# INDIAN RAILWAYS

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| **Document content** | **Technical Specification** | **Yes** |
| | **Schedule of Technical Requirement** | **~~No~~ Yes** |
| **Description of item** | **SPECIFICATION FOR SUPPLY, INSTALLATION AND COMMISSIONING & MAINTENANCE OF "AUTOMATIC FIRE DETECTION CUM SUPPRESSION SYSTEM" (HIGH PRESSURE WATER MIST SYSTEM) FOR PANTRY CAR & GENERATOR CUM BRAKE VAN OF INDIAN RAILWAYS COACHES (ICF AND LHB DESIGN)** | |
| **Remarks** | **Nil** | |

| S. No. | Month/Year of issue | Revision / Amendment | Page No. | Reason for Amendment |
|---|---|---|---|---|
| 1. | February - 2023 | - | - | First issue |
| 2. | June-2024 | Amendment No.1 | 06 & 11 | • Standard data format and error codes.<br>• Common USB port for data downloading.<br>• Extension of Suppression system in luggage area and escorting staff area. |



**Issued by:**
**Carriage Directorate**
**Research Designs and Standards Organization**
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Amendment slip No. 1 of April 2024 to Specification No. Spec No. IS/RDSO/CG/S/22001 (Rev.-0) for Supply, Installation and Commissioning & Maintenance of "Automatic Fire Detection cum Suppression System" (High Pressure Water Mist System) for Pantry Car & Generator cum Brake Van of Indian Railways Coaches (ICF and LHB Design).

**1. Clause No. 4.1 modified and shall be read as under:**

The System designed shall be a proven and established technology/system on repute National/ International Railway systems. Documentary evidence along with proof of supply and satisfactory performance certificate (minimum 3 months successful functioning) from user Railway(s)/Rolling Stock manufacturer shall be provided by the Supplier/OEM.

In case, a supplier/OEM offering product which has not been fitted by any repute International Railway and product prima facie appears suitable and meeting technical and functional requirements, the same can be referred to RDSO to judge suitability of system for trial order to encourage the indigenous sources as per Make in India program. The system will be subjected to a 3 months' field trial after commissioning on IR system on minimum 2 coaches for checking and verifying the fitment, design and requirements as specified in this specification.

**2. Clause No. 4.2 table modified and shall be read as under:**

| Documents Name/No | Description |
|---|---|
| ARGE Guideline Part 1 | Fire Detection in Rolling Stock |
| ARGE Guideline Part-2 | Fire Fighting in Rolling Stock |
| EN 50 121-3-2 2007 | Railway applications – Electromagnetic compatibility – Rolling stock – Apparatus |
| EN 50 125-1 – 2014 | Railway applications – Environmental conditions for equipment – Equipment on board rolling stock |
| EN 50 126 - 2017 | Railway applications – The specification and demonstration of reliability, availability, maintainability and safety (RAMS); |
| EN 50 128 – 2012 | Railway applications – Communications, signaling and processing systems – Software for railway control and protection systems; |
| EN 50 153 – 2014 | Railway applications – Rolling stock – Protective provisions relating to electrical hazards |
| EN 50 155 – 2017 | Railway applications – Electronic equipment used on rolling stock |
| IEC 61373-2010 | Railway applications – Rolling stock equipment – Shock vibration tests |
| EN 50159-1 2010 | Railway applications – Communication, signaling and processing systems – Part 1: Safety-related communication in closed transmission systems; |
| BS EN 45545-6 :2013 | Railway applications – Fire protection on railway vehicles – Part 6: Fire control and management systems |
| NFPA 750 | Standard on Water Mist Fire Protection Systems |
| IS/ISO 7240-5 or EN 54-5 | Point - type heat detectors |
| IS/ISO 7240-7 or EN 54-7 | Point-type smoke detectors using scattered light, transmitted light or ionization |

**3. Clause No. 4.3.3 modified and shall be read as under:**

For monitoring the readiness for working, the reservoirs shall be provided with pressure gauges. Further, there should also be provision ~~also~~ for audio indication on control panel ~~that whether~~ whenever solenoid coil of solenoid valve is disconnected with Nitrogen cylinder head.

**4. Clause No. 4.3.4(viii) modified and shall be read as under**

The luggage compartment of power car will be protected with Linear Heat Detector (LHD) cable (UL or EN approved, 105-110 deg C, approx. 20 meters). The system should be so designed that on receiving a fire signal from luggage compartment, the buzzer should sound and DG set(s) should shutdown. Activation of suppression system should take place automatically in luggage portion whenever fire signal is received from luggage compartment. Sensor installation/protection should be robust enough to prevent damage during luggage loading/unloading. Provision of High pressure water mist based fire suppression system along with associated piping, solenoid valves, sectioning valves, nozzles etc. in luggage area of Power car. ~~The similar material which is presently used by the concerned OEM during fitment of suppression system in DG set area of Power car should be used.~~

**5. Clause No. 4.3.4 (x) (new clause) added.**

Provision of High pressure water mist based fire suppression system along with associated piping, solenoid valves, sectioning valves, nozzles is also to be provided in escorting staff area. On activation of smoke alarm through smoke detector in escorting staff area, the fire suppression is to be activated manually in the escorting staff area only after automatic shutting down of DG set. Thus the system should have the capability to differentiate the location of fire alarm and sectioning valves should be so programmed that suppression system should activate only in the area from where fire alarm is generated.

**6. Clause No. 4.3.11 (New clause) added.**

Two-digit Error code for FDSS system should be as per following format:

| S. No. | For FSDS System Error codes are as per below | |
|---|---|---|
| | Error Description | Error Code |
| 1. | Wiring Break/Electrical discontinuity within the system | E1 |
| 2. | Networking fault in Smoke & Fire detection circuit | E2 |
| 3. | Nitrogen cylinder Solenoid coil disconnected | E3 |
| 4. | Alert due to Smoke detector with location | A1 |
| 5. | Alert due to Heat detector or LHD with location | A2 |
| 6. | System functional without any error | 00 |

**7. Clause No. 4.3.12 (New clause) added**.

Data downloaded from Fire Detection cum Suppression System (FDSS) shall be as per following format along with details of coach no and FDSS make:

| S. No. | ~~Control Panel ID along with make~~ | Date and time of activation of suppression | Trouble /Error id | Message address etc. |
|---|---|---|---|---|
| 1. | | | | |

**8. Clause No. 5.3 of (New clause) added.**

USB 2.0 output port for data downloading on Fire Detection cum Suppression System (FDSS) Control Panel at suitable location to be provided for event log extraction during service & maintenance.

**9. Clause No. 5.4 of (New clause) added.**

Manual activation switch should be provided with protective covering to avoid any un-intentional activation of suppression system.

**10. Clause No. – 8.3.1 (New clause) added.**

The price proposal for refilling of Nitrogen cylinder, water cylinder and recertification-cum-refilling of Nitrogen cylinder should be quoted along with the tender. PUs to advise these details to Zonal Railways along with coach details..

**11. Clause No. 10.1 modified and shall be read as under:**

The prototype approval of the complete system will be done by ~~PUs/~~RDSO. Prototype approval shall be done by actual fitment on a coach and successful functional test as per this specification.

**12. Clause No. 10.4 modified and shall be read as under:**

For supplier whose prototype approval is not done by ~~any of the PUs~~/RDSO and are supplying to Zonal Railways, the prototype approval will be conducted by ~~PUs/~~RDSO and the prototype approval by ~~PUs/~~RDSO will be considered for future references by other Zonal Railways.

**ANNEXURE-A**

**[RDSO SPECIFICATION No. IS/RDSO/CG/S/22001 amend-1]**
**(INFRASTRUCTURAL REQUIREMENT)**

1. **Scope:**

This section covers the infrastructural requirement for Supply, Installation and Commissioning & Maintenance of "Automatic Fire Detection cum Suppression System" (High Pressure Water Mist System) for Pantry Car & Generator cum Brake Van of Indian Railways Coaches (ICF and LHB Design).

2. **Requirements:**

All the vendors seeking registration with Indian Railways shall comply with all the requirements mentioned below:

3. **Manufacturing Facilities:**

3.1. The manufacturer shall have adequate space and covered area with cemented floor to accommodate the following.

a) Damp free place for storage of raw material and finished products.
b) Independent Manufacturing area
c) Inspection area

3.2. Firm shall have following minimum M&P and Infrastructure at their works:

i) In Circuit Debugger / tester.
ii) Regulated DC power supplies.
iii) Microcomputer based and computer aided design system with workstations for R&D which will be, needed for failure investigation and future up-gradation
iv) Other regular tools like Hot Air gun, Thermocouple, Measuring tape, measuring scale, magnifying glass, screw drivers, cutting tools, crimping tools etc. used for manufacturing, electronic assembly line, inspection and testing of FDSS working.

3.3. Clean room for electronic product manufacturing/assembly.

3.4. Ultrasonic cleaner (suitable for volume production cleaning) for assembled PCB's to prevent field failure of assemblies due to PCB surface impurities in high moisture/ humidity environments.

3.5. Dust free environment for assembly of electronic modules. Assembly area should have electro static discharge protection in line with IS:10087-1981(Anti-static mat in assembly area and wrist band earthed with anti-static mat)

4. **Testing Facilities:**

4.1. Firm should have following minimum testing facilities at their works:

i) Smoke generator test equipment as per "ARGE Guideline-Part 1" for functional test on fire detectors.
ii) Hot wire testing facility as per Annexure-1 of RDSO spec RDSO/2008/CG-04.
iii) Insulation tester.
iv) Digital Multi-meter with basic DC Voltage accuracy of at-least 0.5%.
v) Test Jigs.
vi) Any other test equipment considered necessary for product's reliability.
vii) Instruments to measure static charges.

4.2. The firm should have either in-house arrangement or tie-up with accredited agency for periodical calibration of all the equipment and test instruments.

## 5. INSPECTION TESTING:

### 5.1. General

5.1.1 Only after the detail drawings/documents and Design have been approved and the clearance given to this effect, the manufacturer shall take up the manufacture of the prototype. It is to be clearly understood that any changes, required to be done in the prototype or any additional tests other than specified herein are required to be conducted on the prototype unit or its components, they shall be done expeditiously. During the process of manufacture of the equipment, if the approving authority so desires, it may conduct/repeat any of the routine or additional tests to satisfy that the quality of the module being manufactured is of the required standards.

5.1.2 The test protocol indicating relevant clause of the test, condition of the test, specified value and observed value of the parameter for FDSS shall be submitted by the firm before offering the sample for testing.

5.1.3 Vendor Approving Authority may conduct surprise check on manufacturing process and quality control along with any of the tests to ensure quality of product and its conformance to this specification.

### *5.2.* Inspection Testing

The tests shall be carried out at the works of the manufacturer in presence of Indian Railway representative on a prototype system as per relevant governing specifications modified or amplified. The manufacturer shall have all possible necessary arrangements for inspection and testing of the system.

#### 5.2.1 Routine Tests:

The following shall comprise the routine tests and shall be conducted by the manufacturer in-house on every equipment and the test results will be submitted to the inspection authority before the inspection. The application software in proper format shall also be submitted to the inspection authority in advance.

##### 5.2.1.1 Insulation Resistance Tests:

Insulation test shall be done between shorted terminals of supply port and the metallic portion of the enclosure at 500V DC.

Apply AC voltage of 1000V, 50Hz between the metal rack and the short-circuited points of power supply connector for one minute. (Neither disruptive discharge nor flash-over shall occur).

Functionality test shall also be performed subsequent to these tests.

##### 5.2.1.2 Performance test:

All the units shall be tested for their functionality as required in service condition as per this specifications design requirements. To simulate such condition in test lab a PC based simulator shall be specially developed for this purpose by the manufacturer.

##### 5.2.1.3 Reverse Polarity test:

The system shall be functional after applying 160V DC for one minute in the correct polarity as well as in the reverse polarity to check the polarity of connection in case of 110 V DC supply. In case a DC-DC converter is used the same shall be applied to the DC-DC converter with full connected load.

##### 5.2.1.4 System level functional tests:

a) Constructional details.
b) Dimensional check.

c) General Workmanship.
d) Configuration.
e) Cables for electrical connections should be properly harnessed with cable channel/tray or into ducts having adequate fire retardancy.

**5.2.1.5 Visual inspection of complete system:**

During visual test general workmanship, connector, cable and wiring shall be checked of the system. Dimensions shall as per approved drawing. The visual inspection shall broadly include:

a) Indications and displays.
b) Mounting and clamping of connectors.
c) Proper housing of cards.
d) Visual inspection system (with magnifying lens/CCD camera) or Automatic optical inspection unit.

Any other tests shall be carried out as considered necessary by the purchaser.

**5.2.2 Acceptance Test:**

As per clause 11.0 of this specification.

**5.2.3 Installation &Commissioning testing:**

The contractor shall carry out Commissioning test on completed coach at Railways.The contractor shall submit all test documents, test procedures and check sheets. Proforma to be followed for installation & commissioning tests as per clause 11.0 of this specification.

5.3. **Batch Testing of FDSS.**

i) Certificate of conformance to be provided for FDSS from OEM. Lot wise test record shall be maintained which may be verified by the inspecting officials.
ii) Manufacturer shall maintain proper account of FDSS being used. The record shall include various details like source of supply, procurement invoice no. and date, quantity, incoming rejection, lot-wise consumption etc. which may be verified by the inspecting officials.

6. **QUALITY CONTROL REQUIREMENTS**

6.1 The firm should have acquired ISO: 9001certification from the agency accredited by an accreditation body which is a part of International Accreditation Forum (IAF), and the product for which the approval is sought should be broadly covered in the scope of the certification for manufacture and supply.

6.2 The Quality manual of the firm for ISO: 9001 should clearly indicate at every stage the control over manufacturing and testing of the said railway product.

6.3 There should be a system to ensure the traceability of the product from raw material stage to finished product stage. The system should also facilitate to identify the raw material composition from the finish product stage.

6.4 It should be ensured that there is a Quality Assurance Plan for the product detailing the following various aspects.

- Organization chart
- Process flow chart
- Process control chart
- Stage inspection details from the raw material stage to finish product stage.
- Various Parameters to be checked and level of acceptance of such parameters indicated and method to ensure control over them.
- Disposal system of rejected raw material and components

6.5 There should be at least one full time technologist having a minimum Master's degree in relevant field with experience of at least 3 years or Bachelor's degree in relevant field with experience of at least 5 years or a person with Diploma in relevant field with 12 years' experience. He should be free from day-to-day production, testing and quality control responsibilities. He should be mainly responsible for development of a product, analysis of products, control over raw material, and corrective action in case of difficulties in achieving the parameters.

6.6 Ensure that the in-charge of the Quality Control Section is having a qualification of minimum Master's degree in relevant field with experience of at least 3 years or Bachelor's degree in the relevant field with a minimum of 5 years' experience or alternatively he should be a Diploma holder with minimum of 12 years' experience. He should be actively involved in day-to-day activities of quality control / stage inspection / compliance of QAP etc.

6.7 The firm must ensure that proper analysis is being done on monthly basis to examine the rejections at various internal stages and it is documented.

6.8 The firm should ensure that latest version all the relevant specifications, IS Standards are available with the firm.

Note: - SN 3.4 can be outsourced to ISO certified firm. MOU with sub vendor along with QAP and M& P shall be submitted to RDSO for prior approval RDSO official may visit to the premises of sub vendor for physical verification.