REASONED DOCUMENT

FOR

AUTOMATIC FIRE DETECTION & ALARM SYSTEM

FOR

SIGNALLING INSTALLATIONS

SPECIFICATION No. RDSO/SPN/217/2018
Version 2.0-d1

Number of Pages – 28

Issued by

SIGNAL DIRECTORATE
RESEARCH, DESIGNS & STANDARDS ORGANISATION
MINISTRY OF RAILWAYS
MANAK NAGAR
LUCKNOW – 226 011

DOCUMENT DATA SHEET

RDSO/SPN/217/2018		**Version 2.0-d1**
Title of Document REASONED DOCUMENT ON FINAL DRAFT SPECIFICATION FOR AUTOMATIC FIRE DETECTION & ALARM SYSTEM FOR SIGNALLING INSTALLATIONS		
Authors **See Document Control Sheet**		
Approved by RDSO **Name: Shri Sandeep Mathur** **Designation: Executive Director/Co-Ordination/Signal** **RDSO, Lucknow- 226 011**		
Abstract REASONED DOCUMENT ON FINAL DRAFT SPECIFICATION FOR AUTOMATIC FIRE DETECTION & ALARM SYSTEM for POWER EQUIPMENTS & RELAY ROOM OF SIGNALLING INSTALLATIONS		

Document Control Sheet

Name	**Organization**	**Function**	**Level**
Shri Ranjeet Singh JE (D)/Signal	RDSO	Member	Prepare
Shri R.N. Singh ADE/Signal-V (i)	RDSO	Member	Check
Shri G. Pavan Kumar Director/Signal-V	RDSO	Member	Issue

REASONED DOCUMENT ON DRAFT SPECIFICATION FOR AUTOMATIC FIRE DETECTION & ALARM SYSTEM FOR SIGNALLING INSTALLATIONS

Clause No.	Description	Comments by Railways	Comments by the Firm's	RDSO's Remarks
0.2	**This specification requires reference to the following specifications**	---	**Nitin fire:** FM 3210:2007 Approval for Heat Detectors for Automatic Fire Alarm Signaling.	Not agreed due to certification of other bodies are also mentioned in the specification in addition to FM.
			---	IRS: S 93/96 (A) is removed as the reference is no longer existing in the specification.
0.4	This specification is intended to cover the technical provisions and it does not include all the necessary provisions of a contract.	---	---	New clause added to clarify that this document is a technical specification.
2.1 (a) & 4.2.1	**Probe type Bimetallic Heat detectors for Diesel Generator enclosure**	---	**Fire Safe Technologies:** A hollow stainless steel tube shall be used for linear heat detection to sense fire. It shall be continuous detection, used for detection in electrical cabinets, transformers, Invertors, cabel trays, electronic equipment, power equipment room, relay rooms or any other enclosed areas, which are vulnerable for fire as deemed fit by Indian Railways. It shall be able to operate in extreme environmental conditions, have no moving components and be of robust nature. The sensing of the fire shall be done on the basis of change in temperature. It shall be able to withstand mechanical damage, tensile, water and corrosion electromagnetic interference. It shall not burn during the occurrence of fire and shall be reusable without any need to change or recalibrate the system. It shall b easy to install and shall have very little maintenance. It shall also have facility to adjust its sensitivity as required for an individual application. It shall be able to operate in the temperature range of -30°C to 120°C. It shall monitor for any breakage, disconnection or obstruction and notify as FAULT on the panel.	Not agreed, As IS2189 recommends probe type bi-metallic heat detector inside diesel generator enclosure.
			Nitin fire: Linear Pneumatic Heat Detection for Diesel Generator Enclosure. Bimetallic Heat detectors use spot detection to detect the presence of fire which leaves fire undetected when a spot fails to detect the fire at the right time. A continuous detection line such as a	

Clause No.	Description	Comments by Railways	Comments by the Firm's	RDSO's Remarks
			Linear Heat Detection System with 2mm hollow stainless steel tubing should work with better efficiency and accuracy.	
2.1 (c)	Heat and Smoke multi sensors for Diesel Generator room, Power Supply Room, non-air conditioned Relay Rooms, ASM Room, and other rooms connected with signalling Installations.	---	**Nitin Fire:** Linear Pneumatic Heat Detection System for Diesel Generator rooms.	Not agreed, LHS/LHD is proposed to be used in cable trays and cable troughs only.
2.1 (e)	Aspirating (air sampling) type smoke detector for Relay Rooms preferably	---	**M/s Honeywell:** Define Preferably for relay rooms whether the aspiration system is mandatory or not	The clause is modified as follows: "Aspirating (air sampling) type smoke detector for air conditioned Relay Rooms". Made mandatory for Air Conditioned relay rooms only.
2.2	The AFDAS shall be designed to work on power supply of 110V/230V AC +10%, -15% as well as 24 V DC +10%, -15% . The control panel shall have in-built charging facility to have 24V DC battery backup (VRLA as per IRS: S-93/96(A) or latest) for at least 24 hours. It shall power the aspiration type detection system, the Linear Heat Sensing Cables and all detectors, Manual Call Points etc., which constitute AFDAS. Addressable modules can be used if required to connect electronics of LHS device and Aspiration system to the control panel.	---	**M/s Honeywell:** 1. 24 V DC power supply shall be the secondary power for the control panel. The power supply should be monitored. **M/s Ravel:** Aspiration type detector and linear heat sensing cables, UV&IR and Bimetallic heat detectors shall have separate power supply unit as per RDSO specification. Addressable modules can be used if required to connect the electronics of LHS device and aspiration system to the control panel. **Fire Safe Technologies:** It shall power the aspiration type heat detection, the linear heat sensing cables, Linear Heat Detection System and all detectors, Manual Call Points which constitute AFDAS.	Clause 2.2 is deleted due to duplication of cl. 4.9.8. Noted and this is mentioned in clause 4.9.8. "The control panel shall be designed to work on power supply of 110V/230V AC +10%, -15% as well as 24 V DC +10%, -15% . The control panel shall have in-built charging facility to have 24V DC battery backup for at least 24 hours for operating the system at quotient load and then 15 minute under fire or emergency condition at maximum connected load (Cl. 10.6.7.2.1.2 of NFPA 72 Edition 2016). Addressable modules can be used if required to connect electronics of LHS interface module and Aspiration Type Smoke Detector to the control panel." During the development of specification and testing it was found that aspiration type detection system, the Linear Heat Sensing Cables have their own power supply modules. Further, the charger inside control panel has limited capacity in the range of 7 AH to 45 AH. There is a space constraint also in control panel to accommodate higher AH batteries

Clause No.	Description	Comments by Railways	Comments by the Firm's	RDSO's Remarks
			Nitin Fire: It shall power the aspiration type detection system, the Linear Heat Sensing Cables, Linear Heat Detection System and all detectors, Manual Call Points etc., which constitute AFDAS	and hence the modification. The concerned line in this clause is removed as: "It shall power all the detectors, Manual Call Points etc., which constitute AFDAS." Cl. 4.9.12 is shifted to the place of Cl. 2.2 as it is relevant to the general requirement of AFDAS. "The control panel shall be modular in structure, so that any fault in any of the modules can be set right by simply replacing the Faulty Module, with a spare."
2.3	The AFDAS shall be self-checking & diagnostic type. It shall continuously monitor the health of the sensors/ detectors & the complete system including battery. The data regarding health & event shall be logged in the system with date & time stamp, which can be downloaded to a PC/ Laptop at later stage. The system should have capacity to store data for up to a minimum of 1000 fire events and 1000 other events. The Control Panel shall be networkable to the Zonal/Divisional Railway headquarters preferably over TCP/IP and shall have clock synchronization facility.	---	**M/s Honeywell:** 1000 event logs and 1000 alarm logs are in favor of one particular brand, hence request you to reduce it to 999 events only so that all can participate. The control panel has RTC & get synchronized to the graphical application running on the connected PC	As the signaling installations are not so large installations like a multistory building. Therefore the requirement for data logging is reduced from 2000 in total to 512 in total & hence the clause is modified as follows:- "The AFDAS shall be self-checking & diagnostic type. It shall continuously monitor the health of the sensors/ detectors & the complete system including battery. The data regarding health & event shall be logged in the system with date & time stamp, which can be downloaded to a PC/ Laptop at later stage. The system should have capacity to store data for up to a minimum of 512 fire events and other events. The Control Panel shall be networkable to the Zonal/Divisional Railway headquarters preferably over TCP/IP and shall have clock synchronization facility."
2.4	The detectors shall be suitable for installation in electrical cabinets, transformers, invertors, cable trays, electronic equipments, power equipment rooms, relay rooms, or any other enclosed areas, which are vulnerable for fire as deemed fit by Indian Railways.	---	**M/s Nitin fire Protection Pvt. Ltd.:** Please clarify as to which of the AFDAS systems are to be used for which of the equipments/rooms. **Fire Safe Technologies:** Electrical Cabinets, transformers, invertors, cable trays, electronic equipments, power equipment rooms or any other enclosed areas are very sensitive and fire prone areas where the traditional heat and smoke detection would not work due to frequent occurrence of false alarms.	Not a comment. It is specified in clause 2.1.

Clause No.	Description	Comments by Railways	Comments by the Firm's	RDSO's Remarks
			Nitin Fire: The Linear Heat Detection shall be used for detection in electrical cabinets, transformers, invertors, cable trays, electronic equipments, power equipment rooms, relay rooms, or any other enclosed areas, which are vulnerable for fire as deemed fit by Indian Railways.	
2.6.1	Temperature range shall be as per the limits specified in the concerned para.	---	**M/s Honeywell:** Operating Temperature range of UL certified detectors are up to 38 degrees. It has to be certified by CPRI lab separately for 45deg C operation.	Temperature tests are to be conducted as per the limits for each type of detector mentioned in relevant clause.
2.6.3	In dusty, sandy, and desert conditions, the OEMs shall specify the frequency for cleaning of the detectors, after installation to avoid false alarms.	---	**M/s Honeywell:** Maintenance for detector shall be notified by the detector to the panel automatically. **M/s Nitin fire Protection Pvt. Ltd.:** The use of the AFDAS system no. (b) and (d) in Sr. no. 2.1.1 would be invalid under the given conditions and thus for such environment, linear pneumatic heat detection system should be used, which is robust and rated with IP67.	Noted. This clause indicates the OEM to specify the maintenance frequency.
2.7	Loop controllers shall have built in interference nullifier so that separate EMI control circuit is not required. The loop distance shall not exceed 1.2 KM.	---	**M/s Honeywell:** The permissible length as per IS 2189 is 3000 mts. The same needed to be amended from 1200 mts.	Modified as per clause 4.2.4.1 of IS 2189: 2008.Recommended length of the manufacturer exceeding minimum 1.2 km would be considered.
2.9	The Automatic Fire Detection and Alarm System covered in this specification shall also be able to generate requisite commands to activate 'Automatic Fire Suppression System', where provided.	---	**M/s Mircom:** You have mentioned Clause No. 2.9, 4.1.1, 4.8 Addressable Fire Alarm Panel which will connect or facility to connect with Automatic Fire Suppression System (Conventional Gas Release Panel) but latest Addressable fire alarm panel have inbuilt gas releasing facility so there is no need to take a separate conventional panel for gas	Not considered as vendor specific. This specification deals with fire detection and/ alarm. A separate specification RDSO/SPN/218/2016 Ver. 1.0-d2 has been issued tentatively for fire suppression.

Clause No.	Description	Comments by Railways	Comments by the Firm's	RDSO's Remarks
			releasing and it will also reduce of project. It shall be UL/FM/Vds/EN/ LPCB approved.	
2.12	In case of low battery, the system shall give alarm and indication	---	**M/s Ravel:** **The statement is not clear.**	Noted, amended and shifted to Cl. 4.9.12 as: In case of low battery, the system shall give alarm and indication on the control panel. Portion of Cl. 4.9.11 is shifted to Cl. 2.12 as it is relevant to the general requirement of AFDAS: "The AFDAS shall have provision to provide sufficient sets of Programmable Potential Free NO/NC contacts (minimum 3 NO and 3 NC for each room where AFSS is installed); to trigger the Automatic Fire suppression system through logical function as per RDSO/SPN/218/2016 or latest pertaining to Signalling Installations, if provided, switching off the power supply to power equipment /relay room (if required) and for interfacing with the existing Data Logger system. The Current carrying capacity of NO and NC contacts shall be at least 500mA."
2.14	The system shall be capable of working in non-air conditioned environment in the installation except for Aspirating (air sampling) type smoke detector. It shall be suitable for installation on AC/ DC electrified and non-electrified sections. It shall be suitable in all areas including where locomotives having thyristor controlled single phase or 3-phase induction motors haul passenger or freight trains and where chopper controlled EMU stocks are operated.	---	**M/s Honeywell:** Installation location of aspiration detector is contradictory to 2.1.e & 4.1.1	Agreed and modified Clause 2.1 (e) accordingly.
2.15.1	The response time for alarm generation from the time of detection by sensors/detectors shall not exceed ten seconds (NFPA 72 Para 23.8.1.1). It shall reliably transmit the detected signal to the Control Panel, so that it can translate this detected signal into suitable alarm signal and warn the railway personal for taking corrective action.	---	**M/s Honeywell:** Para Ref point from NFPA needs to be changed.	Para is corrected as Cl. 10.11.1 of NFPA 72 2016 edition.
2.15.2	It shall monitor the health of the system.	---	**---**	The Clause is deleted since it is Already covered in Cl. 2.3.

Clause No.	Description	Comments by Railways	Comments by the Firm's	RDSO's Remarks
2.16	Power Supply Arrangements for AFDAS: The primary source of supply shall be 24V DC and Secondary source of supply shall be 110V/230V AC. The minimum cut off voltage for primary shall be specified by OEM. Whenever the primary power supply fails to provide minimum voltage required for operation, the secondary source of power supply shall automatically provide power within 10 seconds (NFPA 72 10.6.6.1). The control panel, detectors, audio-visual alarm devices, LHS devices, Aspiration system shall be separately wired.	---	**M/s Honeywell:** Primary should be 230V AC and secondary shall be 24V DC as per clause of 10.6 of NFPA 72 2016. **M/s Nitin fire Protection Pvt. Ltd.:** The control panel, detectors, audiovisual alarm devices, LHD system, Aspiration system shall be separately wired. **Fire Safe Technologies:** The control panel, detectors, audio-visual alarm devices, LHD System, Aspiration system shall be separately wired.	The primary source of supply and secondary source of supply are modified accordingly "Power Supply Arrangements for AFDAS is corrected as the primary source of supply shall be 110V/230V AC to be given by Railways. In case, failure of primary power supply the system should work on Secondary power source (battery backup) as part of the system. The minimum cut off voltage for primary shall be specified by OEM. Whenever the primary power supply fails to provide minimum voltage required for operation, the secondary source of power supply shall automatically provide power within 10 seconds (NFPA 72 10.6.6.1)." The required changes to this effect has also been done in Clause 4.9.8 & 9.4.1.
3.0	GENERAL ARRANGEMENT OF AUTOMATIC FIRE DETECTION & ALARM SYSTEM (AFDAS)	---	---	Grammatical correction done in accordance with Cl. 2.1 (e).
4.1.1	The AFDAS shall have Probe type Bimetallic Heat Detectors, UV&IR Flame Detectors and Heat & Smoke Multi Sensors which shall be installed, at critical locations to detect smoke, temperature rise & absolute temperature & send the signal to Control Panel. The AFDAS shall be an addressable system with facility to program cross zoning of detectors. In addition, Linear Heat Sensing cable or Linear Heat Detector shall be laid in cable trays, battery boxes, power equipments etc. for heat detection & sending the signal to the Control Panel through an Interface. In Air-conditioned Relay Rooms preferably, Aspirating Smoke detectors shall also be installed for early detection of smoke. On getting the signals from above detectors/ sensors, Control Panel shall give Audio Visual Alarms to the railway personnel to actuate Fire Extinguishing System manually. The AFDAS shall also have a feature to trigger _Automatic Fire Suppression System'(if provided) when the suppression	---	---	Corrected grammatically and Aspiration type Smoke detector is made mandatory for AC Relay Rooms: The AFDAS may consist of Probe type Bimetallic Heat Detectors, UV&IR Flame Detectors and Heat & Smoke Multi Sensors which shall be installed, at critical locations to detect smoke, temperature rise & absolute temperature & send the signal to Control Panel. The AFDAS shall be an addressable system with facility to program cross zoning of detectors. In addition, Linear Heat Sensing cable or Linear Heat Detector shall be laid in cable trays, battery boxes, power equipment's etc. for heat detection & sending the signal to the Control Panel through an Interface. In Air-conditioned Relay Rooms, Aspirating Smoke detectors shall also be installed for early detection of smoke. On getting the signals from above detectors/ sensors, Control Panel shall give Audio Visual Alarms to the railway personnel to actuate Fire Extinguishing System manually.

Clause No.	Description	Comments by Railways	Comments by the Firm's	RDSO's Remarks
	system is interfaced with AFDAS.			The AFDAS shall also have a feature to trigger Automatic Fire Suppression System (if provided) when the suppression system is interfaced with AFDAS.
4.2.1.2	The actuating temperature shall be as per the model number offered by the manufacturer. Same shall be considered in type/acceptance test. The manufacturer may specify as many models as possible	---	**M/s Honeywell:** As per NFPA-72 the actuating temperature of heat detector should be more than 11deg than the maximum ambient temperature. So in Indian condition the max temperature goes upto 50deg. So the activating temperature of the probe type heat detectors should be more than 61deg	Agreed and the following line is added to this clause: "The probe type bi-metallic heat detector shall be chosen by the purchaser such that the temperature rating of the detector shall be at least 11°C above the maximum operating temperature of the diesel generator (Ref: Clause no. 17.6.2.3 of NFPA 72-2016)."
4.3	HEAT & SMOKE MULTI SENSOR FOR POWER EQUIPMENT ROOM, BATTERY ROOM, ASM ROOM, NON-AIRCONDITIONED RELAY ROOMS, DIESEL GENERATOR ROOMS	---	**Nitin fire:** The addressing of the detectors/devices shall be hard addressing or manual addressing through expert card.	No change is required as both are acceptable.
4.3.5	The detector's alarm condition shall be visible from a distance of 6 Meters and shall be visually different from the indications of the other conditions.	---	**M/s Honeywell:** 6m visual distance is debatable during smoke condition when visibility reduces. Please clarify	The 6m visual distance specified is for normal conditions. This is as per IS 11360. Noted and clarified in the specification.
4.3.8	The Detector / devices must have inbuilt fault isolator or alternate arrangement at detector level which shall isolate the detector in case of short circuit or open circuit in the loop.	---	**Nitin fire:** The Detector / devices must have inbuilt fault isolator or base type isolator for detectors which shall isolate the detector in case of short circuit or open circuit in the loop.	Not agreed, as vendor specific and not relevant.
4.3.9	The detectors shall be addressable type.	---	---	The clause 4.3.9 and 4.3.11 are merged as- "The detectors shall be addressable and resettable type".
4.3.10	It shall detect the fixed heat above 58°C and the rate of temperature rise (not more than 10°C/minute) independently in addition to the photo electric smoke detection.	---	---	Clause is modified in light of clause no 23.2 of UL 521: "It shall detect the fixed heat above 58°C and the rate of temperature rise (between 6 °C/minute to 11.10°C/minute) independently in addition to the photo electric smoke detection."
4.3.11	The detectors shall be resettable type.	---	---	Deleted as discussed in clause 4.3.9

Clause No.	Description	Comments by Railways	Comments by the Firm's	RDSO's Remarks
4.4.1	The air sampling–type detector system shall be able to withstand dusty environments by onboard monitored air filtering, Auto cleaning facility in optical chamber, electronic discrimination of particle size, or other listed methods or combinations thereof. The detector should be capable of providing time delays (< 10 seconds) of alarm outputs to eliminate nuisance alarms due to transient smoke conditions. The detector should also provide facilities for the connection of monitoring equipment for the recording of background smoke level information necessary in setting alert and alarm levels and delays. It shall have event logging facility with date and time stamp. It shall also have clock synchronization facility.	---	**M/s Honeywell:** Built in dual stage filter with memory and CMOS imaging sensor for particle identification based on color, size & shape of the sample particle.	Not agreed as functional description is specified in the clause. Clock synchronization facility is removed as the clock of the AFDAS control panel is sync with master clock and would be used for any analysis. The data stored in Aspiration type smoke detector is used as supplement to AFDAS control Panel.
4.4.3 & 4.4.5.3.1	The detector shall have the capability of generating four alarm signals depending upon level of smoke detected, for example Stage 1 – 0.5 to 0.95% obs/m Stage 2 – 1.0 to 1.45% obs/m Stage 3 – 1.5 to 1.95% obs/m Stage 4 – ≥ 2.0% obs/m	---	**M/s Honeywell:** Aspiration detectors are used for detecting fire at incipient stages & the sensitivity can 0.0003% obs/ft. If the sensitivity requirement for relay room is more than 0.03% then Laser based spot detectors solution should also be allowed.	Not agreed as vendor specific
			Securiton: Kindly includes another example also so that the System Integrators/ Vendors are clearer in their offerings. For example: Stage 1 (Alarm Level 1) – 30% of Alarm Level 4 Stage 2 (Alarm Level 2) – 50% of Alarm Level 4 Stage 3 (Alarm Level 3) – 70% of Alarm Level 4 Stage 4 (Alarm Level 4) – 0.13% obs /m	Agreed and modified accordingly.

Clause No.	Description	Comments by Railways	Comments by the Firm's	RDSO's Remarks
4.4.5.1	One number sampling point shall be provided on either side of each - relay rack, cable termination rack, Air Conditioner, 230V AC Used and unused points etc.	---	---	Grammatically corrected and clause modified as: 'Required number of sampling point shall be provided on either side of each - relay rack, cable termination rack, Air Conditioner, 230V AC Used and unused points etc.'
4.4.6	It shall be suitable for operation in a temperature range of 0-49ºC.	---	**Securiton:** Keeping in view of temperature variations in India we suggest having temperature range of –20 – +60°C. The Aspiration System shall have Auto Learning feature with IP rating 54.	Not agreed as this may be vendor specific. As per Cl. 10.3.5 of FPA 72 Ed. 2016 "85% and 110% of the nameplate rated input voltage, 32°F (0°C) and 120°F (49°C) ambient temperature, 85% relative humidity at 85°F (29.4°C)"
4.5.1	The pipes used in the pipe network shall be made of copper, preferably with 25mm dia (±5%) and 1mm (±5%) thickness to cater for ceiling temperature of 69ºC and their assemblies such as couplings, unions, elbows, tees, end caps, capillary tubes, sampling ports, mounting brackets and they shall be tested in accordance with ASTM E 814.	---	---	The material for piping for Aspiration type smoke detector is changed from Copper to CPVC (Chlorinated Poly Vinyl Chloride) as signallling installation is not very high temperature area and CPVC can cater a ceiling temperature up to 95ºC efficiently. The clause is modified as: Further copper is a costly and highly conductive. The copper pipe running through installation can cause insulation impairments. 'The pipes used in the pipe network shall be made of CPVC and shall be listed/approved by UL or FM or Vds or LPCB or tested with appropriate equivalent standard to cater for ceiling temperature of 69ºC. The pipe and their assemblies such as couplings, unions, elbows, tees, end caps, capillary tubes, sampling ports, mounting brackets shall be as per the recommendation of manufacturer of Aspirating (Air Sampling) type smoke detector.'
4.4.5.2	Maximum transport time from the most remote port to the detection unit of an air sampling system shall not exceed 60 seconds.	---	---	As per Cl. 17.7.3.6.2 of NFPA 72 Ed. 2016 "Maximum air sample transport time from the farthest sampling port to the detector shall not exceed 120 seconds." Hence the clause is modified as below: Maximum transport time from the most remote port to the detection unit of an air sampling system shall not exceed 120 seconds.

Signature			
Name & Designation	Prepared By: Ranjeet Singh JE (D)/Signal	Check By: R.N. Singh ADE/Signal-V (i)	Issued By: G. Pavan Kumar Director/Signal-V

Clause No.	Description	Comments by Railways	Comments by the Firm's	RDSO's Remarks
4.6.3	This linear heat sensing shall be in the form of continuous cables consisting of copper conductors / cores and shall be of analogue type.	---	---	The restriction from conductive material as copper for LHS cable is removed. Because, most of the availability of LHS cable is of steel conductors. The clause is modified as: 'This linear heat sensing shall be in the form of continuous cables consisting of conductors / cores and shall be of analogue type.'
4.6.4	Each core of analogue Linear Heat Sensing cable shall be insulated with a negative temperature coefficient material. (Clause 5.1.1.4 of IS: 2189-2008). An outer sheath of high temperature, flame retardant PVC insulation, shall protect the cores. The outer sheath or metallic braid shall not affect the performance of the heat sensor.	---	---	Grammatically corrected.
4.6.8	The design of the analogue, linear heat sensing cable and corresponding electronic sensing circuits shall be such that the cable length and the number of required loops should be set up to provide optimal coverage for the desired region with cable length ranging from 10m to 200 m. The system shall be designed to have an optimum sensitivity.	---	**Fire Safe Technologies:** The Linear heat sensing cable shall be able to withstand mechanical damage, tensile, water and corrosion and electromagnetic interference. **Nitin fire:** The Linear heat sensing cable shall be able to withstand mechanical damage, tensile, water and corrosion and electromagnetic interference. The Linear Heat sensing cable should not burn during a fire event and the same shall be reusable without any replacement.	Not agreed, as firm specific.
4.6.11	Linear heat sensing cable should be brought from UL or FM or Vds or LPCB approved/listed sources	---	**M/s Honeywell:** LHS cable should be listed/ approved. Not the source from where it is procured. The source should have service support facility in India. **Nitin fire:** Linear Heat Sensing Cable along with its control panel should be brought from UL or FM or VDS or LPCB approved/listed sources and shall be approved together as a product.	Grammatical correction done. The clause 6.1.1 already specifies the responsibility of the manufacturer and is further modified as follows: "The manufacturer may outsource the left over items of AFDAS from other firms, but shall be responsible for the complete system functioning."

Clause No.	Description	Comments by Railways	Comments by the Firm's	RDSO's Remarks
4.7.2	The alarm temperature shall be 70ºC.	---	---	Clause deleted due to redundancy in cl. 4.6.9 and subsequent clauses renumbered.
4.7.6	LED indicators shall also be provided for normal system operation, faults and fire – alarm status.	---	---	Clause deleted due to redundancy in cl. 4.7.5 (4.7.4) and subsequent clauses renumbered.
4.7.8	Linear heat interface module should be UL or FM or Vds or LPCB approved/listed.	---	---	Clause added for conformity (4.7.6)
4.8.1	Temperature sensitive detector also known as linear heat detector shall be laid in all cable trays located in Power Equipment room and relay room. Signal about alarm temperature shall be sent to Control Panel by LHD interface module attached with Linear Heat Detection system.	---	**Fire Safe Technologies:** Temperature sensitive detector also known as linear heat detector shall be laid in all cable trays located in power equipment room and relay room.	Noted.
			Nitin fire: Temperature sensitive detector also known as linear heat detector shall be laid in all cable trays located in power equipment room and relay room, electrical cabinets, transformers, Diesel Generator and other electronic equipment.	Not agreed as LHS has to give indication to AFSS control panel.
4.8.2	Linear Heat Detector shall be of temperature sensitive hollow metallic pneumatic tube type.	---	**Fire Safe Technologies:** Linear hear Detector shall be of temperature sensitive hollow metallic pneumatic tube type.	Not a comment & it is only functionality.
			Nitin fire: Linear hear Detector shall be of temperature sensitive hollow metallic pneumatic tube type and shall work on the Rate of rise in temperature principle.	
4.8.3	The Linear Heat Detector should have strong capability to withstand the mechanical damage, tensile, water and corrosion and electromagnetic interference. The LHD shall be made of hollow tube of non-corrosive metal/alloy	---	**Fire Safe Technologies:** The Linear Heat Detector should have strong capability to withstand the mechanical damage, tensile, water and corrosion and electromagnetic interference. The LHD shall be made of hollow tube of non-corrosive metal/alloy.	Noted

Clause No.	Description	Comments by Railways	Comments by the Firm's	RDSO's Remarks
			Nitin Fire: The Linear Heat Detector should have strong capability to withstand the mechanical damage, tensile, water and corrosion and electromagnetic interference, having IP 67 protection. The LHD shall possess a hollow tube of 2mm external diameter o stainless steel. The LHD system should not during a fire event and the same shall be reusable without any replacement.	Not agreed, as this is not required in signaling installation.
4.8.5	The linear heat detector of every zone shall be continuously monitored for breakage and obstruction. A breakage, disconnection or obstruction shall initiate a FAULT alarm on the fire alarm panel of Control Panel	---	**Fire Safe Technolgies:** The linear heat detector of every zone shall be continuously monitored for breakage and obstruction. A breakage, disconnection or obstruction shall initiate a FAULT alarm on the fire alarm panel of Control Panel.	Noted.
			Nitin fire: The linear heat detector shall have a BIT module which can provide for continuous testing of the detector malfunction and the detection tube for blockage, jamming or opened (broken) tube. It shall indicate failure in the event of reduced performance over the entire range of sensor tube and initiate the notification on the control panel.	Not agreed as it may be vendor specific.
4.8.6	LHD shall be resettable type. The LHD shall be reusable after detecting the alarm condition.	---	**Fire Safe Technolgies:** LHD shall be resettable type. The LHD shall be reusable after detecting the alarm condition.	Noted
			Nitin fire: The LHD shall be resettable type. The LHD shall be reusable even after the occurrence of multiple fire events and no human intervention shall be required to recalibrate the system.	Not agreed, as the clause means the same.

Clause No.	Description	Comments by Railways	Comments by the Firm's	RDSO's Remarks
4.8.7	The optimal coverage for the desired region with detector length ranging from 10m to 200 m or more. The system shall be designed to have an optimum sensitivity.	---	**Nitin fire:** The optimal coverage for the desired region with adequate detector length. The system shall be designed to have an optimum sensitivity. **Fire Safe Technologies:** The optimal coverage for the desired region with detector length should be designed as per the application to be protected. The system shall be designed to have an optimum sensitivity.	Not agreed as it is not a proper comment. The sentence is grammatically corrected. The clause is modified as: 'The LHD shall provide optimal coverage for the desired region with detector length ranging from 10m to 200 m or more. The system shall be designed to have an optimum sensitivity.'
4.8.8	For a given length of LHD it shall be possible to set the alarm temperature at 70ºC with an Interface Module and with a tolerance not to exceed ±5%.	---	**Nitin fire:** For a given length of LHD it shall be possible to detect fire at an early stage using the Rate of rise in temperature principle and the sensitivity of the system shall be adjusted as per the site requirements.	Not agreed, as the temperature for LHD triggering is fixed at 70ºC in the specification. If the triggering temperature is kept less than this, then the false alarm may get initiated.
4.8.9	The alarm temperature shall be 70ºC	---	**Fire Safe Technolgies:** The sensitivity of the linear heat detection system will vary as per the application that is to be protected. **Nitin fire:** As explained earlier, the LHD system would work effectively when it works on the rate of rise in temperature principle.	Not agreed as discussed above. Clause deleted due to repetition in above, subsequent clauses renumbered.
4.8.10	The LHD interface shall supervise the detector for alarm temperature condition and damage to generate a fault condition which shall be displayed on the interface module faceplate by suitable means.	---	**Nitin fire:** The LHD interface shall supervise the detector for alarm temperature condition and damage to generate a fault condition which shall be displayed on the interface module faceplate by suitable means. Also, multiple linear heat detectors shall be integrated and monitored together via networking using a Command Control Unit.	Not agreed as it is vendor specific.
4.8.11	It shall be suitable for operation in a temperature range of 0-49ºC	---	**Fire Safe Technolgies:** Please refer to the comments given to clause 2.1 (a) and 4.2.1 **Nitin fire:** It shall be suitable for operation in	Not agreed. However, the clause is reworded for avoiding confusion as' 'The LHD interface shall be suitable for operation in a temperature range of 0-49ºC.'

Clause No.	Description	Comments by Railways	Comments by the Firm's	RDSO's Remarks
			the temperature range of -40°C to 125°C.	
4.8.12	Linear heat Detection system should be brought from UL or FM or Vds or LPCB approved/listed sources.	---	**M/s Honeywell:** LHD should be listed/approved. Not the source from where it is procured. The source should have service support facility in India. **Nitin fire:** The Linear Heatdetection system shall be UL/FM/LPCB approved. Also, both the detection tube and the detector together should be approved under the same standard and the same should be reflected in the approval certificate. Also, multiple linear heat detectors shall be integrated and monitored together via networking using a Command Control Unit.	Agreed and Grammatical correction done.
4.9.1	Detection, actuation, and control system shall have provision for automatic as well as manual operation. Where they are automatic, provision shall also be made for manual operation.	---		Grammatical correction done. Clause modified as: Detection, actuation, and control system shall have provision for automatic as well as manual operation. Provision for manual operation shall also be provided in addition to automatic operation.
4.9.2	The Control Panel shall be the central processing unit of the system, receiving and analyzing signals from Probe type bimetallic heat detectors, UV&IR flame detectors, Heat and Smoke multi sensors, LHS Interface, Aspirating Type Smoke Detectors and Manual Call Points, providing audible and visual information to the user	---	**Fire Safe Technolgies & Nitin fire:** The Control Panel shall be the central processing unit of the system, receiving and analyzing signals from Probe type bimetallic heat detectors, UV&IR flame detectors, Heat and Smoke multi sensors, LHS / LHD Interface Aspirating Type Smoke Detectors and Manual Call Points, providing audible and visual information to the user.	Agreed and modified for conformity.
4.9.5	The Control Panel should be located in Station Master's Room.	---	---	Grammatical correction done as: The Control Panel should normally be located in Station Master's Room.

Clause No.	Description	Comments by Railways	Comments by the Firm's	RDSO's Remarks
4.9.6	The Control Panel shall have sufficient input ports for connecting various sensors/detectors along with their interfaces, if any, & shall have sufficient output ports for controlling fire extinguishing system, operating/switching off electrical units and shall have provision for remote monitoring in network. The system shall be approved by UL or FM or Vds or LPCB. The software shall be able to monitor the health of each detector and other devices along with control panel. It shall also have clock synchronization facility.	---	**Park Group:** In 4.9.6 – (Control Panel approving authority) please revise as UL or FM or LPCB or VDS or any recognized lab by Govt of India provided in Sl. No- 4.11.11 for fire survival cable. **Realty Automation & Security Systems Pvt Ltd:** In recent amendment to RDSO/SPN/217/2016, I have observed that four foreign labs namely UL, FM, Vds and LPCB are mentioned. And no Indian Lab like TUV India, ERTL or ETDC is listed. In order to support "Make in India", I request you to modify the criterion so as to include laboratories based in India. **Vighnaharta**: This has reference to draft specs under preparation for Automatic Fire Detection & Alarm System for Signalling Installation.We are "Design in India" and "Make in India" company. We are registered under MSME and our R&D is recognised by Dept of Scientific and Industrial Research, Govt. of India. We are locally manufacturing Addressable Fire Alarm Panels. They are certified as per EN54-2 and EN54-4. We have got them tested from TUV India which is subsidiary of TUV Nord of Germany. In recent amendment to RDSO/SPN/217/2016, I have observed that four foreign labs namely UL, FM, Vds and LPCB are mentioned. And no Indian Lab like TUV India, ERTL or ETDC is listed. In order to support "Make in India" which is official Govt of India and Railways policy, I request you	Agreed and a new clause added in the specification as 6.1.2. The clause 6.1.2 is reproduced here: 'In case, where OEMs are not listed/approved by UL or FM or Vds or LPCB, the equipment may be listed/approved from any ISO 17065 accredited body which is authorized for carrying out fire detection system certification.'

Clause No.	Description	Comments by Railways	Comments by the Firm's	RDSO's Remarks
			to modify the criterion so as to include laboratories based in India.	
			M/s Ravel: The Control Panel shall have provision to provide sufficient input ports for connecting various sensors/detectors along with their interfaces, if any, & shall have provision to provide sufficient output ports for controlling fire extinguishing system, operating/switching off electrical units and shall have provision for remote monitoring in network. The system shall be approved by UL or FM or Vds or LPCB. The software shall be able to monitor the health of each detector and other devices along with control panel. It shall also have clock synchronization facility.	Agreed and grammatical correction done.

Clause No.	Description	Comments by Railways	Comments by the Firm's	RDSO's Remarks
4.9.7	There shall be preferably one Control Panel for a station. However, at stations having bigger relay room & power equipment room deploying more number of sensors/ detectors, more than one Control Panels can be provided but there shall be a main Control Panel also to control fire extinguishers, to provide alarms, for user interaction etc. of the entire installation through the individual Control Panels. In order to cater more than one room, the control panel should have the Loop expandability.	---	---	The provision of loop expandability is removed from this clause as the similar provision is also covered in Cl. 2.15.3.
4.9.8	The AFDAS shall be designed to work on power supply of 110V/230V AC +10%, -15% as well as 24 V DC +10%, -15% . The control panel shall have in-built charging facility to have 24V DC battery backup (VRLA as per IRS: S-93/96(A) or latest) for at least 24 hours. It shall power the aspiration type detection system, the Linear Heat Sensing Cables and all detectors, Manual Call Points etc., which constitute AFDAS. Addressable modules can be used if required to connect electronics of LHS interface module and Aspiration Type Smoke Detector to the control panel.	---	---	The provision of VRLA battery as per IRS: S 93/96 and provision to power LHS, ASD are removed based on discussion with vendors as it is not possible to draw so much power from control panel. The battery capacity as required for AFDAS is from 7AH to 45AH. However RDSO shall try to regulate the sourcing of battery for quality operation while approving the vendor. There is a space constrain in the control panel to accommodate higher AH batteries. RDSO specification IRS: S 93/96 is generally for higher AH batteries. Hence, it is removed from the clause. The modified clause is reproduced below: 'The control panel shall be designed to work on power supply of 110V/230V AC +10%, -15% as well as 24 V DC +10%, -15% . The control panel shall have in-built charging facility to have 24V DC battery backup for at least 24 hours for operating the system at quotient load and then 15 minute under fire or emergency condition at maximum connected load (Cl. 10.6.7.2.1.2 of NFPA 72 Edition 2016). Addressable modules can be used if required to connect electronics of LHS interface module and Aspiration Type Smoke Detector to the control panel.'

Clause No.	Description	Comments by Railways	Comments by the Firm's	RDSO's Remarks
4.9.10	The front panel of the Control Panel shall have the facility of buzzer silence, alarm silence and alarm activate, lamp test & reset. The front panel shall also indicate the status like fire, fault, disable, test, supply, primary supply fault, battery fault, secondary supply fault, and earth fault by respective LEDs/other suitable means	---	**M/s Ravel:** The term secondary supply fault is same as battery fault.	Discussed in the meeting with the vendor and the secondary power supply fault is considered same as battery fault.
4.9.11	The Control Panel shall have sufficient sets of Potential Free NO/NC contacts (minimum 4 NO and 3 NC for each zone); to trigger the Automatic Fire suppression system as per RDSO/SPN/218/2016 or latest pertaining …	---	**M/s Ravel:** The Control Panel shall have provision to provide sufficient sets of programmable Potential Free NO/NC contacts to trigger the Automatic Fire suppression system through logical function as per RDSO/SPN/218/2016 or latest pertaining …	The provision of PFC is related to AFDAS as a complete system and not for control panel alone. The portion of the clause (Requirement of PFC for AFSS) is moved from here to Cl. 2.12 i.e.; general requirements of the AFDAS.
4.9.12	The Control Panel shall be modular in structure, so that any fault in any of the modules can be set right by simply replacing the Faulty Module, with a spare.	---	---	The portion of the clause (Requirement of PFC for AFSS) is moved from here to Cl. 2.2 as it pertains to general requirements of the AFDAS and the condition of low battery is moved here from Cl. 2.12 as it pertains to the technical requirement of the Control Panel. "In case of low battery, the system shall give Audio Visual indication on the control panel."
4.9.13	It shall be possible to download data or extend alarms from Control Panel through suitable ports like RS232/USB or TCP/IP into a PC/Laptop/remote location operating on Windows platform. The software for downloading and analyzing fault data shall be provided & shall be compatible with the latest windows operating system.			As the networking is a compulsory feature of the system as per Cl. 2.3, hence the clause is modified as 'It shall be possible to download data and extend alarms from Control Panel through suitable ports like RS485/RS232/USB/TCP/IP etc. into a PC/Laptop at the installation and remote location operating on Windows platform. The software for downloading and analyzing fault data shall be provided & shall be compatible with the latest windows operating system.'
4.9.14	Audio Visual Alarm:	---	**M/s Honeywell:** The audio visual alarm should be UL or FM or LPCB or VDS approved for life safety application.	Based on the discussion with various vendors AFDASCP provides Indication along with buzzer on the panel and alarm through hooter and strobe. The sub clauses of 4.9.14 are deleted for conformity. The clause is modified as follows: 'Audio Visual Indication shall be provided on

Clause No.	Description	Comments by Railways	Comments by the Firm's	RDSO's Remarks
				the control panel and get activated in case of fire/smoke, trouble/fault and for supervisory functions. The audio indication may be from piezo electric buzzer and visual indication may be LED indication and/or LCD display.'
4.9.14.3	Audio visual alarm shall be provided with provision of resetting the hooter from Control Panel. However, visual alarm shall continue to be lit till such time the alarm conditions exist.	---	**M/s Ravel:** Audio visual alarm indication shall be provided with provision of silence the piezo electric audio buzzer from Control Panel. However, visual alarm shall continue to be lit till such time the alarm conditions exist.	Deleted as discussed above.
4.9.14.4	Visual Alarms: It shall work on 24V DC and shall be preferably flashing type RED Color.	---	**M/s Honeywell:** Visual alarm flashing color should be white as it improve indirect reflection & help in understanding alarm better **M/s Ravel:** It shall work on 24V DC and shall be preferably flashing/steady type RED LED.	Deleted as discussed above.
4.9.14.5	Audio Alarms: It shall work on 24V DC and shall be preferably with Piezo-electric type sounder with tone type of Fire-Engine. The sound level shall be preferably adjustable type up to 90db at a distance of 1m.	---	**M/s Ravel:** Audio Alarms: Indication shall be preferably with piezo electric type buzzer. It shall have distinct tone for alarm supervisory and trouble.	Deleted as discussed above.
4.9.16	The software preferably should have the capability for the following 4 levels of actions:	---	---	Grammatical and conformity corrections were carried out.
4.9.17	The control panel should have a GSM module and the system(s) shall send SMSs on GSM network….	---	**M/s Ravel:** The control panel should have a provision to connect programmable GSM module and the system(s) shall send SMSs on GSM network…	Agreed and grammatical correction done. In addition to this support to GPRS class 10 is removed as it is not required as only SMS is required.
4.9.19	The front panel shall have character display (LED/LCD) and alphanumeric keyboard. The control panel shall also work in degrade mode, i.e., the failure of the control panel shall operate the audio-visual and other output devices in case of an alarm detected.	---	**M/s Honeywell:** The degrade mode is specific to UL system only, hence request you to amend the same so that we can also participate since we are quoting with EN based solution.	Based on the discussion with the various vendors in the meeting and in light of extracts of 84th SSC meeting and criticality & vitality of major yards and junction the degrade mode is made mandatory, while for wayside station the degrade mode was made optional considering cost and multi-sourcing concerns. The choice is left to the purchaser. The definition of degrade mode under C.

Clause No.	Description	Comments by Railways	Comments by the Firm's	RDSO's Remarks
				4.9.20 is incorporated in the specification.
4.10.1	Audio Visual Alarm (Hooter cum strobe):	---	**M/s Honeywell:** Loop powered hooter cum strobe is specific to LPCB and VDS listed system only and addition of section for 4.10 is favoring specific makes.	Agreed and loop powered is removed from cl. 4.10.3. The term 'cum' is replaced with 'and'.
4.10.3	Visual Alarms (Strobe): It shall be preferably loop powered from control panel and shall be preferably flashing type RED Color.	---	**M/s Ravel:** Visual Alarms (Strobe): It shall be preferably 24V DC NAC powered/ loop powered from control panel and shall be preferably flashing type RED Color.	Modified. White colour for strobe is also added. As per Cl. 18.5.3.4 of NFPA 72 Edition 2016.
4.10.4	Audio Alarms (Hooter): It shall be preferably loop powered and shall be preferably with Piezo-electric type sounder with tone type of Fire-Engine. The sound level shall be preferably adjustable type up to 90db at a distance of 1m.	---	**M/s Ravel:** Audio Alarms (Hooter): It shall be preferably24VDC NAC Powered/ loop powered and shall be preferably with Piezo-electric type sounder with tone type of Fire-Engine. The sound level shall be preferably adjustable type up to 90db at a distance of 1m.	Agreed and modified accordingly.
4.10.11	The Control Panel shall be able to communicate and display the exact number of the Sensor or the Part of the Linear Heat Sensing Cable, which has activated the Fire Detection System, for pinpoint location of the seat of fire.	---	**Fire Safe Technologies & Nitin Fire:** The Control Panel shall be able to communicate and display the exact number of the Sensor or the Part of the Linear Heat Detection Cable, which has activated the Fire Detection System, for pinpoint location of the seat of fire.	Agreed and corrected.
4.11.3	Armored copper cables of minimum 2 Core x 1.5 sq.mm having cross linkable Low smoke halogen free insulation, inner & outer sheath, 1000V rated, twisted shall be used when the entire circuit is not within the same building.	---	---	The clause is modified considering vendor base as presently low smoke zero halogen sheath is available. Whereas, low smoke zero halogen insulation is not found available. The clause is modified as: 'Armored copper cables of minimum 2 Core x 1.5 sq.mm having cross linkable Low smoke halogen free inner & outer sheath, 1000V rated, twisted shall be used when the entire circuit is not within the same building.'
4.11.4	Unarmored copper cables of minimum 2 Core x 1.5 sq.mm having cross linkable Low	---	---	The clause is modified considering vendor base as presently low smoke zero halogen

Clause No.	Description	Comments by Railways	Comments by the Firm's	RDSO's Remarks
	smoke halogen free insulation and sheath, 500V rated, twisted with ATC uninsulated circuit protective conductor of 1.5 sq. mm, aluminum tape screening shall be used when the entire circuit is within the same building.			sheath is available. Whereas, low smoke zero halogen insulation is not found available. The aluminum tape screening is also not found with several vendor bases and not found critical for this application. The clause is modified as: 'Unarmored copper cables of minimum 2 Core x 1.5 sq.mm having cross linkable Low smoke halogen free sheath, 500V rated, twisted with ATC uninsulated circuit protective conductor of shall be used when the entire circuit is within the same building.'
4.11.8	Cables/wiring shall be laid down in metallic/rigid PVC conduits. PVC Conduits shall be used only in concealed spaces.	---	---	Clause is deleted as it is observed that PVC conduits are not required for this purpose as the cables proposed for this application is LSZH. Hence the PVC conduits serve no purpose and it may become more hazardous in case of fire.
4.11.10	All the cables and wires shall be tagged for proper identification. Wires shall be identified by ferrules at junction and cables by colour bands at every 3 m distance.	---	---	Grammatical correction done. The clause is modified as: "All the cables shall be tagged with colour band for proper identification."
4.12	MANUAL CALL POINTS	---	**M/s Honeywell:** When all the equipment are UL/EN listed then the Manual Call Point also shall be UL/EN/Vds approved or listed.	Not agreed as it is not a very sophisticated component.
4.12.4	It shall be addressable.	---	---	The clause is modified as 'It shall be addressable and resettable.' Cl. 4.12.5 is deleted and subsequent clauses are renumbered.
4.13.2	If only one detector is triggering the control panel, it shall give alarm.	---	---	The clause is modified for conformity as 'If only one detector is triggering the control panel, it shall give audio visual indication in the control panel.'
4.13.5	If alarm is received from LHS cable controller or Manual Call point it shall be treated as fire like situation. Cross zoning is not applicable for this system.	---	---	Deleted due to repetition. Already included in cl. 4.9.16.
4.14.3	One number Smoke and heat multi sensor shall be provided on either side of each - one way relay rack, cable termination rack, each IPS equipment, each power panel, Change over panels, Operating Panel, Maintainer	---	---	Grammatical correction and modification done for conformity.

Clause No.	Description	Comments by Railways	Comments by the Firm's	RDSO's Remarks
	Panel, 230V AC Points used or unused, above Air Conditioner and other locations where fire like situation can arise. Each sensor shall be wired/addressed in different zones. If one detector only identifies fire like situation, then control panel shall provide only visual indication at alarm. If both the adjacent detector provides the trigger for alarm, then the control panel shall treat as fire like situation.			
4.16.2	For CPU card and Power Supply card minimum one number shall be provided for each installation.	---	---	The spare CPU and power card is made mandatory for every five installations from one installation for cost concerns. The CPU card and Power Supply card, minimum one number as spare shall be provided for every five installations, subject to a minimum of one number of each card.
6.1.1	The manufacturer must be certified with ISO 9001:2008 (the scope of the ISO Certification has to specifically refer to the manufacturing of the products related to AFDAS). The copy of the certification shall be provided by the manufacturer. The manufacturer in this specification shall at least manufacture the Control Panel, Heat and Smoke Multi Sensor, Audio Visual alarms and Manual Call Point. The manufacturer may outsource the left over items of AFDAS from other firms, but shall be responsible for the complete system functioning. The outsourced firms shall be ISO 9001:2008 certified and the certification shall refer to the manufacturing of products being sourced	---	**Realty Automation & Security Systems Pvt Ltd:** Addressable Fire Alarm Control Panels are manufactured by us are branded as Apollo. Rest of devices like Heat and Smoke Multi Sensors, Audio Visual Alarms and Manual Cal Points are manufactured by Apollo Fire Detectors, UK. We have obtained licence from Apollo, UK to manufacture panels locally under agreement and they have issued certificate to that effect. Necessary changes are requested to be done to accommodate such partnerships in the document under reference above.	Not agreed as firm specific. Grammatical and conformity correction done.
6.1.2	---	---	---	New clause added for certifying agency. In case, where OEMs are not listed/approved by UL or FM or Vds or LPCB, the equipment may be listed/approved from any ISO 17065 accredited body which is authorized for carrying out fire detection system certification.
6.2	The manufacturer shall guarantee for supply of spares including outsourced items during life of the equipment & extend maintenance	---	---	As per Cl. 14.4.5.4.1 of NFPA 72 Edition 2016, the OEM shall extend support at least up to 10 years. Hence this clause is modified

Clause No.	Description	Comments by Railways	Comments by the Firm's	RDSO's Remarks
	support, if required by the Railway/purchaser.			as follows: The manufacturer shall guarantee for supply of spares including outsourced items during life of the equipment for minimum 10 years from the date of supply & extend maintenance support, if required by the Railway/purchaser.
7.1.1	Type, Acceptance and Routine tests on AFDAS and its sub-units, including outsourced items; as and when required, shall be conducted by concerned agencies as mentioned in the subsequent paras.	---	---	Grammatical correction done: Type, Acceptance and Routine tests on AFDAS and its sub-units, including outsourced items; as and when required, shall be conducted by concerned agencies as mentioned in the subsequent clauses.
7.3.3	One complete system as a sample as per guidelines of RDSO shall be tested for this purpose. The equipment shall successfully pass all the type tests for proving conformity with this specification. If the equipment fails in any of the type tests, the purchaser or his nominee at his discretion, may call for another equipment/card(s) of the same type and subject it to all tests or to the test(s) in which failure occurred. No failure shall be permitted in the repeat test(s).	---	---	Prototype sample for type test is defined and clause is modified in accordance with RDSO's apex ISO documents. The clause is as follows: 'One complete system as a prototype sample as per guidelines of RDSO shall be tested for this purpose. The equipment shall successfully pass all the type tests for proving conformity with this specification. The prototype sample for AFDAS may consist of followings: i. Probe type Bi-metallic Heat Detectors (2 Nos.) of each type ii. UV & IR Flame Detectors (2 Nos.) iii. Heat & Smoke Multisensors (4 Nos.) iv. Aspiration (Air Sampling) type Smoke Detector with copper piping & accessories (1 No.) v. LHS/LHD with its interface module (1 set) vi. Manual Call Point (2 Nos.) vii. Control Panel (1 No.) viii. Audio Visual Alarm (Hooter cum Strobe) (2 Nos.) ix. Fire Survival Circuit Integrity Cable (As required) x. GSM Modem (1 No.) xi. Battery (2 Sets)'
9.3.1.2	When temperature exceeds 55°C for Probe type bi-metallic heat detectors.	---	---	Correction for conformity to the technical requirements of clause as 'When temperature exceeds the manufacturers specified limit for Probe type bi-metallic heat

Clause No.	Description	Comments by Railways	Comments by the Firm's	RDSO's Remarks
				detectors.'
9.3.1.6	When LHS cable senses temperature beyond 70°C.	---	**Fire Safe Technologies:** A testing procedure should be introduced to make sure the detection cable detects fire from a significant distance and at a very early stage using the change in temperature principle. **Nitin fire:** The LHS/LHD tube shall not burn for a minimum of 1000 fire events without any replacement/change in the detection system. An empty cabinet (0.6m x 0.6m x 2m) similar to an electrical IPS panel shal be setup. A small circular tray of Ø150 mm diameter and height 100mm with nominal thickness 1.5mm shall be placed at the bottom of the cabinet. The tray shall be filled with 0.2L of water, 0.2L of diesel and 0.1L of heptane which shall help in lighting of fire. The LHS/LHD detection tube/cable shall be mounted only at the inner top side of the cabinet and not anywhere inside the cabinet. Also, the detection tube/cable shall not be kept hanging and should be installed within 100mm from the top of the cabinet. From the time of the ignition of the fire , the detector shall be able to sense the fire within 10 seconds and send an alarm signal . The LHS/LHD detection tube/cable should not burn during the testing and also shall be usable for a minimum of 200 testing cycles (200 fire events) without any change or replacement in the detection system.	Not agreed. Corrected for conformity as 'When LHS/LHD cable senses temperature at 70°C ±5% .'
9.3.1.10	When Manual Call Point is actuated.	---	---	Modified for conformity as 'When Manual Call Point is actuated, all the audio visual alarm (hooter and strobe) shall initiate.'

Clause No.	Description	Comments by Railways	Comments by the Firm's	RDSO's Remarks
9.3.1.13	All the above detectors shall have provision for fault isolation (in-built or alternate arrangement).	---	---	The clause is modified for conformity to the specification. The clause is modified as, 'Heat & smoke multisensor and Manual call point shall have provision for fault isolation (in-built or alternate arrangement).'
9.5.3	Probe type Bi metallic Heat Detector, UV&IR Flame Detector, Heat & Smoke Multi Sensors, Linear Heat Sensing Interface Module, Aspirating type smoke detectors, and Control Panel shall be tested as per Sl. No. 1 (temp range 0°C to 49°C), 2 (49°C), 3 (0°C), 4 (humidity 85%), 5 (humidity 85%), 6 (humidity 85%), 7, 11 & 12 of Clause No. 9.3 and Insulation Resistance test as per clause 9.5, High Voltage test as per clause no. 9.6 of Specification RDSO/SPN/144/2006 or latest on single sample.	---	---	S. No. 11 of Cl. 9.3 of Specification RDSO/SPN/144/2006 is 'Shock test', which is not applicable to Indoor equipment. Hence deleted. S. No. 10 of Cl. 9.3 of Specification RDSO/SPN/144/2006 is 'Bump test', which is applicable to Indoor equipment. Hence included. The clause is reworded as follows: Probe type Bi metallic Heat Detector, UV&IR Flame Detector, Heat & Smoke Multi Sensors, Linear Heat Sensing Interface Module, Aspirating type smoke detectors, Manual Call Point and Control Panel shall be tested as per Sl. No. 1 (temp range 0°C to 49°C), 2 (49°C), 3 (0°C), 4 (humidity 85%), 5 (humidity 85%), 6 (humidity 85%), 7, 10 & 12 of Clause No. 9.3 and Insulation Resistance test as per clause 9.5, High Voltage test as per clause no. 9.6 of Specification RDSO/SPN/144/2006 or latest on single sample.
9.5.4	The triggering temperature of Probe type Bi metallic Heat Detector shall be set to value more than 100°C be subjected to 100°C for 16 hours. It shall be functioning properly during & after the test.	---	---	Clause deleted in conformity to Cl. 4.2.1.2.
9.5.5.2	VRLA Battery as per IRS/S-93/96(A) or latest.	---	---	Deleted for conformity to the technical requirements of clause.
10.1.5	Connection diagram of the equipment on the side of the cover of control panel.	---	---	Correction for conformity is done. Connection diagram of the equipment on the side of the cover of control panel.
10.2	The equipment and its sub -assemblies shall be packed in thermo Cole boxes and the empty spaces shall be filled with suitable filling material. Before keeping in the thermo Cole box, the equipment shall be wrapped with bubble sheet. The equipment shall be finally packed in a wooden case of sufficient	---	---	As these products are well proven and established products and having their standard norms for packing. Based on discussion and previous experience the clause modified as The equipment and its sub -assemblies shall be packed such that it can withstand bumps

Clause No.	Description	Comments by Railways	Comments by the Firm's	RDSO's Remarks
	strength so that it can withstand bumps and jerks encountered in a road/rail journey.			and jerks encountered in a road/rail journey.
11.1.1	Guaranteed performance data, technical and other particulars.	---	---	On discussion with firms it is found these requirements are not relevant to be supplied with each system, the same may be supplied while seeking approval. Hence the clause modified as 'Guaranteed performance data'
11.1.2.1	Schematic block diagram showing mounting arrangement of various modules/PCB, components, & details of each type of assembled PCB.	---	---	Clause modified as Schematic block diagram showing mounting arrangement of various modules/PCB. Based on the above discussion with firms.
11.1.2.2	Details of Hardware e.g. schematic diagrams of the system circuits/ components, details for each type of assembled PCB and part list.	---	---	Clause modified as Details of Hardware e.g. schematic diagrams of the system. Based on the discussion with firms.
11.1.2.4	Part no. and manufacturer's details of components used.	---	---	Clause deleted as discussed with firms.
11.1.2.5	Trouble shooting procedure along with test voltages and waveforms at various test points in PCBs.	---	---	Clause modified as discussed with firms. The clause is renumbered as 11.1.2.4 and reproduced as follows: Details/procedure of trouble shooting of AFDAS.
15.1	All the provisions contained in RDSO's ISO procedure laid down in Document No. QO-D-7.1-11 dated 19.07.2016 (titled ―Vendor- Changes in approved status‖) and subsequent versions/amendments thereof, shall be binding and applicable on the successful vendor/vendors in the contracts floated by Railways to maintain quality of products supplied to Railways.	---	---	Clause modified as to incorporate the ISO guidelines as 'All the provisions contained in RDSO's ISO procedure laid down in Document No. QO-D-7.1-11 latest version (titled ―Vendor- Changes in approved status‖) and subsequent versions/amendments thereof, shall be binding and applicable on the successful vendor/vendors in the contracts floated by Railways to maintain quality of products supplied to Railways.'
---	---	---	**FogTec:** All products should be as per bodies/standards of UL or FM or VDS or LPCB or EN54 or CE approved/listed from any ISO 17025 accredited labs.	Agreed and Modified as cl. 6.1.2.