PLC BASED FIRE DETECTION & ALARM SYSTEM

1. SCOPE OF WORK
   1.1. Design, Engineering, Manufacturing and supply of PLC based Fire alarm detection system for Multi Storied Building of VSSC with SCADA based display at multiple locations, through the existing Intranet facility available with VSSC.
   1.2. Scope includes supply of suitable Smoke & Heat Detectors, Manual Call Points, duct detectors hooters etc. & siren as per applicable standards.
   1.3. Proposed system shall be installed in the 9-storey building of VSSC and bidder shall design the system in such a way that individual room numbers with details shall be displayed in the SCADA system and HMI display in case of fire or any defect in the system.
   1.4. Bidder shall select the devices like detectors, Manual Call Points, Duct detectors hooters compatible with the PLC.
   1.5. Supply and installation of public addressing system with necessary amplifier units and speakers inside & outside the rooms.
   1.6. Supply of PC and Laptop with necessary software required for uploading, downloading, configuration and editing of PLC programs. All interface communication cables required shall be included.
   1.7. Any software supplied shall have eternal license and shall be in name of VSSC.
   1.8. Erection testing, pre commissioning and commissioning of the supplied Fire alarm detection systems including all other relevant accessories shall be under the scope of bidder.
   1.9. The job includes removal of Old panels, detectors and cable terminations of all existing interconnections, power supply, field termination etc and same shall be handed over to VSSC.
   1.10. System shall include necessary battery backup to support the system in case of power failure.
   1.11. Bidder shall provide Cables for connecting all the field devices. Laying of new cables is under the scope of the bidder. (Hence Bidder is advised to design the system accordingly). Detailed cable requirement with specifications shall be provided in the BOM and shall meet the specifications as mentioned in para 6.8.
   1.12. Quantity of field devices mentioned in the tender document is indicative only. Spacing of the detectors shall be as per the “Annexure 1” enclosed. However bidder has to submit a detailed BOM only after assessing the site requirement.
1.13. Bidder shall provide suitable surge protection devices to all the systems connected.

1.14. Bidder has to impart technical knowhow and awareness to a satisfactory level to VSSC Engineers during the process of commissioning at site about the complete Operation and Maintenance aspects of the system.

1.15. Bidder is advised to visit and examine the site and shall familiarise himself with the existing facilities and shall collect all the information which he may require for submitting the bid.

1.16. Bidders are required to quote exactly as per requirement and to be submitted as per Formats provided. Bidder shall also submit an un-priced copy of the pricing schedule along with technical bid. This shall also include details of all the components/equipment proposed and the commercial terms.

1.17. Bidder shall note that Supply, Erection testing, pre-commissioning and commissioning of the Fire alarm detection in totality is on a TURNKEY basis and shall be awarded to one single Bidder only. Evaluation will be done accordingly.

1.18. Bidder must state categorically whether or not their offer meets all the technical and job specifications. Bidder shall furnish a complete list of deviations.

1.19. Bidder shall supply all technical specifications/information as mentioned in the tender. Detailed specifications of the supplied system, filled data sheets, drawings and operation manuals, printed Catalogues and technical literature for all the items should be supplied along with the offer.

1.20. VSSC reserves the right to suggest suitable modifications in the design provided by the bidder.

1.21. Bidder to note that any information not asked in the tender but is required to support the functional requirement must be provided.

1.22. Bidder prior to proceeding with any job at site should take approval from VSSC.

1.23. Bidder to ensure availability of necessary spares required during commissioning of the system.

1.24. Bidder shall be fully responsible for meeting all functional requirements through hardware and software on commissioning. Any change/modification or addition of systems/equipment/software necessary to achieve these functional requirements during detailed engineering shall be carried out by the bidder at his own cost. Any Software modification within 24 months from the installation has to be done free of cost by the bidder.
1.25. Bidder to note that they have to provide details of BOM. Bidder to also note that BOM shall not be checked by VSSC, bidder shall assume full responsibility for meeting all the functional requirements through hardware and software during detail engineering at his own cost.

1.26. Bidder has to provide warranty of the supplied items **24 months** from the date of Site Acceptance Test and post warranty AMC support for a period of **Five years**. (Quote Separately)

   i. AMC shall be non–compressive. It shall include four visits per year. Vendor shall carryout necessary software changes as requested, take system backups submit a report on performance of all systems.

   ii. In case if any major problem with the system vendor shall reach VSSC within 24 hrs after being informed through e-mail, phone / fax etc.

   iii. A detailed list of essentials spares along with price shall be submitted separately.

1.27. Bidder shall quote the price separately for the systems like detectors, hooters, Manual call points etc. for expanding the similar systems in other areas not covered/mentioned in this document. The price for supply and installation of cabling may be quoted on per metre basis.

2. **MODE OF TENDERING**
   Details as per the Specific Terms and Conditions mentioned in the tender document.

3. **MODE OF EVALUATION**
   Offers will be evaluated based on the compliance to execute the work as per the scope of work, specification, experience and credentials of executing the work of similar nature. Offers not accompanied without documentary evidence of having executed similar job shall not be considered. However the department reserves the right to accept/reject any offer without assigning any reason thereof.

   **Pre bid Discussion:** A pre bid briefing will be scheduled at VSSC to brief the contractors on the actual scope of the work and other conditions of the contract. The pre bid meeting will be arranged after 15 days from the date of Public Tender advertisement in the newspaper. During this meeting, site visit will be arranged for getting first-hand information on the site conditions and other aspects before quoting. Offer of those parties who have participated in the pre bid meeting only will be considered. Other offers will be considered as unsolicited and will not be considered.

   All those who desire to participate in the pre bid meeting shall contact Shri. Vignesh R SFD / VSSC Tel. 0471 256-2261 / 3761 order to arrange the entry pass.

   The party shall make a detailed technical presentation about the proposed system before price
bid opening if called for.

**Bid Evaluation Methodology:**

[1] Evaluation shall be done on overall L-1 basis.

**Techno-Commercial Bid Evaluation:** The evaluation of all the responsive bids to arrive at the lowest evaluated offer shall be done on OVERALL L1 basis i.e.

1. Ex-works price quoted by the bidder including installation and commissioning.
2. Packing & Forwarding charges, if any
3. Excise duty on the finished goods
4. Sales tax (with/without form "C") OR VAT
5. Any other taxes mentioned by bidder
6. Freight charges (as quoted) for inland transportation up to VSSC site
7. Any other charges quoted by bidder

**4. WORK EXPERIENCE & COMPETENCY**

The Bidder having minimum three years’ experience in the relevant field may submit their credentials indicating the same in execution of similar type of installation works on Fire detections system.

The bidder should have successfully executed at least single order for supply, installation & commissioning of PLC based Fire detection system of similar nature of job to an organization of repute (Govt./semi govt./ PSU/ Private) industry.

In support of the above, bidder has to submit the following documents along with bid:-

Proof of work executed i.e. client certificate indicating the satisfactory completion of supply, installation & commissioning of PLC based Fire Alarm detection systems or Copy of work order along with detailed Schedule of rates & Invoice for the same work executed.

**5. PROPOSED SYSTEM:**

New proposed system should have the following features:

5.1 The suitable type of detectors, Manual Call Points (MCP), Duct detectors shall be provided in the rooms available in the building.

5.2 If any Detectors gets activated or MCP are operated from the field, siren shall blow as per standard Siren code and indication with Room no. details shall come in the screen locally available and SCADA display available at VSSC Fire Station. A separate 8"(nominal) touch screen HMI display shall be provided to monitor the sensor status locally. The HMI shall be password protected.

5.3 Display of all details of detectors available in each floor wise and MCP points shall be displayed in single screen with the exact location in SCADA system.

5.4 Provision for selecting different siren modes from HMI / remote stations, like Test
siren, Alarm mode, All clear and Evacuation as per the siren code shall be made available in the PLC/SACDA system.

5.5 Provision for selecting Auto and Manual mode.

5.6 Provision to isolate/ Bypass any single MCP unit/ detectors keeping other MCPs detectors in working condition

6.0 SPECIFICATIONS:

6.1 Programmable Logic Controller:

6.1.1 Reputed PLC (Rockwell/Siemens/Omron/GE Fanuc/ Honeywell/Allen Bradley/ABB/Bosch etc..) based control system for execution of all control logics.

6.1.2 PLC shall be located inside a control panel made of mild steel of suitable thickness and shall be powder coated.

6.1.3 Suitable cooling system shall be provided in the control panel.

6.1.4 Control panel shall be provided with lock and key. And in case of any unauthorised access it shall be communicated to the SCADA display at the fire station.

6.1.5 If the I/O modules are separately provided at each floors, then each module shall be suitably protected with a covering to avoid unauthorised access to the system.

6.1.6 PLC based system shall be user programmable either from front key pad or through PC/Laptop working in windows environment or any other user friendly operating system.

6.1.7 HMI shall display the status of the connected system.

6.1.8 Bidder shall select I/O Card based on the number of devices to be connected. General schematic layout of the building is enclosed as Annexure 1. However the system shall take care the following: number of each system to be included,

i. System shall have input processing circuit for Photoelectric type Smoke Detectors.(approx. 239).

ii. Input processing approx. 18 manual call points.

iii. Input processing for approx. 71 Duct detectors.

iv. Input processing circuit for approx. 35 Heat detectors.

v. Potential free contacts for tripping AHU/AC.

vi. Output processing circuit for energizing approx. 18 hooters cum strobe.

6.1.9 System shall have an audible indication at control Panel for any abnormality like system failure, power failure etc.
6.1.10 SMS relay module capable of sending messages to the predefined numbers & e-mail generation to the defined receipts minimum 5 numbers.

6.1.11 Provision of Fire siren auto manual selection.

6.1.12 Suitable circuitry for distinguishing Fault and alarm.

6.1.13 Extension of Alarms and status signals to the SCADA/ SCADA terminals including HMI.

6.1.14 Provision of 25% spare I/O channels in the PLC System for MCP/Smoke/Heat detectors to take care of immediate expansion if required.

6.1.15 Accept / reset facility for acknowledging alarms at HMI panel at site.

6.1.16 Required Documents like as built wiring diagram, logic diagram, system functional description etc. in the form of hard copy and softcopy to be provided.

6.1.17 The system shall be connected through the existing intranet network available at VSSC.

6.2 GRAPHIC MONITORING SOFTWARE

6.2.1 The software shall be compatible with the PLC fire alarm and detection system. This shall permit monitoring and control of multiple areas or building from a single point of system access.

6.2.2 All the information shall available on a single screen allowing quick Assessment.

6.2.3 It shall provide specific information and/or control options that relate to the event highlighted in the Event list. Related information may include event action information (specific tasks the user may need to perform in response to the event), or geographical information about the area where the event has taken place.

6.2.4 Graphical maps shall also be presented to aid in the understanding of an event and how it should be managed.

6.2.5 The system shall display the address of the alarm or off-normal point with type and description and time of the event in a prioritized colour-coded event list.

6.2.6 Highlighting an event in the event list shall automatically cause the other viewports (described below) to display information relating to the highlighted event. The system LCD shall display colour graphical representation of the area in which the alarm or off normal device is located (Floor, room no, cabin no etc.).

6.2.7 It shall be possible for the operator to manually zoom in to any portion of a vector- based graphic without aliasing, artifacting, or pixilation of the image.

6.2.8 Graphics should be windows / any other use friendly operating system based (Latest Platform), dynamic and should display real-time values. Software license
shall be of network basis and is to be provided for at least 4 user systems and Perpetual License should be in the name of VSSC.

6.2.9 It must be possible to operate control functions from the PC including acknowledging, silencing, and resetting of fire alarm functions from the Fire Station.

6.2.10 It must be possible to manually activate, deactivate, enable, and disable individual fire alarm points.

6.2.11 The system shall be capable of generating status, maintenance and sensitivity reports for all fire alarm components. The system must be capable upon receipt of a fire alarm to activate an audio sound over the workstation speakers alerting the operator to an alarm and providing audible instructions.

6.2.12 The system must be capable upon receipt of a Fire Alarm, Monitor Event to send e-mail messages to appropriate recipients via a SMTP mail server.

6.2.13 The system shall provide the ability to schedule the automatic running of reports. Reports shall be capable of being scheduled daily, weekly or monthly. Scheduled reports shall be automatically stored electronically for easy retrieval.

6.2.14 The system shall provide for simple control via a computer mouse, touch-screen and keyboard commands.

6.2.15 It shall have option to monitor and display events from fire and security panels of different manufactures at a common location.

6.2.16 The system shall be capable of generating daily report with provision for selecting date, time for any occurrences like alarm, acknowledgement, silence etc on a separate event log file.

6.3 USER INTERFACE

6.3.1 All off-normal events displayed simultaneously with text and corresponding graphic screens.

6.3.2 Automatic screen navigation (selectable for each device) that locates and zooms to the device related to an alarm or event, based on the priority of the event.

6.3.3 Dynamically generated floor plan overview.

6.3.4 Floor plans can be zoomed in and out and devices can be placed at different zoom levels.

6.3.5 Full linked multimedia (text, audio, video, and bitmaps) to any device, all definable by the administrator.

6.3.6 Intuitive navigational tree and icons for easy access to building floor-plans.
6.4 SPECIFICATIONS FOR DETECTORS

**Smoke detector**: Sensor shall be of Multi sensors type and integral response indicator with 360 degree sensing. The detectors must have high tolerance to dust, dirt, temperature fluctuations and air currents. Mounting position shall be on ceiling in open areas and above false ceiling where ever required.

Operating voltage shall be 18V to 30 V DC.

Standards EN 54/LPCB/VDS/FM.

Ingress Protection Class IP40.

**Heat Detector**: Sensor shall be of (Static +Rate of Rise) type and integral response indicator with 360 degree sensing angle and can be set to 3 different modes of ROR temperature alarm settings. The detectors must have high tolerance to dust, dirt, temperature fluctuations and air currents. Mounting position shall be on ceiling in open areas and above false ceiling where ever required.

Operating voltage shall be 18V to 30 V dc.

The sensors shall conform to EN 54/LPCB/VDS/FM standards.

Ingress Protection Class IP40.

**Duct Detector Unit**

Duct detector shall provide early warning of an impending fire and prevent smoke from circulating throughout the building. It shall detect smoke in the supply side of the HVAC system but can provide supervision of the return side as well.

The detector assembly cover shall provide easy access to the smoke sensor, its wiring connections, sample and exhaust tube fittings, and the smoke chamber itself. Air shall enter the detector’s sensing chamber through a sampling tube that extends into the duct and is directed back into the ventilation system through an exhaust tube. The difference in air pressure between the two tubes shall pull the sampled air through the sensing chamber. When a sufficient amount of smoke is detected in the sensing chamber, the detector shall initiate an alarm. The detector shall be complete in all sense and of the same make including housing.

The functional requirements of the Duct Detector Unit shall be:

- Air velocity rating: 100 to 4,000 ft/min and meets the required minimum air pressure differential Air pressure differential : 0.005 to 1.00 inches of water
- Sensitivity : 0.8 to 2.5 %/ft obscuration (nominal) or better.

The sampling tube shall be installed from either the duct side of the assembly or from inside the sensor compartment, as preferred by the installer. (The exhaust tube must be installed from the duct side.) Sampling tubes may be rotated so that air-holes can be aligned to allow the unit to be mounted at virtually any angle relative to the air flow.

The Duct detector Unit shall be compact, easy to install and with the facility to dismantle the
cover or Detector for maintenance purposes.

The Duct Detector Unit shall be UL Listed and FM Approved.

6.5 MANUAL CALL POINTS

The fire alarm station shall be of ABS/ Polycarbonate construction and incorporate an internal press re-settable switch.

The station shall have RED LED indicator to indicate Alarm Condition.

It should be finished in red with "FIRE" lettering/Symbol

6.6 HOOTER CUM STROBE

Electronic hooter cum strobe shall operate on 24 V DC nominal.

Sounder/ horn output shall be minimum 92 dB and with multiple frequencies tone that result in excellent sound penetration and an unmistakable warning of danger.

Horns shall be configured for either coded or non-coded signal circuits. They can also be set for low or high dB output. Horn-only models may be ceiling-mounted or wall-mounted.

The suggested sound pressure level for each signalling zone used with alarm signals shall be at least 15 dB above the average ambient sound level, or 5 dB above the maximum sound level having a duration of at least 60 seconds, whichever is greater, measured 5 feet (1.5 m) above the floor.

Strobe and horn-strobes shall comply with UL 1971 signals for public mode operation.

Strobes may be set for 15, 30, 75, or 110 candela output. The output setting shall be changed by simply changing the switch to the desired setting. The device shall not have to be removed to change the output setting. The setting shall remain visible on the device after the cover is closed.

6.7 PUBLIC ADDRESSING SYSTEM

6.7.1 SPEAKER

All speakers shall operate on 25/70/100 VRMS or with field selectable output taps from 2.0 to 5.0 Watts or better.

Speakers in corridors and public spaces shall produce a nominal sound output of 90 dBA at 10 feet (3m).

Frequency response shall be a minimum of 400 HZ to 4000 HZ.

The back of each speaker shall be sealed to protect the speaker cone from damage and dust.

Front portion of the speakers to be adequately protected for any sudden accidental damages.

Speakers installed outside the buildings should be adequately protected from all weathers.
6.7.2 AMPLIFIER UNIT

6.7.2.1 Amplifier shall be able to meet the complete requirements of the above proposed speakers in multi storey building (9 floors) and the surrounding assembly areas.

6.7.2.2 The requirement of each floor is approx. 35-40 watt.

6.7.2.3 Amplifiers will form an integral part of the PLC, housed in the same housing as the PLC.

6.7.2.4 There should be provision to link the amplifiers for announcement of any fire event automatically and manually.

6.7.2.5 The system shall be capable of fulfilling the following requirements:

6.7.2.6 Clear, un-distorted announcements to selected areas during public addressing;

6.7.2.7 Clear, un-distorted paging to all zones; either individually or collectively. Selection of floors/ groups of zones shall be programmable from time to time.

6.7.2.8 The system shall have a provision that each floor of the building can be selected and addressed individually.

6.7.2.9 The system shall be designed such that when the Public addressing system is switched ON the hooter/siren shall be muted.

6.8 CABLE REQUIREMENT

For networking/ Communication(CAT-6) : 2 C x 1.5sqmm Copper twisted pair cable (ATC), FRLS Type. Aluminium Mylar shield, PVC covered armoured cable. Approximate Length – 600Mtrs

For Loop/ Speaker: 2 C x 1.5sqmm Copper twisted pair cable (ATC), FRLS Type. PVC covered armoured cable – Approximate Length – 10,000m

Power : 2 C x 1.5sqmm Copper twisted pair cable (ATC), FRLS Type. PVC covers armoured cable. Approximate Length – 200m

Approved Make for all Cable Types as above: Polycab / HAVELLS /KAYCEE/ UNIVERSAL/ LAPP

Minimum Cable rating is 1.5 sq mm. However successful bidder has to submit the calculation sheet for total load calculation of power for the basis of selection of cable and the executer has to provide higher rating cable as well if the same is required. Bidder shall also provide specifications of cables that are not listed in this document specifically.

7. TESTS AND ACCEPTANCE:

Bidder shall submit SAT procedure for approval of the VSSC. This document shall include the information related to each test (purpose of the Test, definition procedure for the test, test results, final acceptance etc.)
If during execution of functional tests, any electronic component of the unit is required to be replaced e.g. due to malfunction or failure of the unit to fulfil the performance requirements of the specification, then the test shall be repeated.

8. SUBMISSION OF DRAWINGS, CERTIFICATES, SOFTWARE CD & PANEL KEY:

1 Set Original + 3 Sets in hard & soft copy in CD of Final Drawings(as built), Connection Diagram, PLC program, Operating & Maintenance Manuals, Complete Bill of Material, and Troubleshooting instructions, All Test Reports / Certificates are to be submitted to VSSC. One set of duplicate Panel key shall be submitted to VSSC Engineers at site by the representative of the bidder at the time of commissioning.

Original Licenced software along with licences details shall be provided.

9. RECOMMENDED SPARES:

Bidder shall submit the list of critical spares along with Price (sealed cover), complete technical details, specifications, description, part No., dimensions, rating etc. along with the bid as a Separate annexure.

10. WARRANTY:

The total system & components supplied shall be covered under performance warranty for a period of TWENTY FOUR MONTHS from the date of acceptance by VSSC.

On site rectification (including replacement of defective components) of warranty issues shall be done within 48 hrs from intimation from VSSC. Delay beyond 72 hrs shall attract application of LD clause as per VSSC norms. The failure of any component during this period shall be the responsibility of supplier and that needs to be replaced / repaired without any cost implication to VSSC. Software up gradation / modification during the commissioning / warranty period shall be under bidder scope only.

11. COMPLETION PERIOD:

The supply, installation and commissioning to be completed in all aspects within Six Months from the date of acceptance of the purchase order subject to availability of site from the user side.

12. OTHER REQUIREMENTS:

Bidder shall submit single line drawing, General Arrangement drawing and general schematic drawing showing module configuration, interconnection scheme, bill of material etc. of the system along with the bid.
List of Technical documents to be submitted along with the technical bid.

1) Complete technical specifications.
2) Single line drawing, General Arrangement drawing and general schematic drawing showing module configuration, interconnection scheme, unpriced bill of material.
3) Terminal details and wiring diagram.
4) List of Critical spare