EED- 50-23

SPECIFICATIONS OF ADDRESSABLE AUTOMATIC FIRE DETECTION SYSTEM FOR NAVAL SHIPS

ISSUING AUTHORITY

DIRECTORATE OF ELECTRICAL ENGINEERING INTEGRATED HEADQUARTERS MOD (N) NEW DELHI 110011
## RECORD OF AMENDMENTS

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2. **Revision Note**: - Nil

3. **Historical Record**: - Nil
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STATEMENT OF TECHNICAL REQUIREMENTS –
ADDRESSABLE AUTOMATIC FIRE DETECTION SYSTEM

1. **Scope.**

1.1 This technical specification covers the manufacturing, testing, supply and onboard commissioning of the Fire Detection System which is located onboard ships for detecting fire.

2. **AFDS Characteristics**

2.1 The system should be suitable for operation on ship’s supply of AC as normal supply. The power to the system should be provisioned through on-line UPS. In case main supply fails, the UPS should power the system automatically without causing any interruption in system input power supply. The UPS shall be provided with a maintenance free battery to supply 8 hours back up power. The battery should have a service life of minimum 4 years.

2.2 The system should also comply to the latest classification society rule requirements and DEF STD 02-603.

3. **Construction.**

3.1 The control panel shall be bulkhead mounted type, drip proof, enclosed in sheet steel cubicle made of 14 SWG sheet steel. All the components shall be mounted such that they are accessible from front for operation, maintenance and replacement. The panel shall be hinged type provided with adequate number of latches operated by keys.

3.2 The size and weight of the panel shall be kept to a minimum consistent with electrical and mechanical requirements.

3.3 Cable entry should be from the bottom of the panel. The panel should be supplied with detachable gland plate at the bottom of the panel. The panel and other components of the system should be supplied with cable entry glands suitable for yard supply cables. Yard will furnish overall dia of cables on receipt of interconnection diagram from the supplier.
3.4 Any suggestion on terminal connections and procedure for laying the system cables onboard ship etc. are to be clearly brought out at the time of submitting the technical proposal.

3.5 The supplier should generate detailed cable diagram for the complete system, render assistance in preparation of system cabling and connection diagrams and during STW / Harbour Acceptance Trials of the system.

3.6 All cables used in the system should be Fire retardant, zero halogen toxicity and should be capable to withstand operating temperature from -30 degree Centigrade to +120 degree centigrade.

3.7 The cables used for internal wiring shall be provided with identification ferrules on both ends. 10% spare terminals are to be provided on the terminal block of the panel. Suitable crimping socket of reputed make shall be fitted in the terminals for cable termination.

3.8 Cable glands, entry, termination and Junction components should be as per NES-514 in addition to DSG/EED/VI/1535/R6.

3.9 All tally plates and diagram should be as per NES-723.

4. **Architecture of Fire Detection System**

4.1 The addressable sensors should be configured with either a Centralised Control or a Distributed Control. In the Centralised Control and Distributed Monitoring, all the addressable sensors can be monitored and controlled from one Programmable Controller with display and the information can be repeated to other positions through digital networks. In a Distributed Control and Distributed Monitoring architecture, the sensors can be monitored and controlled from more than one Programmable Controller that resides in another host system, usually associated with BDCS/other machinery control platform management etc. The choice between the above two architecture would of course depend on size of platform, no. of sensors, co-fitment of the host system, NBCD requirements etc. and to be defined by the Order placing authority.

5. **Functional and Design Requirement**

5.1 The system shall be designed to give an audio visual alarm indication within one second of detection of smoke or fire. The system shall also distinctly
indicate fault conditions of open loop conditions, short circuit and earth fault in the loop which could be caused due to defective sensors or cable faults. The system normally consists of detectors, manual call points mounted at various location of the ship. Details of location of the sensors is placed at Encl (to be provided by Order placing authority). The panel shall be designed on modular basis with each zone represented by a module.

5.2 The activation of any detector or manual call point is to initiate an audiovisual alarm at the control panel indicating the zone and compartment details in which the detector or manual call point has operated.

5.3 Facility shall be provided in the control panel to connect external hooter fitted in crew accommodation, service space, control station & Machinery spaces if a fire alarm does not acknowledge within two minutes after activation.

5.4 **Interface Requirements.** The System shall have provision for interfacing with Battle Damage Control System (BDCS). Interface protocol shall be finalized between the vendors of Automatic Fire Detection System & Battle Damage Control System. Depending upon the interface requirement the protocol could be serial RS 485/422/232 or Ethernet gigabit network or any other latest protocol as finalized by the vendors and Order placing authority.

5.5 **Fault Diagnostic.** The system shall have inbuilt fault diagnostic and status scan programme which shall at a pre defined interval scan the status of each module/unit and detector and indicate faults if any on Main Control Panel along with its address, zone configuration, location text, loop number etc.

5.6 **Password Protection.** User control on the MCP shall be password protected. Pressing any control key on the panel shall prompt for appropriate level password. Authorisation to access higher level system functions such as device isolation and configuration data entry through panel keyboard should also be password protected.

5.7 **Relay Panel.** The system should have a relay panel with bank of relays,(to be specified by order placing authority) each of which can be connected to an individual or a group of detectors. In the event of detection of abnormal conditions (as defined in the system) by any of such detectors, the connected relay operates potential free auxiliary contacts which can be utilized for switching off ventilations, duct or operate sprinkling system or any other fire fighting system as specified.
5.8 **Event Logging.** The system should have provision of Online event logging of various alarms with date and time for each addressable detector. The data to be retained using non volatile memory.

5.9 The main control panel shall have provisions for interfacing with a graphic based PC / LCD front end to provide the ship’s GA drawing as an underlay. The individual address of each sensor along with all kill card data would enable speedier response for fire fighting.

5.10 The interface network for sensors shall be in a loop which shall not be rendered ineffective due any fault occurring in it. Further, the system can be reconfigured in the event of a failure of the sensor(s).

5.11 The use of addressable fire detection sensors shall permit adjustable alarm threshold levels through their digital link from the main console, for reducing spurious or ‘nuisance’ alarms. Further, provisions to blank out certain sensors pertaining to a damaged compartment(s), through remote operation be made available to minimise false alarms.

5.12 LEDs may be used for indication.

5.13 The control panel shall have the following major features:-

(a) Zone indication with audio-visual alarm.
(b) Power / System ‘ON’ switch and indication.
(c) Power failure indicator and alarm.
(d) Test indicator and alarm
(e) Zone isolation indicator and alarm.
(f) Accept push Button.
(g) Reset push Button.
(h) Test push Button.
(j) Zone isolation push Button.

5.14 Warning is to be initiated by flickering of LEDs in case of defective detector (LED in case of photoelectric sensor) or interrupted cable etc. The indication will be cleared automatically when the fault has been cleared.

5.15 In fault condition audio-visual alarm shall be initiated. The audio alarm will be made off by ‘Accept’ push. However, steady visual alarm will persist until the ‘Reset’ push is operated.
5.16 While one fault is existing and audio alarm is silenced or warning lights of cleared faults are restored to normal, indication of new faults must not be affected.

5.17 When ‘Reset push is operated individual alarm or warning lights of cleared faults are restored to normal, but if any faults are still present, their indications must not be affected.

5.18 Block diagram of system will be supplied in Aluminum anodized plate which will be fitted on back side of control panel door.

5.19 Quick response, EMI/EMC protected Class approved type detectors are to be provided in all fire prone areas in the ship. Quantity and type of detectors shall be as required to meet the latest classification society requirements and as specified in DEF STD 02-602/603.

5.20 Detectors will be provided with detector base, end line resistance, mounting hardware with vibration mounting and cable entry glands as required.

5.21 Nos of detectors of different type (to be defined by the Order placing authority) shall be fitted throughout the Ship. Compartment wise type of detector and zone wise distribution of detector shall be finalized by the firm in consultation with IN.

5.22 Classification Society approved type fire detectors to be provided by the firm of reputed make, which would meet international standard for Marine use.

5.23 Requirement of Manually operated ‘Break Glass’ type manual call points complete with cable glands, hammers, Repeater Panel & Hooter shall be finalized by the firm for all the zones of Main Fire Control panel.

5.24 Detector bases, manual call points, hooters fitted in machinery spaces should be water tight type.

6. **Selection of Detectors**

6.1 Primarily the nature of fire risk which is anticipated at each location/compartment on board a ship is to be considered when selecting the types of detectors. The detectors are to be selected with response values suitable for the anticipated type of fire, so as to provide a quick alarm signal and a low level of false fire signal. The Broad guidelines for compartment wise selection of detectors are:-
(a) Machinery spaces shall be provisioned with combination of photo electric smoke detectors, heat detectors and flame detectors.

(b) Magazine / explosive rooms shall be provided with intrinsically safe UV-IR detectors and Heat (fixed) & rate of rise temperature detectors.

(c) Galley compartments and drying rooms should be fitted with both heat and flame detectors. Heat sensors in such spaces where the ambient temperature is normally high are permitted an operating temperature of 30 °C above the max. deck head temperature.

(d) Compartments stored with solid burning materials viz, clothing stores, cable stores, RU stores etc. shall be fitted with optical smoke detectors.

(e) Mess decks, cabin flat, dinning halls, stairways, corridors and escape routes should be fitted with photo electric smoke detectors. Fire sensors in these compartments are to operate before the smoke density exceeds 12.5% obscuration per meter but not to operate until the smoke density exceeds 2% obscuration per meter.

7. **Scope of Supply**

7.1 Scope of supply of Fire detection system is given below: -

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<tr>
<th>SL</th>
<th>DESCRIPTION</th>
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<tr>
<td>(a)</td>
<td>Main Control Panel</td>
<td>As Required</td>
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<tr>
<td>(b)</td>
<td>Repeater Panel</td>
<td>As Required</td>
</tr>
<tr>
<td>(c)</td>
<td>Intrinsically safe Addressable Detector</td>
<td>As Required</td>
</tr>
<tr>
<td>(i)</td>
<td>Photoelectric Smoke detector</td>
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<td>(ii)</td>
<td>Heat Detector</td>
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<tr>
<td>(iii)</td>
<td>Rate of rise temperature detector</td>
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<tr>
<td>(iv)</td>
<td>Flame detector</td>
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<tr>
<td>(v)</td>
<td>UV-IR detector</td>
<td></td>
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<tr>
<td>(d)</td>
<td>Response Indicator</td>
<td>As Required</td>
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<tr>
<td>(e)</td>
<td>Manual Call Point</td>
<td>As Required</td>
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<td>(f)</td>
<td>Hooters</td>
<td>As Required</td>
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<tr>
<td>(g)</td>
<td>UPS with Maintenance free Battery</td>
<td>1 Set</td>
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<td>(h)</td>
<td>Detector Test Kits(Can and Heat gun)</td>
<td>1 set each</td>
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7.2 Against above tentative requirement, Firm to finalise the actual requirement based on consultations with IN.

8. **Specifications**.

8.1 **Sea Way Conditions.** The limits of ships motion up to which the system should be fully operational are listed below. These motions may not be concurrent. The equipment shall be capable of efficient and unrestricted operation without any deviation from its normal operating parameters under the following seaway conditions:

(a) Roll : max. $+30^\circ$ with 10 sec period
(b) Pitch : max. $+30^\circ$ with 10 sec period
(c) List : max. $20^\circ$ from vertical (permanent)
(d) Trim : max. $5^\circ$

8.2 **Environmental Conditions.** The equipment offered for marine application shall achieve specified output and function smoothly under tropical conditions. It shall withstand air contamination through oil, salt and other contaminants associated with the marine environment. The equipment shall be water drip proof as a minimum requirement. The equipment shall operate under the following environmental conditions:

(a) Storage temperature : 0 to $75^\circ$C
(b) Operating temperature : 0 to $55^\circ$C
(c) Humidity : 95% RH condensing at $35^\circ$C
(d) Vibration : Should be suitable for marine
applications

(e) EMI/EMC : IEC 60945 or equivalent specification

8.3 Tally and Diagram Plates.

8.3.1 All units must have tallies and diagram plates conforming to NES 723.

8.3.2 Diagram plate indicating details of connection, provision of tallies for maintenance line number etc. are to be provided and affixed on the equipment.

9. Information to be supplied when Tendering.

(a) A brief specification of the equipment offered, including a statement showing any way in which the equipment is not expected to meet the stipulated requirement.

(b) Overall dimensions and proposed fixing arrangement.

(c) Estimated total weight

(d) Wiring diagram, circuit, Control and protection system.

(e) Control and indication facility.

(f) Heat dissipation

(g) Confirmation is required that all tests indicated in the specification can be undertaken at the manufacturer’s works, otherwise any alternate arrangement proposed are to be stated.

(h) Maintenance space required for the equipment

10. Documentation.

10.1 The following documentation (02 sets) are to be supplied along with the main equipment with soft copies in CD ROM.

Sl. Description

EED-50-23
(i) Complete system Software along with detailed procedure, password key required to load the software be provided on a suitable magnetic media.

(ii) Technical / functional description including that at PCB and component level.

(iii) Operating Instruction Manual

(iv) Preventive maintenance routines /repair instructions Manual along with drawings.

(v) Installation and Test Manual

(vi) Part Identification list and Tools Catalogue

(vii) Test Procedure and Documentation

(viii) Certified Test Report

(ix) Fault location procedure

(x) List of onboard and B&D spares

(xi) Performance figures including MTBF and MTTR

(xii) Layout diagram of all sensors, units, junction boxes with exact location and cable route for easy fault location and isolation.

11 **Testing (Factory Acceptance Trial Report).**

11.1 Supplier to provide Factory Acceptance Trial Reports indicating test along with inspection report

12. **Inspection.**

12.1 **Receipt Inspection.** The equipment will be inspected by nominated inspector of Navy based on approved QAP and drawings.

13. **Onboard and Base Depots Spares.**

13.1 **Spares.** The onboard spares, base & depot spares and test equipment is to be recommended by the supplier. Such recommendations are to be
commensurate with the reliability of critical components and component use in the system. Special tools and test equipment is to be supplied for onboard maintenance.

13.2 **On Board Spares.** An itemized list of OBS, special tool and special test equipment, which will be supplied with the main equipment, is to be furnished along with the quotation for the main equipment. The OBS and special tool are to be catered for all of the ship’s staff onboard maintenance routines and possible repair requirements. The OBS and tools should include following:

(a) All spares required for exploitation of system up to 2 years.

(b) One set of important assemblies to effect “repair by replacement”.

(c) One set of general-purpose maintenance tools along with each plant.

(d) One set of special tools required for disassembling/assembling of components to effect “repair by replacement”.

(e) One ships set of onboard spares recommended by supplier and approved by IHQ to be supplied along with equipment. CPL/PIL and item wise cost is to be forwarded along with the list of onboard spares while obtaining IHQ approval.

13.3 **Five-Year Base & Depot Spares/Comprehensive Part List.** Base spares recommendation is to cover maintenance/overhaul requirements for 5 years including two refits. Recommendations for insurance holding of long lead items are also to be indicated. Itemized cost of B&D spares are to be forwarded with the main offer.

13.4 Supplier to forward a list of Base & Depot spares for 5 years maintenance indicating Makes, Part Number and Cost of the each item. The list is to be provided in INCAT documentation format.

13.5 List of OBS and B&D spares are to be provided as soft copies in addition to hard copies in the ILMS format mentioned above.

14. **Warranty.**
14.1 The equipment with associated controls/instrumentation is to be guaranteed for stipulated performance for 18 months after commissioning. The equipment supplied shall be warranted from defects, manufacturer and performance for the said period and cover all the defects arising from malfunction through design faults, inappropriate material, bad production and non-conformance to specifications. Any expense because of repairs/supply of spares against guarantee defects is to be borne by the supplier.

15. **Installation Spares.**

15.1 A set of installation spares as recommended by Supplier is to be supplied along with main item.

15.2 **Installation Materials.** All installation materials are to be supplied by the firm e.g. (shock/vibration mounts, free-end connectors/plug/sockets, crimping sockets/terminals etc.) required to complete the installation of system onboard ships. Any other material required for installation of the system to be supplied by the supplier.

16. **Packing.**

16.1 Each of the item is to be individually PIP packed, suitable identification label giving details such as Sr. No. of the item, Order No. etc. are to be marked legibly on outside the packing, which should be prominently visible. On board spares/installation spares are to be packed in separate cases individually with word “On-Board Spares” and “B&D Spares” and “Installation Spares” distinctly marked on each cases. The lists are to be attached to the cases.

17. **System Performance Responsibility.**

17.1 Supplier has to under take full responsibility for ensuring satisfactory performance of the system onboard ship.

18. **Services Of Engineers.**

18.1 Services of Engineers are to be made available at SHIPYARD for advice/assistance in connection with onboard installation, defect rectification, testing, tuning, setting to work presentation of HATS. And onboard commissioning of the equipment as and when required by Shipyards/Navy. Any installations and spare material required during any of these stages are to be supplied/replenished by the supplier free of cost. Any special equipment required for testing/STW are to be brought by the service Engineers.
19. **Maintenance.** The 1\textsuperscript{st}/2\textsuperscript{nd} level maintenance will be carried by SS and 3\textsuperscript{rd} and 4\textsuperscript{th} level maintenance support will be provided by the vendor on the basis of Annual Maintenances Contract.

20. **Training.** Comprehensive training of personnel of the concerned ship is to be carried out by the supplier. Training should also include training upto PCB level repairs for yard personnel.
Appendix “B”
(Refer to para 3.1)

SCOPE OF SUPPLY

To be filled by end User