TECHNICAL SPECIFICATIONS FOR FIRE DETECTION & ALARM SYSTEM OF 350 kW TEST BED IN BHEL – R & D

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1.0 INTRODUCTION

This specification covers the requirements of Fire detection & alarm system to be provided for an upcoming Test Bed for 350 kW RPM Controller. The proposed fire detection & alarm system shall be designed to provide adequate safety measures in the areas susceptible to fire in compliance with the recommendations of the Tariff Advisory Committee (TAC) / National fire protection association (NFPA) codes. The scope of the work is design, engineering, selection, manufacture, assembly, inspection, shop testing, shop painting, delivery for site properly packed for transportation suitably protected from weather including transit insurance of all equipment, unloading at site, transportation to stores, safe storage at site, insurance against pilferage, transportation from stores to site, final painting, erection, testing, commissioning and performance testing, final handling over as mentioned hereinafter for the fire protection system, which form part of project.

2.0 CODES & STANDARDS

The design & installation of the above systems complies with the latest edition of following Indian codes:

Codes	Description
TAC	Rules for Fire alarm systems
IS: 2189	Code of practice for selection, installation and maintenance of automatic fire detection and alarm system

3.0 SCOPE OF WORK

3.1 Supply of Fire Detection and Alarm System (FDA)

FDA system shall cover the entire 350 kW test bed building, with Addressable, microprocessor based fire detection & alarm panel, automatic addressable type (multi sensor/heat) fire detectors along with Manual Call Points (MCP) located strategically.

a) Main Fire Alarm Panel (MFAP) shall be microprocessor based wall mounted panel (located in control room).

i. The microprocessor based main Fire alarm panel shall be designed to achieve the following:-

- To receive and supervise the signals from initiating device circuits of smoke/multi sensor detectors, manual call points.
- To process the signals and display the alarm / trouble conditions and also initiate action for remote audio annunciation, logging of event, as per the software program.

- To provide interface for initiating auxiliary functions such as tripping of air conditioning /ventilation scheme, elevator, tripping of breakers etc.

- System shall have capability to program, configure and expand facilities in the field without field replacement electronic integrated circuits.

- System shall store all field-defined programs in non-volatile memory.

- System shall provide all hardware, software, programming tools and documentation necessary to modify the fire alarm system on site. Modification may include addition and deletion of devices, circuits, zones and changes to system operation and custom label changes for devices or zones. The system structure and software must not place any limit on the type or extent of software modifications on-site. Modification of software must not require power-down of the system or loss of system for fire detection and protection while modifications are being made.

- The system shall be designed such that alarm indications override trouble conditions.

- The system shall have a provision of Auto Tele Dialer (ATD).

ii. Alarm Condition

- The system operation shall be such that the alarm operation of any alarm initiating circuits shall not prevent the subsequent alarm operation of any other initiating circuit.

- The system alarm operation subsequent to the alarm activation of any initiation device shall automatically perform the functions contained in this section.

- Alarm conditions shall be immediately displayed on the control panel. Alarm LED shall flash on the control panel until the alarm has been acknowledged. Once acknowledged the LED shall remain lit. A subsequent alarm received from another zone after acknowledgement shall illuminate the alarm LED and the panel display shall show the new alarm information.

- During an alarm condition, an alarm tone shall sound within the control panel until the alarm is acknowledged.

- When the alarm signals are silenced by pressing the Acknowledge pushbutton on the control module, the visual lamps shall continue to light until the alarm is reset at the control panel.

- All information associated with the alarm conditions, including the type of alarm point and its locations within the protected premises, is indicated on the Main Fire Alarm Control Panel Liquid Crystal Display (LCD).
- Operate audible notification appliances in all areas.
- Any subsequent alarm shall reactivate the audible signals.
- All alarm signals shall be automatically "locked in" at the control panel until the operated device is returned to its normal condition and the control panel is manually reset.
- All auxiliary functions shall be connected to and operated by the control panel.
- Upon the initiation of an alarm condition the system shall shut down the process.
- Supervise all circuits to addressable devices, annunciators and conventional peripherals and annunciate loss of communications with these devices. Upon loss of response from a device, it shall sound an audible trouble and indicate device or devices not responding.

iii. Trouble Condition

- Failure of normal power on the initiation circuits, or on the annunciation circuits, disarrangements in system wiring, or system ground faults shall activate a trouble circuit.
- An Amber "SYSTEM TROUBLE" LED shall flash and the system audible signal shall intermittently sound when any trouble is detected in the system.
- A trouble signal shall be acknowledged by actuating an 'ACKNOWLEDGE' push button switch. This shall silence the panel trouble buzzer.
- During an alarm condition, all "trouble" signals shall be inhibited.
- Unacknowledged alarm messages shall have priority over trouble messages, and if such an alarm occurs during a trouble sequence, the alarm condition will have display priority.

iv. System Supervision

- All wiring extending from the fire alarm system control panel to system components shall be supervised for open circuits, short circuits and/ or ground. Systems containing unsupervised wiring of any type shall not be acceptable.
- The occurrence of any fault shall activate the system trouble circuitry, but shall not interfere with the proper operation of any circuit that does not have a fault condition.
- Power supply shall be supervised so that any power failure shall be audibly and visually indicated at the control panel.
- DC Voltage shall be supervised so that a low voltage condition or disconnection of the battery shall be audibly and visually indicated at the control panel.
- The activation of any standpipe spray system shall activate a steady audible trouble signal and illuminate the supervisory LED at the control panel.

v. System Reset

- Means to reset the system to return the control unit to its normal state after an alarm condition shall be provided.

The fire alarm panel shall have a central power supply unit with a built-in battery backup for 24 hours operation with all functions.

All major devices installed in the panel and loop shall have 10% spare capacity. All wiring inside the panel shall be in accordance with the applicable codes & standards.

b) Multi sensor detectors shall incorporate a heat detection element and a photoelectric detection element. Both the element shall be incorporated in a single unit. Both the elements shall be operative at all times and the fire signal shall be available from any or both elements combined together.

c) The detectors shall be self-compensating for ambient temperature and humidity.

d) Beam detectors shall be provided in test bed area as per IS 2189.

e) Electronic horn shall be provided as an alarm annunciation device. They shall be placed in accordance with the applicable codes and standards, and shall provide sufficient coverage to notify all personnel in the affected area of an alarm condition.

The horn portion shall be solid-state construction and shall produce a minimum broadband output of ≥100 dBA at 1 meter in an un echoic chamber with continuous applied power. Higher output horns shall be utilized if the background noise level is sufficient to warrant a higher output requirement

f) Response indicators shall be provided for detectors placed above false ceiling.

In areas such as false ceiling / flooring where detectors themselves are not easily accessible, the remote response indicators outside the enclosed areas shall be provided to indicate the fire condition.

g) Manual call points (pull type) and hooters shall be provided as per IS 2189.

At least one addressable manual call point shall be provided on each floor/level at each exit. Further, maximum travel distance between any two manual call points shall not exceed 30 meters in any direction.

h) Power/Control Cable

All the devices / detectors in the system shall be looped to main fire alarm panel as per IS 2189 with armored, stranded copper cable.

i) Required no. of modules shall be provided for interfacing main fire alarm panel.

Control / Monitor modules shall be provided to:-

- Receive signals from each circuit of cable connected to the control module.
- Report the cable control module conditions to the Main FAP
- Supervision and monitoring of the associated initiating device circuits and notification appliance circuits for trouble and alarm conditions.
- Detection of the operation of any associated initiating device circuit and the location of the alarm condition.
- Operation of all notification appliances and release devices.
- Visually & audibly annunciate trouble, supervisory or alarm condition on panel display.
- Modules for interfacing with elevators, HVAC etc shall be considered by bidder.

j) Self-illuminating emergency exit signs

Exit sign boards shall be rigid photo luminescent based glow-in-the-dark rigid sheet with high intensity luminous properties enclosed in a transparent weather-proof UV stabilized coated sheet with UV screen printing by imported inks.

These shall be placed at all the exits as per statutory requirements.

k) Required erection hardware, special tools and termination kits for complete erection & commissioning of the Fire Detection & Alarm package shall be in bidder scope.

l) Detectors shall be provided as per the below table:-

Sl. No.	Area	Equipment
Ground Floor		
1.	Electrical Panel Room	Multi criteria detectors = 2
		Manual call points = 1
		Hooter cum strobe = 1
		Response indicator = 1
		Exit sign = 1
2.	Drive Panel Room	Multi criteria detectors = 2
		Manual call points = 1
		Hooter cum strobe = 1
		Response indicator = 1
		Exit sign = 1
3.	Entrance Lobby	Multi criteria detectors = 1
		Manual call points = 1
		Hooter cum strobe = 1
		Response indicator = 0
		Exit sign = 1
4.	Pantry	Heat detectors = 1
		Manual call points = 1
		Hooter cum strobe = 1
		Response indicator = 0
		Exit sign = 1
5.	Lab	Multi criteria detectors = 4
		Manual call points = 1
		Hooter cum strobe = 1
		Response indicator = 2
		Exit sign = 1
6.	Control Room	Multi criteria detectors = 2
		Manual call points = 1
		Hooter cum strobe = 1
		Response indicator = 1
		Exit sign = 1
7.	Workshop Area	Beam detectors = 1
		Manual call points = 2
		Hooter cum strobe = 2
		Response indicator = 0

		Exit sign = 2
First Floor		
1.	Office Room	Multi criteria detectors = 2
		Manual call points = 1
		Hooter cum strobe = 1
		Response indicator = 1
		Exit sign = 1
2.	Lab Manager Room	Multi criteria detectors = 2
		Manual call points = 1
		Hooter cum strobe = 1
		Response indicator = 1
		Exit sign = 1
3.	Discussion Room	Multi criteria detectors = 4
		Manual call points = 1
		Hooter cum strobe = 1
		Response indicator = 2
		Exit sign = 1
4.	Cabin Room	Multi criteria detectors = 2
		Manual call points = 1
		Hooter cum strobe = 1
		Response indicator = 1
		Exit sign = 1
5.	Work Stations Room	Multi criteria detectors = 4
		Manual call points = 1
		Hooter cum strobe = 1
		Response indicator = 2
		Exit sign = 1
6.	Corridor	Multi criteria detectors = 3

Note: - All the items mentioned above shall be UL/FM/Vds/LPCB approved.

3.2 Erection & Commissioning of Fire Detection and Alarm System

Complete fire detection & alarm system shall be erected, commissioned and tested before handing over the system to purchase

4.0.0 SCOPE OF WORK

4.1.0 Equipment and services to be provided by bidder

The equipment and services to be Supplied installed and commissioned by bidder under this contract are detailed herein for reference. Any item though not specifically mentioned but required for safe and satisfactory operation of system and for any modification or changes for taking care of TAC/accredited agency approval of system shall be treated as included and shall be supplied within the quoted price and no extra shall be admissible on such account unless otherwise specified clearly in the bid offer.

SR.	FIRE DETECTION AND ALARM SYSTEM BILL OF QUANTITY	UNIT	QTY
1.	Addressable Multi-criteria detectors	Nos.	28
2.	Addressable Manual Call Points	Nos.	14
3.	Addressable Response Indicators	Nos.	12
4.	Beam Detectors	Nos.	01
5.	Heat Detector	Nos.	01
6.	Addressable Hooters sum Strobe	Nos.	13
7.	Addressable 2 loop Microprocessor based Master fire alarm panel with its own battery charger, Battery for 24 hours backup	Nos.	01
8.	Control Cables - 1.1 KV Grade to IS: 1554, Overall FRLS Sheath, Screened Armored & twisted Size: 2C x 1.5 mm 2	mt	300
9.	Exit Sign Boards	Nos.	13
10	Addressable Input module	set	01
11	Addressable Output Module	Nos.	02
12	Fault isolator Module	Nos.	03
13	Power Cables between main Fire Alarm Panel and Nearest Supply Point (2C x 2.5 mm2 – FRLS Type)	mt	15

- Supply, laying and termination of FRLS power, control cables required for complete fire detection & alarm system.
- Necessary cable glands/lugs/connectors/clips/conduits etc. for laying and termination of control cables.

4.2.0 Equipment and services to be provided by purchaser (BHEL)

- Supply and laying of power cables for 240V, 1-Ph, 50 Hz power supply to fire alarm panel.
- Provision of space for mounting or placement fire alarm panels.