



نگهداشت و افزایش تولید میدان نفتی بینک
فعالیت های روزمینی در بسته های کاری تحت الارض
عمومی و مشترک



شماره پیمان:

053 - 073 - 9184

FIRE & GAS DETECTION DESIGN CRITERIA

پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه
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طرح نگهداشت و افزایش تولید 27 مخزن

FIRE & GAS DETECTION DESIGN CRITERIA

نگهداشت و افزایش تولید میدان نفتی بینک

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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.

As a part of the Project, construction of well location, access roads, wellhead facilities for 6 new wells (with electric power supply for 2 of them) and required modifications on 4 workover wells (with electric power supply) shall be done. In addition, construction of 6 new flowlines from new wells to Binak B/C unit (with extension of relevant manifold) is in the Project scope of work.

GENERAL DEFINITION

The following terms shall be used in this document.

CLIENT:	National Iranian South Oilfields Company (NISOC)
PROJECT:	Binak Oilfield Development – Construction of New Well Locations, Modifications on Workover Wells, Wellhead Facilities, Electrification Facilities, Flowlines and Extension of Binak B/C Manifold
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:	Executer 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 COMPANY rather than by an EPC/EPD CONTRACTOR, supplier or VENDOR.

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MAY:

Is used where a provision is completely discretionary.

2.0 SCOPE

This document covers minimum necessary requirements for the design and selection of Fire and Gas devices for wellhead area and manifold for the "Preservation and Production Increase of Binak oilfield".

Since there is no electrical power in wellhead area, F&G scope has been limited to pneumatic line mounted Fusible plugs around wells.

Manifold area scope is dedicated to a wall mounted FACP located on Binak production unit existing control room and related F&G devices for existing building.

It shall be used in conjunction with data/requisition sheets for present document subject.



3.0 NORMATIVE REFERENCES

3.1 LOCAL CODES AND STANDARDS



- IPS-M-IN-220 Material and Equipment Standard For Control Panel& System Cabinets
- IPS-G-IN-270 General Standard For Instrumentation of Fire and Gas Detection Equipment
- IPS-E-GN-100 Engineering Standards For Units
- IPS-E-SF-100 Engineering Standards For Classification Of Fires And Fire Hazard Properties
- IPS-E-EL-110 Engineering standard For Hazardous Area
- IPS-E-SF-260 Engineering Standard For Automatic Detector and Fire/Gas Alarm System
- IPS-G-SF-310 General Standard For Gas Detection
- IPS-M-IN-260 Material and Equipment standard for Alarm and Protective System
- IPS-G-IN-260 Engineering and installation standard for Indicating Light, Alarm and Protective system

3.2 INTERNATIONAL CODES AND STANDARDS

- API 610 Centrifugal Pumps for Petroleum, Petrochemical And Natural Gas Industries, 11th Edition
- ISO 15156 Petroleum and Natural Gas Industries. Materials for use in H2S Containing Environments in Oil and Gas Production

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- API RP 505 Recommended practice for classification of locations for electrical installations at petroleum facilities classified as Class 1, Zone 0, Zone 1 and Zone 2
- API RP 551 Process measurement
- API 552 Transmission systems
- BS EN 60079-7 Specification for Electrical apparatus for explosive atmospheres. Type of protection 'e'
- BS 5445 Components of Automatic fire detection systems-all parts
- BS 5839 Fire detection and alarm systems for buildings-all parts
- BS 6667 Electromagnetic compatibility for industrial process measurement and control equipment-all parts
- BS 7671 Requirements for electrical installations. IET wiring regulations
- BS EN 60529 Specification for degrees of protection provided by enclosure.
- EN 54 Fire detection & alarm systems
- BS EN 60079-0 Explosive atmospheres. Equipment-General requirements
- BS EN 60079-1 explosive atmospheres. Equipment protection by flame proof enclosure 'd'
- BS EN 50020 Electrical apparatus for potentially explosive atmospheres. Intrinsic safety "i".
- BS EN 60079-25 Explosive atmospheres. Intrinsically safe electrical system.
- BS EN 50058 Electrical apparatus for the detection and measurement of combustible gases. Performance requirements for group II apparatus indicating up to 100% Lower Explosive Limit.
- BS EN 61000-6 Electro-magnetic compatibility (EMC), generic standards, immunity for residential, commercial and light- industrial environments.
- EN 55022 Limits and methods of measurement of radio disturbance Characteristics of information technology equipment
- IEC 60331 Fire resisting characteristics of electric cables
- IEC 60331-23 Test for electric cables under fire conditions-circuit integrity-procedures and requirements-electric data cables
- IEC 60801-3 Electromagnetic compatibility for industrial process measurement and control equipment. Radiated electromagnetic field requirements
- IEC 61131-3 Programmable logic controllers
- IEC 61508 Functional safety of electrical/ electronic/ programmable electronic safety related systems
- ISA 5.1 Instrumentation symbols and identification.
- ISA 5.4 Instrumentation loop diagrams.
- ISA 18.1 Annunciators-sequences and specification.

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- NFPA 30 Flammable and combustible liquids code-storage
- NFPA 70 National Electrical Code
- NFPA 72 National Fire Alarm and Signalling Code

The latest published issue or amendment shall apply unless otherwise stated.

3.3 THE PROJECT DOCUMENTS

- BK-GNRAL-PEDCO-000-PR-DC-0001 Process Basis of Design
- BK-SSGRL-PEDCO-110-PI-SP-0001 Piping & Pipeline Material Specification
- BK-SSGRL-PEDCO-110-IN-DC-0002 Instrument & Control System Design Criteria
- BK-GNRAL-PEDCO-000-IN-SP-0009 Specification for Fire & Gas Sensor and Devices

3.4 ENVIRONMENTAL DATA

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

All fire & gas equipment (i.e. detectors, system, final elements) shall be certified for use in the specific environmental conditions.

One aspect which should be considered is the ambient conditions in the various areas under which the detectors will have to operate. This will involve evaluation of natural environmental conditions such as wind, temperature, solar radiation, salinity, humidity, as well as industrial conditions such as dust, oily atmosphere, vibration, etc.

4.0 ABBREVIATION

Industry standard abbreviations shall take their usual meaning. Outlined herein are the most common, which may be used in this and other project documents:

DCS	Distributed Control System
ESD	Emergency Shutdown System
F&G	Fire and Gas
FAT	Factory Acceptance Test
FGS	Fire and Gas System
FACP	Fire Alarm Control Panel
HD	Heat Detector
HVAC	Heat Ventilation and Air Condition
IR	Infrared
IR3	Triple Infrared
IS	Intrinsic Safety
LEL	Lower Explosion Limit

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MAC	Manually Alarm Call point
MMI	Man Machine Interface (Operator Interface)
PLC	Programmable Logic Controller
WHCP	Wellhead Control Panel

5.0 DESIGN PHILOSOPHY

5.1 GENERAL

Fire and gas detection devices shall be installed throughout the plant to detect hazardous conditions resulting from gas leakage or fire and to initiate appropriate alarms and actions.

The purpose of the Fire and Gas Detection System (F&G) shall be to safeguard personnel, plant equipment and the environment by:


- Monitoring designated areas for presence of flammable and toxic gases (if any) or fire by the use of fire and gas detectors.
- Initiating alarms on fire and/or gas detection, and communicated across the affected facility to alert personnel.
- Activating automatic fixed fire-extinguishing systems (if any).
- Monitoring buildings for smoke, flammable and/or toxic gases
- Automatic safety process actions (shutdown/blow down) to limit escalation of the hazardous event.

The alarms and actions generated by the activation of each detector shall be detailed in Fire and Gas Causes and Effects Charts.

5.2 SELECTION OF DETECTORS

The selection of detectors, principle of operation, quantity and location shall consider the predominant combustible/flammable/toxic materials presence, the type of fire which may occur and the possible presence of flammable and/or toxic gases, together with the following:

- The ambient conditions and possible causes of impaired performance.
- Dispersion behavior of smoke and gas and the possible locations for fire and gas detectors, such as areas where there may be insufficient air changes.
- Ventilation air flow patterns.
- Shielding by beams, equipment or piping.
- Possible failure modes, including risk of accidental damage, consequences of failure and the probability of false alarms.
- Maintenance requirements including access frequency and duration.
- Performance requirements including performance standards and the speed of response to a developing hazard.

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Elements that can influence the efficiency of the Detection and Alarm Systems shall be taken into account. Those shall include, but not be limited to, the following:

- Maximum and minimum temperatures.
- Wind direction and velocity.
- Low elevation sun conditions.
- Obscuration by mists, dusts and other causes of poor visibility.
- Excessive rain.
- Presence of pollutants.
- Expansion and contraction of support arrangements due to ambient temperatures and sunlight.
- Explosion hazards.
- Mechanical stress and vibrations.
- Noise levels.
- Electromagnetic influences.
- Mechanical damage.
- Plant obstructions.

For more details, please refer to "Specification for Fire & Gas Sensor and Devices Doc No.BK-GNRAL-PEDCO-000-IN-SP-0009.

5.3 DETECTORS VOTING LOGIC

To safeguard against initiation of safety measures on a false basis, it is common to require two fire or gas detectors or more in some area to operate before this is initiated.

Signal from any one detector should always give an alarm.


It is important that the detectors involved are located such that both will sense the fire development or gas release sufficiently fast to enable the safety measures to be initiated before the fire has developed to a critical level or gas leakage become critical.

Voting describes the philosophy of utilizing combinations of actuated detectors to provide alarms and executive actions.

The proposed ESD system has to be certified by a recognized certifying authority for use in safety & shutdown application, and shall satisfy the class SIL3. The method of voting may include two-out-of-n (2ooN), which requires two detectors, out of a group of N ($N \geq 3$), to operate to provide an executive action and alarm.

The gas detectors are voted in a 2oo3 configuration.

It shall be noted that manually operated controls shall not be voted.

 <p>NISOC</p>	<p>نگهداشت و افزایش تولید میدان نفتی بینک فعالیت های روزمینی در بسته های کاری تحت الارض عمومی و مشترک</p>																	
شماره پیمان: 053 – 073 – 9184	FIRE & GAS DETECTION DESIGN CRITERIA <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%;">پروژه</td> <td style="width: 10%;">بسته کاری</td> <td style="width: 10%;">صادر کننده</td> <td style="width: 10%;">تسهیلات</td> <td style="width: 10%;">رشته</td> <td style="width: 10%;">نوع مدرک</td> <td style="width: 10%;">سریال</td> <td style="width: 10%;">نسخه</td> </tr> <tr> <td>BK</td> <td>SSGRL</td> <td>PEDCO</td> <td>110</td> <td>IN</td> <td>DC</td> <td>0001</td> <td>D03</td> </tr> </table>	پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه	BK	SSGRL	PEDCO	110	IN	DC	0001	D03	شماره صفحه : 10 از 20
پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه											
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Cross-zone describes two different cross loops being activated (i.e. smoke detectors connected to total flooding clean agent extinguishing systems if any) on the same zone to provide an executive action and alarm.

6.0 FIRE DETECTION SYSTEM

6.1 GENERAL

- a) Fire in the plant can generally take place due to the ignitions of flammable material such as ignition of released hydrocarbon from the system or ignition of furniture, cable, etc. in the plant and building areas.
- b) Fire detection system shall be provided with automatic devices for detection of smoke, heat or flame that may be generated from any kind of fire and with manual alarm call points that give the information of any fire by any personnel.
- c) Adequate number of fire detectors and manual alarm call points shall be provided in the plant areas as well as building areas to cover each designated fire zone based on the viewing angle of the detector selected and manufacturer's instructions. Fire detectors have an optical system which looks at the flame and so they need a clear line of sight path.

All materials and equipment's associated with Fire & Gas detection/control shall be suitable for being used within Zone 1 hazardous area and the prevailing environmental conditions (Refer to Specification for Hazardous Area Classification Doc. No.: BK-GNRAL-PEDCO-000-SA-SP-0002)

Field devices shall be certified for electrically hazardous environment Zone 1, Class IIB, T4 as minimum and ingress protection IP65 (Refer to Specification for Hazardous Area Classification Doc. No.: BK-GNRAL-PEDCO-000-SA-SP-0002).

6.1 FIRE ALARM PANEL (FACP)

Fire alarm system shall be microprocessor based addressable and conventional fire detection type in accordance to the EN 54, BS 5839 and IPS-G-IN-270. (For more detail refer to Specification for Fire and Gas System Doc. No.: BK-GNRAL-PEDCO-000-IN-SP-0012)

6.2 FIRE DETECTION DEVICES IN OPEN AREA(IF ANY)

UV/IR Flame detector shall be used in general area where flame are expected to be one of the prime indications of fire, such as; open outdoor areas, hydrocarbon areas and fuel areas and generally in strategically locations to view equipment as primary means of fire detection. In locating the fire detectors, the environmental criterion shall be taken into account such as sunrise, sunset, dust, humidity, vibrations and alignment. (IR or IR3 type flame detectors shall be used in enclosed areas where the smoke and heat detector limitations do not permit their application)

 <p>NISOC</p>	<p>نگهداشت و افزایش تولید میدان نفتی بینک فعالیت های روزمینی در بسته های کاری تحت الارض عمومی و مشترک</p>																	
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Sufficient detectors shall be provided to cover each designated fire zone based on the viewing angle of the detector selected and manufacturer's instructions.

Field of view for flame detector shall be considered Minimum 120° (as per datasheet).

Detectors shall be suitable for use in classified area which they are installed based on Specification for F&G detectors.

Exception of the equipment's which are protected by linear heat detectors other areas like as Feed pumps area, Exchangers area, Heater area shall be monitored by flame detectors.

When one of the flame detectors is activated in open area, the following alarms and action shall be started:

- Audible/ Visual Alarm on F&G system, operating console in Operator Room.
- Local Audible/Visual Alarm and Actions in concerned area.

When two of the flame detectors (2oo3) are activated in open area, the following alarms and action shall be started:

- Local Audible/Visual Alarm and Actions in total plant.
- Audible/ Visual Alarm on F&G system, operating console and/ F&G Matrix panel in Operator Room.
- ESD shut down as per F&G cause and effect diagram and ESD philosophy of the project.
- Deluge system release in the concerned area (if any).

6.2.1 HEAT DETECTOR IN WELLHEAD AREA (FUSIBLE PLUG)

The fusible plugs in wellhead area shall be considered for heat detection.


A pressurized hydraulic loop shall be considered for fusible plugs, required hydraulic shall be supplied from WHCP. Fusible plug set point shall be considered as 100°C. Three No. fusible plugs are required.

6.3 FIRE DETECTION DEVICES IN BUILDING

Combination rate-of-rise and fixed-temperature heat detectors and also point type smoke detectors for buildings shall be installed on ceilings, false ceiling and false floor, Accordance with manufacturer's specifications and NFPA 72 and relevant IPS standards.

Remote indicator shall be provided for those located on false ceiling & floor.

The maximum coverage of detectors shall not be greater than 25m² for Heat and 50m² for smoke detectors (IPS-E-SF-260).

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6.3.1 HEAT/SMOKE DETECTOR IN BUILDING

Typically, point type rate-of-rise heat detectors and also point type optical smoke detectors shall be selectively located in buildings of low fire hazards.

- Rate of rise heat detector shall be used where fire are expected to generate heat such as pantry room.
- Spot type smoke detector shall be provided for manned building like as office rooms, HVAC room, Corridors, Prayer room, Dressing room, Guard room& Cylinder rooms.

When one of the Heat/Smoke detectors is activated in building, the following alarms and action shall be started:

- Audible/ Visual Alarm on F&G system, operating console in Operator Room.


When two of the Heat/Smoke detectors are activated in building, the following action shall be started:

- Audible/ Visual Alarm on F&G system, operating console and/ F&G Matrix panel in Operator Room.
- Local Audible/Visual Alarm (red light) and Actions at Building.
- HVAC shut-down and dampers closed in concerned fire zone (if any).
- Extinguishing systems Activation (if any).

6.3.2 FIRE DETECTION DEVICES ON TRANSFORMERS(IF ANY)

Linear Heat detection cables shall be provided for transformers area in the substation building for started the water spray system(if any) so, In addition of above alarm and action when any linear heat detector activates in transformer area, bellow actions shall be started:

- Local Audible/Visual Alarm (red light) and Actions at Building.
- Audible/ Visual Alarm on F&G system, operating console and /F&G Matrix panel in Operator Room.
- Transformers shutdown.

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7.0 GAS DETECTION SYSTEM

7.1 GENERAL

The flammable and toxic gas detection system shall provide continuous and automatic monitoring for the presence of flammable and toxic gases in specified areas.

The type of detector and its location should be based on typical leakage and equipment layout and the heat and material balance statistics for the process.

General guidelines and requirements for location are given below.

- Prevailing wind speed and direction and local atmospheric conditions (dust, humidity, alignment...) should be considered.
- Potential leakages sources shall be determined in plant.

The elevation at which the gas detectors are mounted shall reflect the presence of heavier or lighter-than-air gases. Consideration should be given to the molecular weight of the gas mixture in the various parts of the process, and whether a lighter or heavier-than-air gas leak would result in case of a leakage.;

➤ For gas lighter than air:

Location of detectors shall be at a height of 500~700 mm above the Potential leakages source

➤ Gas heavier than air :

Location of detectors shall be at a height of 500~700 mm above ground level

Flammable gas detector:



- Accuracy : $< \pm 3\%$ full scale
- Availability : $< \pm 2\%$ full scale

Toxic gas detector:

- Accuracy : $\pm 2\%$ of full scale
- Availability : $< \pm 2\%$ full scale

7.2 FLAMMABLE GAS DETECTION DEVICES IN OPEN AREA(IF ANY)

In open area, infrared flammable gas detectors (IRGD) shall be installed for all process equipment which may cause gas leakage.

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پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه											
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To allow a level of redundancy, the minimum number of detectors in any one fire area shall be two, wired on separate circuits (2oo3 voting logic). This will allow for a single detector failure or fault. Detection by two or more devices at high level in the same voting group shall constitute a 'confirmed' alarm.

Respective thresholds to indicate Low/High level for flammable gas detectors shall be set at 20% & 50% LEL as Low & High levels for hydrocarbons.

When one flammable gas detector is reached to 20% LEL, the following alarm shall be started:

- Common Audible/ Visual Alarm on F&G system, operating in Operator Room
When one flammable gas detector is reached to 50% LEL, the following alarms shall be started:
- Common Audible/ Visual Alarm on F&G system, operating console in Operator Room
- Local Audible/Visual Alarm and Actions in concerned area.
And when two gas detectors are reached to, 20 % LEL and 50 % LEL, the following alarms and action shall be started:
- Local Audible/Visual Alarm and Actions in total plant (only in 50% LEL).
- Common Audible/ Visual Alarm on F&G system, operating console in Operator Room
- Common Audible/ Visual Alarm on F&G Matrix panel in Operator Room (only in 50% LEL)
- ESD shut down as per F&G cause and effect diagram and ESD philosophy of the project (only in 50% LEL)

7.3 FLAMMABLE GAS DETECTION DEVICES FOR DIESEL GENERATOR(IF ANY)

For diesel generator shed, three flammable gas detectors shall be provided in Diesel Room.

When 20% of LEL is reached, any detector shall activate:

- Common Audible/ Visual Alarm on F&G system, operating console in Operator Room
When 50% of LEL is reached, the following alarms shall be activated:

- Local Audible/Visual Alarm and Actions in concerned area.
- Local Audible/Visual Alarm and Actions in total plant (only in 2oo3 voting).
- Common Audible/ Visual Alarm on F&G system, operating console in Operator Room
- Common Audible/ Visual Alarm on F&G Matrix panel in Operator Room (only in 2oo3 voting)
- Emergency shutdown of the machine (only in 2oo3 voting).

7.4 FLAMMABLE GAS DETECTION DEVICES IN BUILDING

Three Flammable gas detectors shall be provided for HVAC system at each air intake and air lock for buildings. When 20% of LEL is reached by any detector:

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- Common Audible/ Visual Alarm on F&G system, operating console in Operator Room

When 50% of LEL is reached by detector, the following alarms and actions shall in addition

- Common Audible/ Visual Alarm on F&G system, operating console in Operator Room
- Local Audible/Visual Alarm and Actions in concerned area.

And when two gas detectors are reached to, 20% LEL and 50% LEL, the following alarms and action shall be started:

- Local Audible/Visual Alarm and Actions in total plant (only in 50% LEL& 2oo3 voting).
- Common Audible/ Visual Alarm on F&G system, operating console in Operator Room
- Common Audible/ Visual Alarm on F&G Matrix panel in Operator Room (only in 50% LEL& 2oo3 voting)
- ESD Shut down as per F&G cause and effect diagram and ESD philosophy of the project (only in 50% LEL& 2oo3 voting).
- HVAC shut-down and dampers closed (if any and only in 20% LEL& 2oo3 voting).

7.5 TOXIC GAS DETECTION IN OPEN AREA (IF ANY)

The measurement principle used can be of a semi-conductor (Electrochemical cell Type) with temperature maintained in the semi-conductor.

The characteristics of the probe shall be clearly specified as a function of changes to the environmental conditions (hygrometry, temperature and pressure).

H₂S detectors shall be located at HVAC inlets to all occupied areas and in process areas where sour gas is being handled.



HVAC inlets shall be provided with three detectors as a minimum with 2oo3 voting. Action levels shall be set at 10ppm and 20ppm. At 10ppm by two detectors will register in the control room and allow a warning announcement to be made over the bells and a toxic gas alarm raised and at 20 ppm by two detectors allows a warning announcement to be made over the sounders and the HVAC shall be shut down.

H₂S detectors shall be located in sour gas processing areas at low level where gas could accumulate. Typically:

Significant areas of pipework where control and isolation valve seals are located and large numbers of flanges or screwed joints are present in the containment systems.

The alarm levels for the detectors shall be set at 10ppm and 20ppm.

When 10ppm is reached by any detector:

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BK	SSGRL	PEDCO	110	IN	DC	0001	D03											

- Common Audible/ Visual Alarm on F&G system, operating console in Operator Room

When 20ppm is reached by detector, the following alarms and actions shall in addition

- Common Audible/ Visual Alarm on F&G system, operating console in Operator Room
- Local Audible/Visual Alarm and Actions in concerned area.

And when two gas detectors are reached to, 10 ppm and 20 ppm, the following alarms and action shall be started:

- Local Audible/Visual Alarm and Actions in total plant (only in only in 20ppm).
- Common Audible/ Visual Alarm on F&G system, operating console in Operator Room
- Common Audible/ Visual Alarm on F&G Matrix panel in Operator Room (only in only in 20ppm)
- ESD Shut down as per F&G cause and effect diagram and ESD philosophy of the project.(only in only in 20ppm)

Flammable gas detection will however continue to monitor the area of concern for increased gas build up.

The characteristics to be specified include the following, at a minimum:

- The zero stability in ppm per month with the measurements, hygrometry, temperature and pressure held constant.
- The zero drift in ppm per month as a function of the hygrometry at 20°C and 1013 mb. The deviations between 20% and 100% of the Relative Humidity (RH) shall be stated
- The zero drift in ppm per month as a function of the temperature at 50% RH and 1013 mb. The deviations between -20°C and +40°C shall be stated
- The zero drift in ppm per month as a function of the pressure at 50% RH and 20°C. The deviations at 1013±50 mb shall be stated
- The sensitivity drifts in ppm in the above conditions
- The sensitivity drifts when the probe has not been in contact with the gas to be detected for six months
- The sensitivity drifts when the probe has been in contact with the gas to be detected at 50% of the mean allowable concentration for one month
- The guaranteed operating life of the sensor shall not be less than two years, even in the presence of Freon, silicone and tetraethyl leads (TEL and TML)
- Use of physical or chemical filters before the sensors shall only be accepted if the sensor's sensitivity and detection speed are not altered by same

The transmitters shall be smart type and communication protocols shall be approved by the client.

The transmitter signal shall be 4-20 mA and their accuracy shall be better than ±0.1% of span.

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7.6 TOXIC GAS DETECTION DEVICES IN BUILDING

Three Flammable gas detectors shall be provided for HVAC system at each air intake and air lock for buildings. When 10ppm is reached by any detector:

- Common Audible/ Visual Alarm on F&G system, operating console in Operator Room

When 20ppm is reached by detector, the following alarms and actions shall in addition

- Common Audible/ Visual Alarm on F&G system, operating console in Operator Room
- Local Audible/Visual Alarm and Actions in concerned area.

And when two gas detectors are reached to, 10ppm and 20ppm, the following alarms and action shall be started:

- Local Audible/Visual Alarm and Actions in total plant (only in 20ppm & 2oo3 voting).
- Common Audible/ Visual Alarm on F&G system, operating console in Operator Room
- Common Audible/ Visual Alarm on F&G Matrix panel in Operator Room (only in 20ppm & 2oo3 voting)
- ESD Shut down as per F&G cause and effect diagram and ESD philosophy of the project (only in 20ppm & 2oo3 voting).
- HVAC shut-down and dampers closed (if any and only in 20ppm & 2oo3 voting).

7.7 HYDROGEN DETECTION IN BATTERY ROOM

Hydrogen gas detector shall be installed in battery room. The hydrogen gas detector is designed to allow dissipation and give warning before any concentration reaches the lower explosive limit 5% LEL. (Battery room devices shall be certified EExd for electrically hazardous environment Zone 1, Class IIC, T4 (Refer to Specification for Hazardous Area Classification Doc. No.: BK-00-HD-000-SA-SP-0002)).

When at least 5% LEL hydrogen is present in the air:

- Common Audible/ Visual Alarm on F&G system, operating console in Operator Room
- Start duty exhaust fan

When at least 10% LEL hydrogen is present in the air:

- Local Audible/Visual Alarm and Actions at Building
- Common Audible/ Visual Alarm on F&G system, operating console and /F&G Matrix panel in Operator Room
- Isolation of battery feeder and Shutdown of battery boost charging

 <p>NISOC</p>	<p>نگهداشت و افزایش تولید میدان نفتی بینک فعالیت های روزمینی در بسته های کاری تحت الارض عمومی و مشترک</p>																	
<p>شماره پیمان: 053 - 073 - 9184</p>	<p>FIRE & GAS DETECTION DESIGN CRITERIA</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 10%;">پروژه</td> <td style="width: 10%;">بسته کاری</td> <td style="width: 10%;">صادر کننده</td> <td style="width: 10%;">تسهیلات</td> <td style="width: 10%;">رشته</td> <td style="width: 10%;">نوع مدرک</td> <td style="width: 10%;">سریال</td> <td style="width: 10%;">نسخه</td> </tr> <tr> <td>BK</td> <td>SSGRL</td> <td>PEDCO</td> <td>110</td> <td>IN</td> <td>DC</td> <td>0001</td> <td>D03</td> </tr> </table>	پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه	BK	SSGRL	PEDCO	110	IN	DC	0001	D03	<p>شماره صفحه : 18 از 20</p>
پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه											
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Detectors for battery room shall be certified based on Specification for F&G devices.

8.0 MANUAL CALL POINTS

Manual call points shall be of the resettable type with single pole change over switch (equipped with opening key for test, maintenance and reset). The complete housing of manual call points installed outdoors shall be constructed in accordance with requirements for the classified areas based on Specification for F&G devices be corrosion- resistant and fully weather- proofed.

Manual alarm call points shall be used only for alarm initiating purposes to provide alarm points in emergency situations and to supplement the automatic fixed fire detection systems.

Each manual alarm call point shall be installed 1,4 m above the finished ground, surface mounted on the wall, shelter, structure or stand.

Manual call points shall be clearly recognizable from a distance and should be positioned as follows:

- Along roads in the plant area at intervals exceeding 60 m, preferably at or near to logical escape routes and access ways.
- Near or at locations having a higher risk such as slug catchers, manifolds, launching and receiving area.
- Entrance of the plant near the gate house.

At near the building entrance, inside the buildings at corridors and exit door of rooms at intervals not exceeding 30 m. Operation of a manual alarm call point in buildings, shall initiate:

- Local Audible/Visual Alarm and Actions in concerned area.
- Common Audible/ Visual Alarm on F&G system, operating console and /F&G Matrix panel in Operator Room

Operation of a manual alarm call point in open areas, shall initiate:

- Local Audible/Visual Alarm and Actions in concerned area.
- Common Audible/ Visual Alarm on F&G system, operating console and /F&G Matrix panel in Operator Room

9.0 ALARMS & LIGHTS DEVICES

Alarm sounder and flash lights shall be provided for outdoor locations. The sound level shall be selected such that the alarm can be clearly audible and distinguishable. The alarm sound level shall be suitable for personnel warning in industrial environment where other machinery noises are already present. The sounders shall have different tones so that F&G audio alarm and extinguished pre-alarm can be distinguished. The electronic sounders shall have an output of 117 dB within a

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پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدارک	سریال	نسخه											
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frequency range of 500 ~ 1000 HZ at a radius of one meter with a built-in gain control to adjust the volume and facility to select the tones.

Accordingly; Audible alarm for open area shall be at least 117 dB(A) at 1m away.

One motorized siren shall be considered for plant area. It may be activated by F&G system.

In open area, where noise level doesn't permit application of sounder consideration shall be given to visual flashing light. Different type of hazard such as; toxic/ flammable concentration or fire shall be indicated in suitable plant area location with flashing frequency of 60 flashes / minute by different colors.

The color of beacons shall be:

- Red for fire and flammable gas detection
- Yellow for combustibile and flammable gas detection

And audible alarms shall be:

- non-continuous for flammable and toxic gas detection
 - Continuous for fire detection
- Bells shall be installed in corridors and inside of the buildings for warning the personnel in a building. In case of fire in each fire zone inside of a building it will be activated based on a 100N voting. It should have 110 dB sound pressures.
- Bells or sounders shall be of adjustable type.
- For the protected room by gas extinguishing system in the building a horn shall be installed at above the exit door of for each protected area. Horn sound level shall be 110 dB suitable for personnel warning in industrial environment where other machinery noises are already present. The horn shall be with provisions to alarm different sound levels. The multiple wire cable shall be terminated in the horn terminals. The terminals shall be housed in an explosion proof enclosure as part of the horn. The sound level for the horn shall not exceed 110 dB (A) at 1 meter distance on the main axis.

10.0 SPARE PARTS AND SPECIAL TOOLS

10.1 SPARE PARTS

The VENDOR shall provide lists of recommended spare parts, which shall include the original part numbers with prices for commissioning, start-up and two years operation. All spare parts shall be identified individually.

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پروژه	بسته کاری	صادر کننده	تسهیلات	رشته	نوع مدرک	سریال	نسخه											
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Spare parts for commissioning and start-up; a qualified and complete list based on PROJECT SPARE PART SUPPLY PROCEDURE (Doc. No. E&D-QC-SP-1).

Spare parts for two years operation; a qualified and complete list based on PROJECT SPARE PART SUPPLY PROCEDURE (Doc. No. E&D-QC-SP-1).

The VENDOR shall be able to provide spares back up and support for the plant life of at least 20 years.

SPIR form shall be approved by CLIENT prior to procurement.

10.1 SPECIAL TOOLS

The VENDOR shall provide any special tools required for the satisfactory operation and maintenance of his equipment. A complete list of special tools shall be provided by the VENDOR at enquiry stage.

11.0 TRAINING

Training shall be prepared to provide suitable personnel as required for the following:

- Design configuration assistance to CONTRACTOR
- Operator training courses
- Maintenance training courses
- Site installation and commissioning support.

VENDOR shall provide detailed information of factory and onsite training courses in his proposal.

VENDOR shall furnish UNIT RATES for providing training in English for three groups of employees (at least 8 persons):

- Engineering
- Operators
- Maintenance

Training shall be for Control System, especially on Ethernet TCP/IP data highway communication protocol and shall be arranged to be held before FAT test.

As an additional option, VENDOR shall provide an instructor to conduct operator training before the start-up of plant operations. The training will be specific to the specific facility systems, graphics, control, etc. The instructor shall be required to provide a training manual based on compilation of all configuration work done on the facility systems.