6 km/hr. (1.55 m/s) or more and indicate the true wind direction within +/- 5 degrees.

13.0 ACTIVE FIRE PROTECTION SYSTEM

13.1 GENERAL

- The general philosophy for firefighting installations is that any major fire shall initially be contained by protection system provided, followed by intervention of the fire brigade. For minor fire situations, plant personnel shall be required to initiate a first attack using portable extinguishers and / or hose reels.
- The plant shall be arranged in such a way that it will minimize the probability of fire or explosion by containing the hydrocarbon fluids in properly designed and constructed process systems.
- Design and operation of the plant shall seek to control potential ignition sources by hazardous area classification.
- The fire protection systems shall be combination of firewater-based systems, gaseous fire protection system and passive fire protection; as appropriate to each location.
- Fireproofing is applied to equipment or structures within a fire hazardous zone. A fire hazardous zone is established around the fire potential equipment which have been classified as follows:
 - Process equipment having a flammable liquid, combustible gas or liquid in its tubes.
 - Tanks, pumps and other equipment containing flammable or combustible liquid or gases shall be considered as fire potential equipment.
 - Vessels containing a flammable liquid, combustible gas or liquid operating at auto ignition temperature or above 315°C.
 - Compressors handling combustible gas.
 - Pumps handling flammable/ combustible liquid at or above its flash point.

	<p>نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض</p> <p>احداث ردیف تراکم گاز در ایستگاه جمع آوری بینک</p>																									
شماره پیمان: 053 – 073 – 9184	<table><tr><th colspan="8">ACTIVE FIRE PROTECTION AND SAFETY CONCEPT</th></tr><tr><td>پروژه</td><td>بسته کاری</td><td>صادر کننده</td><td>تسهیلات</td><td>رشته</td><td>نوع مدرک</td><td>سریال</td><td>نسخه</td></tr><tr><td>BK</td><td>GCS</td><td>PEDCO</td><td>120</td><td>SA</td><td>DB</td><td>0001</td><td>D02</td></tr></table>	ACTIVE FIRE PROTECTION AND SAFETY CONCEPT								پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه	BK	GCS	PEDCO	120	SA	DB	0001	D02	شماره صفحه : 17 از 28
ACTIVE FIRE PROTECTION AND SAFETY CONCEPT																										
پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه																			
BK	GCS	PEDCO	120	SA	DB	0001	D02																			

13.2 FIRE WATER SYSTEM

- The fire water system shall be designed on the assumption basis that there will be a single fire contingency in the whole plant at a time.
- The water shall be supplied by facilities that shall be able to guarantee minimum supply capacity, which will be equal to the total expected demand for simultaneous water and foam service and 4-6 hours minimum operating at above condition.
- Two jockey pumps shall be installed to pressurize the fire main network. The jockey pump shall be connected to the fire main network and shall be operated automatically with high and low pressure switches to control the pressure.
- The plant shall be provided with firewater systems and fixed and portable firefighting equipment in accordance with the relevant design codes.
- The firewater pressure shall be sufficient to satisfy the pressure requirements of the most hydraulically remote water spray system monitor or hose reel.
- Firewater storage tank will be provided to fulfill requirement of water reservoir for operation at the required time and shall be designed & installed in accordance with NFPA 22.

13.3 FIRE WATER PUMPS

- Applicable standards are: IPS-E-SF-220, NFPA 20.
- The firewater pumps shall be considered to be the total system necessary to supply water to the firewater distribution system.
- Firewater pumps shall comply with NFPA 20 requirements to define proper specification.
- Firewater pumps shall be directly connected to the firewater distribution system.
- The places shall be selected for firewater pumps to minimize the possibility of damage in the event of fire.
- The main firewater pumps shall be started automatically by pressure switches.
- Firewater pump stop shall be done manually (always).
- Electric driven and diesel engine driven fire pumps plus the electric jockey pumps shall be located in a non-hazardous area.

13.4 FIRE WATER PNETWORK

- Firewater network of the required capacity and suitable material shall be laid to surround all units bounded by service roads.
- Isolation valves shall be provided for isolation of any segment. All the isolation valves shall be indicating types. (Butterfly, OS&Y gate valve or Post Indicating Valve).
- The firewater main network pipe sizes shall be suitable for the design flow at a pressure of 10 barg at the takeoff points of each appropriate section and the pressure drop shall be acceptable with a blocked section of piping in the network.

 NISOC	<p>نگهداشت و افزایش تولید میدان نفتی بینک</p> <p>سطح الارض</p> <p>احداث ردیف تراکم گاز در ایستگاه جمع آوری بینک</p>																	
شماره پیمان: 053 – 073 – 9184	ACTIVE FIRE PROTECTION AND SAFETY CONCEPT	شماره صفحه : 18 از 28																
	<table><tr><td>پروژه</td><td>بسته کاری</td><td>صادر کننده</td><td>تسهیلات</td><td>رشته</td><td>نوع مدرک</td><td>سریال</td><td>نسخه</td></tr><tr><td>BK</td><td>GCS</td><td>PEDCO</td><td>120</td><td>SA</td><td>DB</td><td>0001</td><td>D02</td></tr></table>		پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه	BK	GCS	PEDCO	120	SA	DB	0001	D02
	پروژه		بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه									
BK	GCS	PEDCO	120	SA	DB	0001	D02											

13.5 FIRE WATER SPRAY SYSTEM

- Water spray deluge system shall be provided for exposure protection and also control of burning on the not insulated equipment. Design and installation details shall be accomplished based on NFPA-15 and API2030.
 - The pipe size in water spray system shall not be less than 1 inch.
 - Any group of equipment, which is located in one area, shall be commonly protected by one particular system.
- Any system will be operated as follow:
- Automatically upon fire detection by proper fire detection.
 - Manually at the control valve by means of emergency release device.
 - Manually from remote safe location push button at control room.

13.6 HYDRANT

Fire water hydrants shall supply a minimum fire water of 1000(LPM) at 10 barg. Hydrants shall be installed throughout the process area, with a maximum spacing of 45m between hydrants along the external perimeter of process units. Hydrants shall also be provided throughout utility areas adjacent to plant roads, at a maximum distance of 2m from the kerb. Where possible the hydrants in the process and utility areas shall be positioned along the side of the road, on the edge of shoulders for easy accessibility and such that they also serve the plants roads.

The horizontal range and coverage of hydrants with hose connections shall not exceed 60 m. all hydrants shall be located at a minimum distance of 15 m from the periphery tanks of hazardous equipment under protection and a minimum of 12 m from building.

Hydrants standpipes shall be sized to ensure that the water velocity does not exceed 3.5 m/sec. Water supply lines to hydrants from fire water ring shall be a minimum of 6" diameter.

13.7 MONITOR

Firewater monitors shall be hydrant mounted and provide throughout high fire-risk areas. Supply lines for monitors shall be 6" diameter.

Firewater monitors shall supply a minimum fire water of 2000(LPM) at 10 barg The minimum horizontal straight stream range of such monitor is about 40 m. Monitors shall therefore be along the firewater ring main such that a 30 m jet in still air can reach a fire anywhere in the process area.

Firewater monitor shall be located at a minimum distance of 15 m from the protected equipment.

 NISOC	<p>نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض</p> <p>احداث ردیف تراکم گاز در ایستگاه جمع آوری بینک</p>								
شماره پیمان: 053 – 073 – 9184	ACTIVE FIRE PROTECTION AND SAFETY CONCEPT							شماره صفحه : 19 از 28	
	پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال		نسخه
	BK	GCS	PEDCO	120	SA	DB	0001	D02	

13.8 FIRE SHED

Fire Shed shall be considered for storing firefighting apparatus and it shall have the below characteristics:

- Metal body closed on three sides
- Sloped roof
- Dimensions of 3*3*2.5
- Red colored
- Concrete floor
- Equipped with shelves (three levels)
- Equipped with lighting system
- Equipment List Panel
- Entrance slope way

a) The Fire shed shall be placed in process areas and store:

- 10 No. 2 1/2" hoses 25 meters in length, (BS 336)
- 2 No. Fog / Jet/ Stop combination type nozzle*
- 2 No. In line Inductor(450 lpm) with pick-up tube ,
- 2 No. Nozzles 10x ,(Foam maker nozzles)
- 5 No. Concentrate Foam (FP 3%) containers -PVC (100 lit.)
- 2 No. Dry chemical powder wheeled extinguisher 75 kg
- 6 No. Dry chemical powder portable extinguisher 12 kg
- 2 No. CO2 wheeled extinguisher 5 kg
- 1 No. Foam container Wrench
- 1 No. Mobile water monitor (2000 lpm)

14.0 BUILDINGS

14.1 FIRE EXTINGUISHERS

Extinguishers shall be conspicuously located where they will be readily accessible and immediately available in the event of fire. Preferably they shall be located along normal paths of travel, including exits from areas or premises. (IPS-G-SF-126)

Travel distances for portable extinguishers shall not exceed 15m. (IPS-G-SF-126).

According to NFPA 10, instruction of extinguishers shall be installed on body as clearly visible.

 NISOC	<p>نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض</p> <p>احداث ردیف تراکم گاز در ایستگاه جمع آوری بینک</p>								
شماره پیمان: 053 – 073 – 9184	ACTIVE FIRE PROTECTION AND SAFETY CONCEPT							شماره صفحه : 20 از 28	
	پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال		نسخه
	BK	GCS	PEDCO	120	SA	DB	0001	D02	

PORTABLE CO2 EXTINGUISHERS

Portable carbon dioxide extinguishers will be 5 kg capacity and suitable for class B and C fires. UL/UCL classification shall be 10-B: C.

The horizontal discharge range and discharging time for portable type CO2 extinguishers shall be 1 to 2.5 meter and minimum of 9 seconds.

The material of the cylinder shall be steel with suitable thickness. The working pressure shall be 56 barg and test pressure shall be 250 barg.

The extinguisher shall be designed, manufactured, tested and delivered in accordance with NFPA 10 and IPS-G-SF-126.

The extinguisher operation will be self-expelling and shall be equipped with flexible hose, lever valve, discharge horn, siphon tube, safety bursting disc and wall-mounting bracket. Discharge horn shall not be metal material.

The extinguisher shall be equipped with a discharge horn of water-resistant, electrically nonconductive material.

The external surface of extinguisher shall be painted with an anti-corrosion primer plus epoxy coating.

WHEELED CO2 EXTINGUISHERS

Wheeled carbon dioxide extinguishers will be 30 kg capacity and suitable for class B and C fires. UL/UCL classification shall be 20-B: C.

The discharging time and horizontal discharge range for wheeled type CO2 extinguishers shall be 10 to 30 seconds and 1-3 meter.

The material of the cylinder shall be steel suitable thickness. The working pressure shall be 56 barg and test pressure shall be 250 barg.

The extinguisher shall be designed, manufactured, tested and delivered in accordance with NFPA 10 and IPS-G-SF-126.

The extinguisher operation will be self-expelling and shall be equipped with flexible hose, lever valve, discharge horn, siphon tube, safety bursting disc and wheels. Discharge horn shall not be metal material.

The extinguisher shall be equipped with a discharge horn of water-resistant, electrically nonconductive material.

 NISOC	<p>نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض</p> <p>احداث ردیف تراکم گاز در ایستگاه جمع آوری بینک</p>								
شماره پیمان: 053 – 073 – 9184	ACTIVE FIRE PROTECTION AND SAFETY CONCEPT							شماره صفحه : 21 از 28	
	پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال		نسخه
	BK	GCS	PEDCO	120	SA	DB	0001		D02

The external surface of extinguisher shall be painted with an anti-corrosion primer plus epoxy coating.

PORTABLE DRY CHEMICAL EXTINGUISHERS

Portable dry chemical extinguishers will be 12 kg capacity and suitable for class B and C fires and UL/ULC classification shall be 40-B: C.

Dry chemical powder used shall be potassium bicarbonate agent and shall not be conductive.

The operation method of this extinguisher shall be internal cartridge. The discharging time of agent shall be minimum 15 seconds and horizontal discharge range 1.5 to 6m.

The extinguisher shall be designed and manufactured in accordance with NFPA 10 and IPS-G-SF-126.

Working pressure of extinguisher body will be 15 barg and it shall be tested at 30 barg.

The extinguisher shall be operated with stored pressure of CO₂ gas.

The extinguisher should be equipped with hose, extinguishing pistol with, wall mounting bracket, handle to facilitate manual carriage, safety bursting disc, siphon tube and other accessories.

The external surface of extinguisher shall be painted with an anti-corrosion primer plus epoxy coating.

The extinguisher shall be provided with a self-closing discharge valve located on the extinguisher container at the inlet end of the discharge hose.

WHEELED DRY CHEMICAL EXTINGUISHERS

Wheeled dry chemical extinguishers will be 75 kg capacity. And suitable for class B and C fires .

Dry chemical powder used shall be potassium bicarbonate agent and shall not be conductive.

The discharging time of agent shall be 30 to 60 seconds and horizontal discharge range 3 to 7 m. The material of the cylinder shall be of steel 4.5 mm thickness at least.

The extinguisher shall be designed and manufactured in accordance with NFPA 10 and IPS-G-SF-126.

 NISOC	<p>نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض</p> <p>احداث ردیف تراکم گاز در ایستگاه جمع آوری بینک</p>																	
شماره پیمان: 053 – 073 – 9184	ACTIVE FIRE PROTECTION AND SAFETY CONCEPT	شماره صفحه : 22 از 28																
	<table><tr><td>پروژه</td><td>بسته کاری</td><td>صادر کننده</td><td>تسهیلات</td><td>رشته</td><td>نوع مدرک</td><td>سریال</td><td>نسخه</td></tr><tr><td>BK</td><td>GCS</td><td>PEDCO</td><td>120</td><td>SA</td><td>DB</td><td>0001</td><td>D02</td></tr></table>		پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه	BK	GCS	PEDCO	120	SA	DB	0001	D02
	پروژه		بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه									
BK	GCS	PEDCO	120	SA	DB	0001	D02											

Working pressure of extinguisher body will be 15 barg and it shall be tested at 30 barg.

The extinguisher shall be operated with external pressure cartridge containing of carbon dioxide propellant gas. High pressure cartridge shall be tested at 250 barg.

The extinguisher should be equipped with 10 meters of 3/4" diameter braided hose, extinguishing pistol with flow controller, 2 solid tires, discharge valve, 350 mm wheels, handle to facilitate manual carriage, safety bursting disc, siphon tube and other accessories.

The external surface of extinguisher shall be painted with an anti-corrosion primer plus epoxy coating.

14.2 AUTOMATIC CO2 EXTINGUISHING SYSTEM

- CO2 gas extinguishing system is an Auto/Manual actuation system which is used as total flooding. That is considered as primary means of protection for unmanned electrical buildings (Substation) for prevention of damage to electric or electronic equipment.
- The system design shall be performed based up on NFPA-12.
- The type of hazard to be taken into account is dry electrical hazard.
- In calculating the quantity of CO2 shall be considered a minimum concentration of 50% volume of the room. As the type of fire is deep-seated, the design concentration shall be achieved within 7 minutes, but the rate shall be not less than that required to develop a concentration of 30 percent in 2 minutes.

14.3 LOCATION OF ROOMS & REQUIRED SAFETY ITEMS

The control room, sub-stations or instrument technical rooms shall, where practicable, be located outside areas of over-pressure blast effect. If this is not possible, then the control room structure shall be made explosion resistant to withstand the calculated overpressure level.

To make buildings blast-proof or explosion resistant will be approved in detail design engineering after calculated consequence analysis.

Inside control room portable co2 extinguisher will be considered. A first aid facility is provided in the concerned area such as control room and workshop.

Also SCBA should be provided in side control room to be used during emergency cases.

15.0 SAFETY SHOWER & EYEWASH

Applicable Standard is ANSI-Z-358.1.

	<p>نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض</p> <p>احداث ردیف تراکم گاز در ایستگاه جمع آوری بینک</p>								
شماره پیمان: 053 – 073 – 9184	ACTIVE FIRE PROTECTION AND SAFETY CONCEPT								شماره صفحه : 23 از 28
	پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه	
	BK	GCS	PEDCO	120	SA	DB	0001	D02	

- Safety shower and eyewash combination units shall provide anywhere in the facilities where operating personnel could come into contact accidentally with hazardous substances, with the capacity to cause burns or other damage to human skin such as battery room.
- It shall provide with shower and eyewash combination units mainly surrounding working areas where hazardous substances are mixed, chemical storage area, loaded or unloaded and pumps areas.
- Shower and eyewash units shall be located in a maximum distance of 10 meters from these working areas, and they shall have appropriate safety signs.
- The design of the water supply shall limit its temperature to 40° C or less at the safety showers and eye washes, by buried supply lines, recirculation or combination of methods or other ways.

16.0 SCBA

The SCBAs shall be designed and manufactured in accordance with IPS-G-SF-140 and IPS-E-SF-300.

Closed circuit SCBA is designed to enable man to work in irrespirable atmosphere for longer periods than are generally possible with the open circuit and with the greater freedom of movement than is allowed by airline types. The apparatus is designed and constructed so that exhaled air passes from face piece or mouthpiece through a breathing tube into a purifier containing chemicals which absorb the exhaled carbon dioxide. Oxygen is fed into breathing circuit from a cylinder of compressed oxygen or from a liquid oxygen/air container. The oxygen and purified gases mixture are fed to the wearer who inhales from a breathing bag, and any excess gas is released through a relief valve.

- Since additional weight can reduce the fire fighter's ability to carry out assigned tasks, weight reduction is a prime concern. SCBAs shall be rated 30-minute duration, the predominant SCBA used by the fire service, should be limited to a maximum composite weight of 11.4 kg. Purchasers are advised to specifically address weight in their purchase specifications regardless of the rated service time.
- SCBA shall be equipped by Speech Diaphragm, Support harness, Belt fastening, Audible warning.
- The SCBA manufacturer shall provide, with each SCBA, instructions and information for maintenance, cleaning, disinfecting, storage, and inspection.

17.0 PORTABLE GAS DETECTOR

The portable gas detectors shall be designed and manufactured in accordance with IPS-G-SF-310.

The gas detector is designed to provide early warning of potentially hazardous leakage within the measuring ranges and within the alarm setting of the following table:

 NISOC	<p>نگهداشت و افزایش تولید میدان نفتی بینک</p> <p>سطح الارض</p> <p>احداث ردیف تراکم گاز در ایستگاه جمع آوری بینک</p>								
شماره پیمان: 053 – 073 – 9184	ACTIVE FIRE PROTECTION AND SAFETY CONCEPT							شماره صفحه : 24 از 28	
	پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال		نسخه
	BK	GCS	PEDCO	120	SA	DB	0001		D02

SENSOR TYPE	MEASURING RAGE	SENSOR LIFE(Mths)	ALARM SETTING
Oxygen	0-25	12	19-23
Flammable. (%LEL)	0-100	24	20
H2S(ppm)	0-25	24	10
CO	0-200	24	10

18.0 ESCAPE ,EVACUATION & RESCUE (EER)

The following main concerns shall be taken into account:

- Maintain the safety of personnel when they escape to another location to avoid the effects of a hazardous event.
- Provide safe escapes for easy evacuation.
- Ensure safe evacuation of the units.

ESCAPE:

To escape means to leave the hazardous areas and move away from the plant area to the safe areas.

One main permanent muster area shall be reserved away outside the restricted area, preferably between near the entrance gate. (According to size of project) It shall be non-covered and located upwind process facilities.

During construction, additional temporary muster areas shall be defined.

Mass transportation vehicles shall easily serve the muster areas.

Alert to personnel on site shall be provided in accordance with the general alarm system.

Escape routes shall follow the normal site roadways and other permanent means of access. The escape routes and exit doors within buildings shall be signposted.

The escape routes should be routed reasonably protected to maintain viability under accidental events. All escape routes shall:

- Be unobstructed and as straight and direct as possible;
- Lead personnel away from the hazard without passing through areas of higher hazard;

All escape routes and doors within buildings shall clearly identify using high visibility signs. All signs shall be in both English and Farsi.

All main escape routes, and the routes through large process and utility areas, shall have sufficient

 NISOC	<p>نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض</p> <p>احداث ردیف تراکم گاز در ایستگاه جمع آوری بینک</p>								
شماره پیمان: 053 – 073 – 9184	ACTIVE FIRE PROTECTION AND SAFETY CONCEPT							شماره صفحه : 25 از 28	
	پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال		نسخه
	BK	GCS	PEDCO	120	SA	DB	0001	D02	

clear width to enable two-way flow of escaping and firefighting/rescue personnel, and to enable efficient rescue and firefighting activities to be performed.

EVACUATION:

To evacuate means move out of the impacted area of the plant and go to the safe areas. The normal systems of personnel transportation will be used for evacuating the site (walking, road vehicles).

Emergency exits shall be provided where suitable to allow evacuation of personnel that could be trapped between the security fence and the source of hazards, and could not join the safe areas; disabled or injured persons are evacuated by ambulance or other suitable vehicles.

EVRESCUE:

Adequate means shall be provided for personnel recovery:

- That could not escape:
 - pulling-out devices,
 - specific personnel protection,
 - Stretchers, etc.
- That require on-site medical assistance:
 - medical equipment,
 - designated persons,
 - Adequate training.

The on-site medical assistance will be limited to first aid.

Communication with nearby hospitals is possible to decide and organize the emergency evacuation of most seriously injured persons.

19.0 HEALTH, PERSONNEL PROTECTION, TRAINING & CERTIFICATION

19.1 HUMAN HEALTH

19.1.1 AMBIENT NOISE LIMIT AND VIBRATIONS

The following limits shall not be exceeded in work areas:

- Weighted global noise level more than 85 dB (A),

 NISOC	<p>نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض</p> <p>احداث ردیف تراکم گاز در ایستگاه جمع آوری بینک</p>								
شماره پیمان: 053 – 073 – 9184	ACTIVE FIRE PROTECTION AND SAFETY CONCEPT							شماره صفحه : 26 از 28	
	پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال		نسخه
	BK	GCS	PEDCO	120	SA	DB	0001	D02	

Noise levels for each frequency below a cut-off that falls linearly from 95 dB at 62.5 Hz to 80 dB at 500 Hz.

- Noise levels at frequencies above 500 Hz more than 80 dB (A).

These limits apply within a radius of 15 m around workstations and areas of regular maintenance.

Particular attention shall be paid to the accommodation shelter where shift operators can sleep at day.

Above rules may be granted exception only if:

- The area has a restricted access (machinery, etc.),
- The excessive noise is intermittent only (helicopters).

The excessive noise is caused by emergency conditions only (relief valve, EDP, etc.).

19.1.2 DRINKING

The quality of potable water shall meet the requirements of the W.H.O.

19.1.3 HYGIENE

Buildings are split into clean areas (accommodations) and dirty areas (workshop).

Accommodations are provided with change and shower rooms, conveniently located.

The circulation of food shall be properly defined and implemented. If there is any raw food storage shall consist in independent cold and dry storage.

Features ensuring the transportation to site and storage on-site of domestic water shall be provided, in sufficient quantities to ensure all the physiological needs and normal hygiene for the occupancy load served.

	<p>نگهداشت و افزایش تولید میدان نفتی بینک</p> <p>سطح الارض</p> <p>احداث ردیف تراکم گاز در ایستگاه جمع آوری بینک</p>								
شماره پیمان: 053 – 073 – 9184	ACTIVE FIRE PROTECTION AND SAFETY CONCEPT							شماره صفحه : 27 از 28	
	پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال		نسخه
	BK	GCS	PEDCO	120	SA	DB	0001	D02	

19.2 PERSONNEL PROTECTION

19.2.1 PERSONNEL SAFETY EQUIPMENT

Individual protection (safety shoes, safety helmets, ears and eyes protection, safety clothing, toxic gas masks, blankets, breathing apparatus...) shall be provided for all personnel engaged in operation where they may be exposed to risk of injury.

19.2.2 PARTICULAR REQUIREMENTS

The maximum surface temperature unless out-of reach or guarded shall be 55 °C.

19.2.3 TRAINING AND CERTIFICATION

All personnel present on the Plant shall be adequately trained, and where relevant, certified, for two different types of duties:

- Normal operations,
- Emergency (ER and/or EER).

The physical capability and training of the personnel who is part of the ER Team shall be certified, and periodically refreshed.

Jobs and positions exposing to particular risks, requiring particular skills or entry is restricted areas shall require a particular professional certification that shall be periodically renewed and includes, but is not limited to:

- Traffic,
- Heavy loads,
- Electrical,
- Panel operators.

 NISOC	<p>نگهداشت و افزایش تولید میدان نفتی بینک سطح الارض</p> <p>احداث ردیف تراکم گاز در ایستگاه جمع آوری بینک</p>								
شماره پیمان: 053 – 073 – 9184	ACTIVE FIRE PROTECTION AND SAFETY CONCEPT							شماره صفحه : 28 از 28	
	پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال		نسخه
	BK	GCS	PEDCO	120	SA	DB	0001	D02	

19.2.4 STAIRS & LADDERS

Stairs or steps shall be provided for height changes of more than 300 mm, with non-slip surface.

Fixed vertical ladders shall have a width of at least 450 mm and shall equip with safety cages. Continuous ladder height shall not exceed from 9 meter without landing.

19.2.5 GUARDRAILS & TOE BOARDS

Guardrails of 1100 mm minimum height with 1500 mm maximum stanchion separation shall be provided where a drop of more than 0.8 m occur at the edge of a deck or a wall way.

The height of toe boards shall be minimum 100 mm.