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Technical Specification For Fire Detection System of Weighing

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1. GENERAL SPECIFICATION

1.1 Introduction

This specification defines the minimum requirements for the design, manufacturing, inspection, testing, packing and shipping of addressable **Fire Detection System** for Golgohar Mining & Industrial Company.

The purpose of fire detection system is to detect fire at the earliest practicable and to give an alarm so that appropriate action can be taken such as evacuation of occupants and notifying the firefighting organization.

The Main Addressable Fire Alarm Control Panel shall be connected to existing Fire Detection System and to be monitored in Local Fire Station.

In the event of any requirements conflict, then the Technical Specification will prevail.

Equipment and materials selection will be based on the utilization of modern proven technology that can be demonstrated as having operated successfully and reliably in an equally onerous environment.

The vendor shall be totally responsible for all supplied equipment and inspections & tests performed by himself and his sub-suppliers and for all technical co-ordination within his organization and between the sub-suppliers.

1.2 Document Priority

In the event of any conflict between this specification, the requisition, drawings, codes and standards, the priority shall be given in the following order:

- a. Contract
- b. Specification
- c. Data Sheet
- d. Drawing and other documents
- e. IEC Standards

In any case vendor shall refer the matter with Purchaser and obtain clarification before proceeding with any work.

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1.3 General Requirements

1.3.1 Standards

The Plant and all Plant units, equipment and ancillary equipment thereto will be designed to conform to the latest edition of codes and standards which are mentioned in related sections for quality and safety.

1.3.2 System of Measurement

The S.I. Metric System will be used throughout. Where items of equipment are normally manufactured or specified in Imperial units (except pipes), the metric equivalent (or nominal equivalent) will appear in brackets, e.g. 6" (150 mm).

2. Site Conditions

2.4 Plant Location

The Site is located at Gol-E-Gohar Iron Ore Complex, situated in Sirjan, Province of Kerman in southern part of Islamic Republic of IRAN, approximately 285 km southwest of Kerman city and 335 km north of Bandar Abbas port, in a semi-desertic high plateau terrain, 1750 m above sea level, and flanked by mountains over 2500 m high trending northwest to southwest.

2.5 Meteorological

Ambient Temperature

Max. Temperature:	+40 deg. C (Recorded)
	+50 deg. C (Design)
Min. temperature:	-12 deg. C (Recorded)
	-10 deg. C (Design)
Average temperature:	+15.9 deg. C (Design)
Wet bulb design temperature (summer):	+25 deg C
Relative Humidity:	Max. 70%

Wind Velocity

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According to National Iranian Code (6th revision):

Basic speed data: 130 Km/h

Basic pressure data: 0.845 KN/m²

Correction factor:

0 - 10 m: 2

10 - 20 m: 2.2

20 - 100 m: 2.4

Rainfall

Yearly 120 mm (average)

Monthly rainfall 260mm (Max)

Barometric Pressure

820 milliards

Geological Conditions

This data is belonging to the existing palletizing plant location. For the engineering the contractor shall be study geotechnical conditions for the essential location according to the project plan.

Altitude: About 1,750 m above mean sea level

Soil bearing: approx. 20t/m²

Ground water level: approx. 60 m below ground level

Earthquake Load

Equipment in plant will be dimensioned including a safety calculation against earthquake according to the "Iranian Code for Seismic Resistant Design of Buildings

– Publication No. S253-2nd edition, autumn 1999" ("Iranian Regulations 2800") and "Minimum

Design Loads for Building and Structures" (Iranian Regulations 519).

- Design base acceleration: 0.3·g

- Classification of Buildings: Group 2

- Soil classification: soil type III-b

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3. STANDARDS AND CODES

Materials selection, design, manufacturing, testing and installation of the Fire Detection and Alarm System shall comply with the latest editions (including all revisions and addenda current at the time of order placement) of the following codes and standards:

National Fire Protection Association (NFPA) - USA

- NFPA 70 National Electrical Code (NEC)
- NFPA 72 Central Station Signaling Systems
- NFPA 72 Protective Signaling Systems
- NFPA 72 Automatic Fire Detectors
- NFPA 72 Notification Appliances for Protective Signaling Systems.
- NFPA 72 Testing Procedures for Signaling Systems.
- NFPA 101 Life Safety Code
- NFPA 170 Fire Safety Symbols
- NFPA 79: Electrical Standard for Industrial Machinery
- NFPA 170: Standard for Fire Safety and Emergency Symbols
- NFPA 850: Recommended Practice for Fire Protection for Electric Generating Plants

Above selection is based on:

- Manufacture's catalogue
- Modern Engineering Practice

Electrical

- IEC 60065 Audio, Video and Similar Electronic Apparatus - Safety Requirement
- IEC 60331 Fire Resisting Characteristics of Electrical Cable
- IEC 60332 Tests on Electrical Cables under Fire Conditions
- IEC 60364 Electrical Installations of Buildings
- IEC 60617-1 IEC 60617-1 Guide for Graphical Symbols for Electrical Power Telecommunications and Electronic Diagrams

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- IEC 61938 Audio, video and audiovisual systems - Interconnections and matching values - Preferred matching values of analogue signals
- EIA/TIA-568 Commercial Building Telecommunications Cabling Standards

Other standards which are specified in electrical design criteria

3.1 Symbols, Diagrams and Abbreviations

The electric symbols, diagrams and abbreviations will be as per IEC 61182, 61346, 60617 standards the unified symbols will be used in all parts of production units.

Documents, drawings, data, etc. will be in English, and in metric units.

The English language shall be used for all correspondence documents, catalogs, drawings and nameplates. All other languages are not acceptable.

The drafting symbols will be according to latest edition of IEC 60617 except protective relay numbers which will be according to ANSI C 37.2

3.2 Environmental Criteria

Electrical equipment and installations will be suitable for operation at continuous maximum rating under the extremes of ambient temperature and humidity imposed by the local environmental conditions.

4 FIRE ALARM SYSTEM

4.1 General

This document includes a description of automatic and manual fire detection devices, fire alarm control panels, auxiliary devices, sirens and wiring.

Detectors are common between Fire Detection System and Fire Fighting System.

Fire Alarm Control Panel shall be fed from AC UPS.

As a rule, fire alarm systems will be based on the safety of personnel and equipment during all expected modes of operation interchangeability and expandability shall be considered. The equipment will be selected taking into consideration climatic condition & geographical situation.

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The fire detection system consists of a central board. All fire alarms will be displayed on a LCD display.

The fire alarm system consists mainly of:

- Central alarm panel, including Programming software package and related application program
- Zone Indicator
- Battery and battery charger
- Fault alarms
- Flashing lights and bell
- Optical detectors
- manual call point
- Necessary fire resistance cables and installation material
- Control units with power supply
- Automatic fire detectors
- Non automatic fire detectors
- Required interfaces to HVAC system
- Audible alarm annunciators
- Workstation for System Administration / Management / Monitoring / Maintenance etc.

The fire detection system shall comprise of a central unit and zone indicator Unit, connected by two wires to field devices, including fire detection devices, alarm devices and control devices, and located throughout the protected building area.

All required information shall be shown on duplicating monitoring System (Zone Indicator).

The control unit shall continuously monitor the status of all sensing devices, and initiate action when a fire or smoke condition is present.

The system shall be designed to provide an early warning utilizing the most effective detection methods appropriate to the protected areas. In addition, preference should be given to sensors

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and sensing methods that are environmentally friendly and that do not contain hazardous substances. The following is the order of preference for detection methods.

- Multi sensors, with optical smoke and thermal sensing
- Optical smoke sensors
- Thermal Sensors

The alarm management shall be field configurable from the control panel via a key pad to enable the system to be tailored to suit the protected building, and to permit future changes. This configuration shall be maintained under power failure conditions.

The control unit shall have a front panel comprising of indicating LED's, control keyboard, and LCD display.

The system is to incorporate a polling system which polls each sensor individually and reads information at regular intervals to the control unit. The panel shall make decisions based upon the information obtained from each detector.

4.2 Communication circuit

Usually A 2-wire circuit (2x1.5mm², fire resistance, fire retardant, low smoke free of hydrogen (LSFOH)) is to be used for power and communication between the panel and the sensors. All cables shall be led in 1 inch diameter rigid hot deep galvanized conduit.

Also interconnection and required transmission signals such as status, releasing and malfunctions between addressable fire alarm control panel and firefighting system everywhere automatic fire extinguishing is required shall be established (Using local network devices or Input & Output modules).

4.3 Control System

All communication shall be under the control of the control unit, which shall sequentially poll each device in turn and authorize communication.

No device shall communicate with the control panel without authority.

The control unit must be able to read information from a device or send instructions to a device.

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4.4 Device address

Each device on line must be uniquely identifiable by the control unit. This must be achieved by pre-setting the address of each device.

Removal of a detector head from its base must extend a fault condition to the control unit.

4.5 Device status

The condition of each line device, including circuit, calibration and contamination, must be transmitted to the panel on each polling scan.

4.6 Sensitivity

Adjusting the sensitivity of the devices shall be possible from the main control panel.

4.7 Display and indicators

All display and indicators shall be LCD for text, and LED for lamp indication.

The type, calibration, sensitivity and status of each device must be able to be displayed at the control panel.

4.8 Number of devices in alarm

There shall be no limit to the number of devices which may be in alarm simultaneously.

4.9 Line protection and monitoring

The addressable line must be monitored for short circuit or open circuit.

The occurrence of an open circuit shall cause a fault signal on the panel, but all sensors or devices shall function correctly.

4.10 Backup Battery

1. The battery should permanently keep on stand-by by the automatic battery charger. The fire detection and alarm system will be maintained by batteries for max 48 hours in normal operation, in case of normal power failure followed by max 30 minutes alarm activated sounding. The Rated voltage of the battery and charger shall be manufacture's standard. Supervision of the batteries will be provided for control panels.

2. The battery shall be charged automatically by battery charger.

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3. The dead battery shall be charged to 80% of full capacity on 24 hours and to full capacity on 48 hours later.

4. The appropriate fuses should be considered.

4.11 Work Station

A compatible work station for System Administration / Management / Monitoring / Maintenance etc shall be provided by vendor and connected to addressable fire alarm control panel.

5 FIRE ALARM EQUIPMENT

The main considered equipment in the proposed fire alarm system is nominated as below:

5.1 Heat detectors

"Fixed" type and "rate of rise" type will be considered. The fixed type detector acts like thermostat however the "rate of rise" type acts according to the rate of heat rises. If the temperature reaches the set point, the detector commands.

5.2 Smoke detector

Ionization detector: it depends on invisible material produced from fire.

Photo detector: it depends on the concentration of visible smoke. According to standards, covering zone for each sensor should not be more than 50 m².

The distance between installed detectors and fixed walls should be more than 3.5 m for large rooms.

For small rooms and corridors, it is not necessary to be more than 3.5m. Surface of the roofs should be flat.

For sloped roofs, sensors should be installed on the highest point of building.

5.3 Linear Heat Detector for Transformers

Linear Heat Deception is a line-type form of fixed and spot temperature heat detection used in common commercial and industrial environments. This linear cable can detect a fire anywhere along its entire length and is available in multiple temperatures.

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5.4 Horn & Alarm Enunciators

It will be considered to locate enough outdoor Horn and alarm enunciators' to cover the entire site to inform all people when firing is happened. Protection category will be considered as IP55 for outdoor installation.

5.5 Manual Call Points

The manual call point shall be clearly identified by the word "FIRE" on the case. The call point shall be of robust construction with a break glass window and shall be colored signal red.

A replacement glass window shall be incorporated and breaking the glass shall automatically operate spring-loaded contacts.

A striker shall be provided, if necessary, adjacent to all call points to facilitate breaking the glass.

The manual call points shall be incorporated into separate circuitry from the automatic detectors and be mounted 1.4 m above the floor.

5.6 Addressable Modules for Detectors and Manual Call Points

Addressable control module (input or output) provides a supervised control point so module shall detect open or short circuit conditions in the signaling circuit.

The addressable interface module for conventional detectors such as Linear Heat Detector (LHD) must be capable of supervising a two-wire, non-addressable conventional detection zone.

The addressable interface module for interface between Fire Fighting and Fire detection Systems shall send required signals (such as status, ...) to fire fighting panel in the event of a short circuit in the cables of the loop.

6 NECESSARY INFORMATION FOR SYSTEM DESIGNATION

The main parameters which have the basic rule on Fire alarm system designation and installation are as follow:

- 1) Quantity and voltage of transformers
- 2) Quantity and dimension of rooms for protection
- 3) Length of installed routes in cable ways.

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6.1 Allowable voltage variation, temperature and humidity

The equipment shall provide the required functions under the following conditions:

Voltage supplied from the main or secondary (standby) power supplies, is in the range of 90%.110% of the nominal voltage indicated on the equipment.

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6.2 The basic requirements for system components

Power supplies

The power supply integrated in the control units consists of an electrical source of 230 VAC (+/- 15%) at 50 Hz, single phase, the emergency power back up shall be provided as a rechargeable battery which automatically takes over the power supply of the control unit with no break on mains failure. The battery is permanently kept on stand-by by the automatic battery charger.

All necessary operating and indication elements are built-in in the front of each control unit housing.

The signals should not be lost, interrupted or delayed for more than 10 seconds as a result of the failure of the main supply source.

6.3 Compatibility

All fire-detection devices that receive power supply from control panels (via communication lines with the detectors) must be certified (certified) by the combined use of these control panels.

6.4 Functions of the system

Fire alarm systems used to protect buildings must have one or more of the following functions:

1. Manual start fire alarm signal
2. Automatic fire alarm signal
3. Monitoring of abnormal system fire regimes
4. The start-up of the fire
5. Start features fire safety
6. Fire sirens Launch
7. The voice alert system/speech communication system
8. The monitoring of work management systems
9. Launch signals outside the building
10. Monitoring of voltage
11. Activation of firefighting system everywhere automatic fire extinguishing is required
12. switch off the ventilations in case of fire alarms

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6.5 The main requirements for the components of the systems

Device initialization Instruments

Performance, selection and placement of automatic fire detection devices, sensors and initialization control devices must ensure timely detection and localization of fire.

Smoke and heat detectors shall be installed in all areas where they are required by relevant codes or standards.

When choosing type and location of detectors, performance of characteristics shall be considered to prevent false alarms or incorrect operation after installation.

Manual call point push buttons must be used only for the purpose of initiating a fire alarm.

All smoke detectors should be addressed. Address line to connect smoke detectors must be installed under the scheme ring. In the protected building, the appearance of a single conductor lines break, short-circuit or wire to the ground should not result in an unusable system.

In areas with automatic fire fighting system, design of detectors shall be cross type.

Fire control devices

Fire alarm systems must be integrated systems, the system combines all the functions of detection and warning of fire and extras.

For the exchange of data between control centers, special shielded cables laid in a ring pattern shall be used.

Fire resisting cables shall be used.

Fire resisting characteristic of electric cables shall be according to IEC 60331 and IEC 60332-1 standards. Test on electric cables under fire conditions will be considered according to IEC 332-3 standard.

Fault handling principles for fire detection must be provided.

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6.6 Basic fire alarm concept

The following table shows how the different fire alarm system will be considered for different areas:

Item	Protected Area	Manual Call Point	Smoke Detector	Heat Detector	Linear Heat Detector	Multi (Smoke & Heat) Detector	Gas Detector	Note
1	Cable Room	X				X		1
2	MV & LV Room	X	X					1
3	Panel Room	X	X					1
4	Control Room	X	X					1
5	Engineering Rooms	X	X					1
6	Laboratory	X				X		1
7	Transformer Rooms	X			X			1
8	Auxiliary Buildings	X	X					1
9	Battery Room	X					X	1
10	Pantry			X				1
11	Office	X	X					1

Notes:

- 1) Type of detectors will be finalized in detail design stage.