INTERPLANT STANDARD - STEEL INDUSTRY		
IPSS	**SPECIFICATION FOR FIRE DETECTION AND ALARM SYSTEM**	**IPSS: 2-07-096-14**
	EXISTING IS - 2189	Formerly-: Not Designated *(New Standard)*

1. FOREWORD

1.1. Interplant standardization: Standardization activity in steel industry is being pursued under the aegis of Steel Authority of India Limited (SAIL). This Interplant Standard has been prepared by the Standards Committee on Instrumentation and Automation IPSS 2:7, with the active participation of representatives from the steel plants, other concerned organizations and established manufacturer in the field, and was adopted on **April 2014.**

1.2. Interplant standards on design parameters primarily aim at achieving rationalization and unification of parts and assemblies of process and auxiliary equipment used in steel plants and these are intended to provide guidance to the steel plant engineers, consultants and manufacturers in their design activities.

1.3. Objective – Objective of this standard is to give specification of Fire Detection and Alarm (FDA) system to help selection of the same for the purpose of automatic fire detection and alarm at various locations in the steel plant.

2. SCOPE

2.1. This standard covers the detail technical specification / requirement of FDA system to enable the users for proper selection of FDA system & its auxiliary components.

3. GENERAL

3.1. The Intelligent Addressable microprocessor based fire detection and alarm system will be software controlled/ Hardware addressing of sensors (As per User requirement) automatic system and will provide necessary programmed activities and various controls. The system generally consists of microprocessor based fire alarm control panels, Repeater panels, various types of intelligent addressable automatic Sensors/detectors, Manual pull stations, Hooters, Siren, various types of input/output interface modules, Exit sign board, Workstation, Printer etc and with SMS alert facility.

3.2. Entire system except for response indicator shall be sourced from the same make .

4. SPECIFICATION

4.1. Detectors

4.1.1. The system will comprise of Intelligent Addressable Type Detectors for standard applications. The detector will be suitably selected and provided as per NFPA standard to detect one or more characteristics of smoke and heat during fire. Depending on the application, heat, smoke, multi-criteria, flame or Linear Heat Sensing (LHS) type

detectors will be selected. They will be suitable for the climatic conditions pertaining to the plant site. The detectors will be plug-in type and will have common base.

4.1.2. All detectors will have suitable degree of protection to ensure that they do not generate false alarms due to moisture, particularly in non-air conditioned spaces where high humid conditions may prevail.

4.1.3. The detectors will have visual indications for status of healthiness of the detectors as well as alarm indication.

4.1.4. The visual alarm LED in the detector will be clearly visible from outside by a flashing light of sufficient brightness.

4.2. **Digital Linear Heat Sensing (LHS) Cable**

4.2.1. It will consist of two core cable in which the conductors will be separated by a heat sensitive insulation. When a specified temperature is reached, the cable insulation breakdowns, resulting short circuiting of conductors and thereby alarm is indicated. The digital LHS cables will have required outer shielding such as steel braid etc. Necessary monitor modules will be provided to connect this cable zone wise to addressable fire alarm control panel to indicate location and fire/fault condition. These cables will be used for detecting fire and or overheating in cables in certain specific areas such as cable tunnel, cable vault, cable cellar etc.

4.3. **Intelligent Addressable Control Modules**

4.3.1. The addressable control modules are provided for interlocking and controlling of the external appliances or equipment during fire. Some of the examples of interlocking devices are: - shutting-down of air-conditioning and ventilation system, activating the operation of firefighting equipment etc.

4.4. **Intelligent Addressable Manual Call Point (MCP)**

4.4.1. On each floor/area one or more Intelligent Addressable microprocessor based manual call point will be installed, preferably on the exit routes. Manual Call Points (MCP) will be installed at a height of 1.4 meters above the floor at an easily accessible position free of all obstruction. The MCP will form the integral part of fire detection system. The MCP will have two (2) diagnostic LEDs mounted on it. A green LED will flash to confirm communication with the loop controller. A red LED will flash to display alarm status.

4.5. **Intelligent Addressable Fault Isolator Modules**

4.5.1. It will be designed to be used in addressable system in communication loop to create a zone of 25/30 detectors/devices on an average. An integral LED will be with Fault Isolator Module to indicate the ‘Normal’ status as well as to indicate a ‘Fault’ in the loop.

4.6. **Intelligent Addressable Monitor Module**

4.6.1. The module will be suitable for connecting initiating devices such as pressure switches, flow switches, level switches, potential free contacts etc. in the addressable loop. It will be able to report its unique address to the panel to pin point the exact alarm location. An integral LED will be built in with Monitor module to indicate the status. It will be housed in a metallic/high impact plastic enclosure and suitable for indoor/outdoor installation.

4.7. **Response Indicator**

4.7.1. All the detectors in the rooms, below false floor, above false ceiling or generally at hidden locations will have external response indicators sited at visually accessible places.

4.8. **Hooter with Strobe**

4.8.1. The electronic hooter being located at vital places will have minimum audible level of 85 dB OR 5 dB above noise level of the working area. The hooter will have minimum two (2) tone facility.

4.9. **Siren**

4.9.1. The outdoor siren will be of rugged construction, have weather proof protection of minimum IP65 protection and suitable for outdoor installation. It will have adequate range to cover a radius up to 2 K.M or as applicable and will have dual tone. The operator at the fire station / security control room will have facility to energize the siren. The siren will have IP-65 enclosure.

4.10. Micro-Processor based Intelligent Addressable Fire Alarm Control Panels (FACP)

4.10.1. Fire alarm control panel will be intelligent with its own microcomputer and memory. FACP will have main processor board, necessary loop modules for detector loops, alarm output modules for external hooters/lamp control output modules for various control functions through relay contacts and communication module for interacting with CPU. The Fire Alarm Panels will be provided considering spare loop (Main Loops + one spare loop). The maximum 80% capacity of each loop card will be utilized for connecting intelligent detector and intelligent module. Intelligent Addressable Microprocessor based detectors/ manual call point and required field devices in the various areas will be connected to fire alarm control panels by class A wiring to the loop module. However, number of such sensors/devices per loop will generally be not less than 140 i.e. 140 detectors , 140 devices , Minimum 250 Nos in total per loop card. Provision of 20% spare capacity in each loop will be kept on all the panels.

4.10.2. Fire alarm control panel will have facility for Lamp test, fault test (earth fault, address fault, battery fault) and sounder test (external & internal hooters) and resetting facility.

4.10.3. Networking capability will be considered with other panels on ETHERNET /MODBUS/BACKNET/ OPC over TCP/IP protocol as per requirement. In multi-vendor scenario, open protocol will be considered for networking of multiple Fire Alarm systems.

4.10.4. Stand-by Battery back-up comprising of SMF batteries with battery charger will be considered for stand-by backup of Fire Alarm Panels and associated equipment. The battery backup will be for at least 24 hours plus additional 5 hour alarm time.

4.11. **Intelligent Addressable Repeater Panel**

4.11.1. Active Repeater Panel will be provided with LCD/ LED/ TFT display and in-built buzzer. Repeater panel will be of wall mounting type and it will have diagnostic LED within built buzzer. Network repeater panel will be programmable to repeat fire/fault signal of any individual panel or all the panels in the FDA network, as per requirement. The repeat signal will provide audio-visual indication.

4.12. **Fire Exit Board**

4.12.1. Self-illuminated Fire Exit Boards will be provided indicating escape routes under fire condition. The type of board will be as per site requirement.

4.13. **Central Monitoring System**

4.13.1. The status of individual FDA systems will be monitored from the central fire station of the Plant. All the FDA systems will be integrated over a global network and monitored from the Graphic workstation at central fire station. PC with LED/TFT monitor and printer will be used for central monitoring management.

4.14. **Graphic Workstation**

4.14.1. Graphic Workstation will be a special purpose computer to be used for central monitoring of the entire fire alarm system which will communicate with various microprocessor based fire alarm control panel peripherals of the system. The Graphic Workstation will be UPS driven.

4.15. **Power Supply**

4.15.1. Power supply shall preferably be 24 V DC (for Detectors) until and unless it is technical necessity to have different voltage.

4.15.2. Entire Power Supply shall be sourced from UPS.

5. **SELECTION OF DETECTOR**

5.1. Following detectors will be selected based on application:

5.1.1. Intelligent Addressable Multi criteria Smoke-cum-Heat Detectors

The detectors continually monitor any changes in sensitivity due to the environmental effects of dirt, smoke, temperature, aging and humidity. The detector will be suitable for the areas where ambient temperature is less than 32ºC.

5.1.2. Intelligent Addressable Optical/Photo-electric Smoke Detectors

Smoke detector works on light scattering system and is more responsible to visible particles produced by most smoldering fires, which is like PVC, when overheated, produced mainly large particles to which Photoelectric Detector is more effective. The detector will be suitable for the areas where ambient temperature is less than and equal to 45ºC.

5.1.3. Intelligent Addressable Heat Detectors

5.1.3.1. Heat detectors will be provided in the areas where heat producing equipment (e.g, battery room, hyd. room/cellars, transformer rooms etc.) are used. It continuously monitors the temperature of the air in its surrounding to minimize thermal lag to the time required to process an alarm. The integral microprocessor determines whether an alarm condition exists and initiates an alarm based on the analysis of the data. The detector will be suitable for the ambient temperature of 45ºC or as indicated by the Purchaser in the technical specification.

5.1.4. Fixed Temperature Type

5.1.4.1. The detector is designed to operate when it reaches a preselected threshold temperature.

5.1.5. Fixed Temperature cum Rate of Rise Temperature Elements Type

5.1.5.1. This is designed to operate on a rapid rise in element temperature irrespective of the starting temperature as well as it operates at a pre-selected threshold temperature.

5.1.6. Intelligent Addressable Infra-Red Flame Detectors

5.1.6.1. The IR detector is designed for the detection of fire hazards when the materials are being moved on conveyor belts. The detectors will work on Infra-red monitoring technology that enables the detection of small glowing embers within direct sight of the sensor including very high energy sources buried within the transported material that could not be detected by other conventional detectors. The detector should be designed to monitor the materials moving through its "field of view". The detector will be capable of detecting hazards at temperatures below flame point including embers and buried hot spots. The detector will have in-built air purging unit for dusty environments with air pressure monitoring.

5.1.6.2. The IR monitoring technology is also used for flame detection at hazardous area like fuel/gas storage etc. It responds to the flickering radiation emitted by diffusion type of flame normally found in fires. Because of the presence of other infra-red sources, flame detectors usually have some method of discrimination between fire & non-fire radiation; flickering sensing or the use of one or more infra-red emission bands.

5.1.7. Laser Smoke Detectors for Data Centre / Server Room/ Critical locations. Intelligent laser based smoke detection facility shall be considered. It shall have very high sensitivity compared to conventional smoke detectors.

6. ACCESSORIES

Following accessories may be considered along with the main equipment. However, extent of supply shall be as per Purchaser's requirements.

i) Licensed Software (FDA system software, operating system, GUI software etc.)

ii) Power cable, control cable, optical fiber cable, network cable, special cable etc.

iii) Computer tables, printer table and chairs

iv) Networking Equipment & associated Rack

v) UPS

vi) Conduits (HDPE, GI, PVC etc.)

vii) Cabling and erection accessories like LIU/fiber termination box, Patch Cord, Pigtails, Adaptors, Couplers, Connectors, saddles, cable, glands, joints, tees, cable identification tags, flexible pipe, channel/casing, nuts, bolts other accessories and consumables as required.

viii) Earthing material for Fire Detection System

ix) Detector maintenance tool kit

7. APPROVALS

Entire systems except for response indicator shall be UL listed and FM approved.

8. OTHER REQUIREMENTS

i) Addressable system will monitor individually, Intelligent Addressable microprocessor based detection devices connected on two wire circuit return loops.

ii) Each detector will use a specific address and communicates with fire alarm control unit providing signals which corresponds to its condition.

iii) The detectors will have provision for connecting repeat response indicator. The detectors connected over false ceiling and below false floor will be provided with repeat response indicator for attention of people in case of fire. Smoke detectors or probe will be installed in straight stretches of ductwork, at a proper distance from the nearest bend, corner or junction.

iv) The Intelligent Addressable Microprocessor based fire alarm control panel will have scanning facility. While scanning, the system will read the smoke or heat level detected by each sensor/detector and compares the reading to the alarm threshold for that sensor/detector. When the threshold is reached, the system will identify the sensor type and location by the assigned address and commands to respond an alarm. The alarm threshold will be auto-adjusted with respect to various climatic changes.

v) The placement of detectors and other accessories in the MCC or similar rooms, where height is not accessible, care should be taken to avoid installing detectors just above the live Panels/MCC or on high ceiling as far as possible.

vi) Location of Fault Isolator modules will be provided generally for every20-30 detector / Manual Call Points.

vii) The distribution of electronic hooters-cum-strobe will be such as to alert people uniformly all over the area covered under FDA system. The hooters will be suitably distributed throughout the building in considering attenuation of sound caused by walls, floors, ceilings and partitions. The electronic hooter-cum-strobe will be suitable for indoor use. For outdoor use, siren with larger coverage area will be provided. Zonal hooters with strobe will be provided in each zone and the same will be activated on receipt of fire alarming any fire zone of that floor.

viii) Cross-zoning of detectors will be done on software mode. All stairwells, lift shafts will have a detector at the top. Also all unenclosed staircase will have one detector at each main landing within the staircase.

ix) Zonal hooter with strobe of min. 10 W rating will be provided in each zone and the same will be activated on receipt of fire alarm in any fire zone of that floor.

x) Manual Call Points (MCP) will be provided in buildings etc. and generally at every 30m intervals in process bays, platforms etc. In the buildings, MCP will be provided in corridors, lobbies, entry to staircases, at the entry/exit of the building etc. Minimum one number of manual call points will be provided for each entrance / exit.

xi) Auto dialing facilities will be provided in each Fire Alarm Panel (FAP) for informing the Fire Service department persons via Purchaser Telephone cable network. Each Auto – Dialer for FDA system will have capacity at least four (4) numbers to dial.

xii) Fire alarm system will be interlocked with Air Conditioning and Ventilation systems as well as with process PLCs/automation panels.

xiii) All the detectors should return to their original sensitivity level after cleaning/ servicing/ maintenance.

xiv) The equipment and accessories will be designed, manufactured and installed generally in accordance with the latest revision of NFPA-72.

xv) All equipment in general will be designed for smooth, efficient and trouble free operation for the defined ambient temperature and humidity on 24hrs.