

**FINAL SPECIFICATION FOR
Tablet PC Type Fog PILOT ASSISTANCE SYSTEM for SAFETY (FogPASS)**

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1.0 Foreword

- 1.1 This specification is issued under the fixed serial number RDSO /SPN/201/2010 followed by the year of adoption as standard or in case of revision, the year of latest revision.
- 1.2 Whenever, reference to any specification appears in this document, it shall be taken as a reference to the latest version of that specification unless the year of issue of the specification is specifically stated.
- 1.3 All the provisions contained RDSO's ISO procedures laid down in Document No. QO-D- 8.1-11 dated 02.01.2025 (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.

2.0 Purpose

This document sets forth general, operational, technical and performance requirements for Tablet PC type Fog Pilot Assistance System for Safety (FogPASS).

3.0 Scope of Application

- 3.1 FogPASS is a non-vital and non-signal system. Aim of this system is to assist the Loco pilot by giving pre-warning about the approaching Landmarks such as Signal, LC gate, PSR etc. where the Loco Pilot's attention is required.
- 3.2 Route survey for collecting the GPS/GNSS co-ordinates of landmarks is not covered. It will have to be carried out separately & programmed into FogPASS.

4.0 Terminology

- 4.1 **Landmark:** fixed location such as Signal, level crossing gates, Permanent speed restrictions, neutral section or any other location as identified by the user as landmark.
- 4.2 **Pre-warning distance:** It is the distance from a landmark from where the warning shall be given while approaching that landmark.
- 4.3 **Short Description of Landmark:** It is the text to be displayed on display panel to indicate about the approaching landmark. This may consist of Station code/ LC gate No., its description in short, location etc.

5.0 General Requirements

- 5.1 FogPASS shall be a Microprocessor based unit with minimum 7" touch screen coloured display. The system shall be based on Linux, Windows, Android or Real Time Operating System (RTOS). Screen size variation is permitted, subject to meeting overall weight and dimension requirement since FogPASS is a portable device.

- 5.2 FogPASS Unit shall comply with "Electronics and Information Technology Goods (Requirements for Compulsory Registration) Order, 2021".
- 5.3 FogPASS shall be universally suitable for all types of sections of Indian Railways like single line, double line, twin single line, multiple lines etc. The device shall support Automatic detection of track change, but such change shall be confirmed by the Loco Pilot.
- 5.4 FogPASS shall be suitable for all types of electric and diesel locomotives, EMUs/ MEMUs/ DEMUs and any other self-propelled vehicle treated as train.
- 5.5 FogPASS shall be capable of working in all types of electrified as well as non-electrified territories.
- 5.6 FogPASS shall be suitable for train speeds up to 160 KMPH.
- 5.7 Each FogPASS unit shall store events essential for diagnostic purpose for a period of atleast 15 days. There shall be a provision to download event data for a specific date and time in addition to downloading data trip by trip.
- 5.8 It shall have built-in re-chargeable battery back-up for 14 hrs duration when fully charged.
- 5.9 Fog PASS unit shall be designed as a Loco Pilot's tool and thus it shall be portable, compact in size, light & of robust design. The weight of the unit, including battery, shall not be more than 700 gm. It shall not include battery charger, shoulder bag and swiveling arrangement. It shall be a portable unit which can be easily carried by the driver for placement on the cab desk.
- 5.10 Each FogPASS unit shall be supplied with a suitable shoulder bag of nylon material for porting & carrying. The Bag shall have padding/ suitable provisions to protect the device during transportation. Unit should have robust flip cover and suitable provisions to steadfast with the surface to avoid any movement during run.

6.0 Functional Requirements

6.1 Location identification & Route Log

- 6.1.1 FogPASS shall be an intelligent system having GPS/GNSS receiver with antenna, which shall detect location of the locomotive when kept in the locomotive and shall continuously calculate the distance remaining to the next landmark(s) already loaded in the system by the purchaser.
- 6.1.2 The unit shall be capable of detecting its location correctly ± 1 meter if switched on anywhere on the track for which the route data is already programmed in the unit and after movement, it correctly displays the approaching landmark. After the first GPS fix is received, the unit shall use appropriate inbuilt sensors to resolve its running position coordinates in tunnels / no GPS coverage areas.
- 6.1.3 FogPASS shall be programmable to feed the GPS/GNSS co-ordinates of all

Landmarks as identified by the user along with their short description & location. The GPS co-ordinates shall be collected by carrying out route survey of the section separately.

- 6.1.4 The FogPASS unit shall be capable of storing multiple route data in its memory. It shall be possible to further update new and existing routes on demand from the central server based on the route and section selected. The system software shall enable the driver to easily select among the loaded routes using the keypad/ touch screen. Route selection shall normally be automatic based on the location and direction of travel of the locomotive. However, wherever location fix of the GPS module results in multiple possible routes, the unit shall provide the locomotive pilot a voice prompt for selecting among the various possible routes. The menu for route selection must contain Zone, Division and Section (Route). The keyboard must be displayed at route selection screen for feeding of station code for quick search of all routes in which preferred station code is available. A keyword search option for routes shall also be included to avoid delays in GPS connection for route recognition.
- 6.1.5 The proposed FogPASS device shall comply with the STQC (Standardization Testing and Quality Certification) requirements, issued by the Ministry of Electronics and Information Technology (MeitY), Government of India, for IoT and cyber security, ensuring secure operation throughout its life cycle. This includes the implementation of secure boot mechanisms to prevent unauthorized software from running, firmware integrity verification to detect & prevent tampering, encrypted communication protocols to protect data in transit and robust authentication mechanisms to ensure only authorized access.
- 6.1.6 The FSD shall have physical security mechanisms to prevent tampering, viz., controlled access to USB ports, keeping a log of all activities on the USB and Ethernet ports, etc.
- 6.1.7 The FSD's Operating System (OS) and application must be supported through a long-term update model, offering regular security and performance updates for a minimum duration of 10 years.

6.2 Pre-Warning, Display & Announcement

- 6.2.1 The software version number shall appear on the display board of Tablet PC – within 5 seconds after power ON and shall be displayed for 5 seconds. The system shall then display the following message and it shall progress only after the message has been acknowledged by pressing "Enter" button.

"FogPASS is only a non-fail safe aid. LP to follow extant operating procedures. Press ENTER"

- 6.2.2 The System should give warnings as per following scheme

Approaching Landmark Type	Audio Warning	Visual Indication	Pre-Warning Distance
All Signals on route	[Location]+[Sig Type]	Sig-[Sig Name No.]	500M

All LC Gates excluding D-Class LC Gates	[Location]+LC-[LC Name No.]	LC-[LC Name No.]	500M
Any other Landmark	As defined by the user.		
The landmark types & pre-warning distances given above are only for Guidance and can be changed by the user depending upon local site conditions.			

- 6.2.3 FSD should be programmable to opt for usage in foggy and non-foggy weather conditions. Alerting distance shall be configurable with default pre-warning distance as 500 meters in foggy weather and 900 meters in non-foggy weather. It shall be possible to select foggy and non-foggy sections by Loco Pilot. The default selection shall be for non-foggy weather.
- 6.2.4 Once the FogPASS unit is within pre-warning distance, as prescribed in Clause 6.2.2, of the approaching landmark, it shall display the short description & the remaining distance (in Meters) of the approaching landmark on first (top) two lines of display (screen of the Tablet PC) in large fonts till the landmark is passed. Stop Signals shall be displayed in red, permissive Signals in yellow and other landmarks shall be coded in black. Text color scheme shall be updateable from the route file. It shall also make audio announcement once to the loco pilot. The audio warning shall be different for different types of landmarks. All signal and wayside landmarks are called out in English. Warning Messages may be called out in multiple language, as per user railway requirements.
- 6.2.5 The system shall also display short description and Mast number, kilometer no (wherever available in the route data file) & remaining distance of next two landmarks in geographical order on other two lines on screen of the Tablet PC in comparatively smaller fonts for differentiation.
- 6.2.6 After first landmark is passed, the second landmark shall shift to first line as immediate landmark on approach. This shifting shall take place only when the Locomotive actually crosses the previous landmark as per the position of the previous landmark fed in route data file. In such case, the third landmark shall also shift to second line & new next landmark details shall appear on the third line.
- 6.2.7 The pre-warning distance shall be configurable by the purchaser. It shall be possible to configure this distance separately for each landmark or for a group of landmarks.
- 6.2.8 The voice announcement in speaker & short description for display on display screen of the Tablet PC shall be as per the description for each type of landmark given in the format of Annexure 1 & 2. There shall be facility of configuring the recitation mode for individual landmark during preparation of Data File-whether code (Example: G.K.P) to be recited or full name (Example: Gorakhpur) to be recited. There shall be provision to store minimum 5000 Landmarks Location Name voice recitation files as application data. Voice recitation files shall be updateable over the air.
- 6.2.9 Voice recitation for approaching landmark should occur at the earliest only when it is an immediate approaching landmark and is within the geo-fence distance appropriate for foggy and non-foggy conditions-as per Clause 6.2.2. Further, this voice announcement is to be repeated if there has not been any in past 3 minutes (configurable in steps of 30 seconds). There shall be a provision of snooze button

which facilitates crew to snooze the voice announcement for 3 min only if the train is stationary at any station or signal. The event of snooze should be logged as per para 7.4.3.

- 6.2.10 Prior to commencement of voice recitation, the FogPASS device should verify that the time available before crossing the landmark is adequate for completing announcement. In case of expected clipping of voice announcement due to following nearby landmark, the clipping should be avoided by announcing only the last of such landmarks in vicinity.
- 6.2.11 In order to avoid situation in which a landmark is still shown approaching due to inherent positional inaccuracies associated with GPS/GNSS technology even after the landmark has been actually passed physically, the display message for approaching landmark shall be replaced with "....." when it is within 20m (typical) on approach itself. However, the next (Second) landmark shall shift to first line as immediate landmark on approach only when the Locomotive actually crosses the previous landmark as per the position of the previous landmark fed in route data file.
- 6.2.12 The format of maintaining route data and sample data in CSV format are required to be provided in the Operating & Maintenance Manual as given in Annexure 1&2. Apart from this, user-friendly windows based software tool having following features as minimum is also required to be provided:
- (i) To construct Route Data File by feeding the site of the landmarks and other application data such as Landmark name recitation voice files.
 - (ii) To download such route data file to the FogPASS device.
 - (iii) To upload already stored data in FogPASS to create a route data file.
 - (iv) To interpret data stored in file in a user-friendly graphical section map.

The data files thus prepared through windows based tool may be transferred to the FogPASS device either directly from laptop via USB interface or USB Pen Drive.

- 6.2.13 FogPASS device shall have ability either to accept the voice files related to Landmark Location Name directly through Laptop based tool or through USB Pen Drive and from the central server application.
- 6.2.14 FogPASS unit shall have an inbuilt LTE/4G/5G module with fall back to next available network i.e. 5G to 4G/LTE to 2G (auto connect) with M2M based SIM card (e-SIM in place of SIM Card may also be acceptable) capable of receiving the route files from a central server over the air. Server software shall be provided by the OEM for deployment on servers provided by Indian Railways. Complete integration to the Indian Railway provided server shall be in the scope of the supplier. Till the time such a server is available, OEM shall deploy the software on a MEITY (Ministry of Electronics and Information Technology) approved cloud service. The OEM shall also maintain the route files with proper version control and voice announcement files on the server. The server software shall allow the divisions to upload their nominated routes in Central server through divisional user facility with proper authorisation. The server software shall also be capable of interfacing with other railway servers for automatically receiving applicable caution orders, temporary speed restrictions, permanent speed restrictions and update it on the field devices based on the location of the FogPASS device. FogPASS shall correctly display and announce the Caution orders and speed

restrictions on its configured route. Updates shall be carried out on the device in the background. The modified route data shall be applied after restarting of the device. However, in case of Caution orders, such updates shall be carried out in all devices in real time.

- 6.2.15 The display module of the FogPASS unit (Tablet PC) shall have a wide viewing angle of 170 degrees (minimum) for best viewing by the Loco Pilot according to the requirement. A swiveling type stand shall be provided to securely hold the tablet on driver's desk. The swiveling feature must allow for smooth rotation and adjustment of the tablet's angle.
- 6.2.16 The language of display as well announcement shall be English only.

6.3 Others

- 6.3.1 It shall be possible to change/add/edit the route data by re-programming the system manually with a new route data to make the unit suitable for a new section. This shall be protected by a password. Whenever route data file is altered, it would bear new version number. In case of update of route over the air the data communication shall be encrypted using AES128 encryption or better.
- 6.3.2 When system is in auto route selection mode, it shall select the route based on the location & direction of movement automatically. However, the route so selected shall be displayed on the display screen of the Tablet PC with voice prompt for confirmation from the Loco Pilot. The system shall not display or announce any landmark till the route is confirmed by the Loco Pilot.
- 6.3.3 FogPASS device shall provide a simulation mode, for testing of FSDs.
- 6.3.4 FogPASS device shall have a self-diagnostic tool for testing of Peripheral devices such as LTE/4G/5G module, GPS module and antenna, Microprocessor, Memory etc. and log any faults along with an update to the server software.
- 6.3.5 It shall be a standalone system.
- 6.3.6 It shall be unaffected by weather conditions like Fog, Rain or Sunshine.

7.0 Technical requirements

7.1 GPS/GNSS

- 7.1.1 The unit shall have an in-built GPS or GNSS Receiver having the following technical specifications:
- i. L1 and L5 Frequency C/A Code with 12 (or higher) independent Tracking Module (Channels) and NAVIC support. The devices shall be configurable over the air to switch entirely to NAVIC satellite system.
 - ii. It shall support NMEA-0183 Protocol.
 - iii. Tracking Sensitivity shall be better than -150 dBm.
 - iv. Autonomous Positional Accuracy shall be better than +/- 1 Meter in un-assisted mode and sub-meter accuracy in assisted mode.
 - v. Suitable to work up-to 160 KMPH speed.

- vi. Minimum 10Hz Update Time to support high-speed train operations.
- vii. Reacquisition time < 250 milli seconds
- viii. First fix (subject to open view of the sky) shall be within 20 seconds of device booting up.
- ix. Antenna Short Circuit Protection
- x. Built-in Antenna supervisory circuit for determination of active antenna open or short state
- xi. Built-in nonvolatile RTC with battery backup option.

- 7.1.2 Built-in GPS/GNSS antenna shall be provided with each FogPASS device. FogPASS shall also simultaneously support an external GPS antenna module unit along with its cable of sufficient length. GPS repeater is not permitted. The external unit shall be portable & shall have magnetic base which can be fixed on loco body outside within the MMD of Locomotive.
- 7.1.3 The magnetic base shall be strong enough to keep the antenna fixing intact even under vibrations experienced by a running locomotive. The length of the antenna cable shall be at-least 5 meters to connect to the FogPASS unit kept on the cab desk. The unit shall switch to internal antenna in case external unit is not available or is disconnected due to cable fault.
- 7.1.4 System shall determine the correctness & quality of the GPS/GNSS signal received and in case quality of signal is not considered adequate to correctly identify its location, the same shall be indicated on the display screen of the Tablet PC. It should prompt the drivers regarding failure due to any error such as GPS/GNSS fix etc by means of loud audio beeps and flashing yellow LED. Any failure information shall be transmitted to the main server so that it can be addressed at the next feasible location.
- 7.1.5 There shall be an option with a touch button so that whenever the train approaches a signal showing ON (Red) or when a caution order needs to be reminded, the crew can press this button. It should then intermittently display and announce an alert message regarding the event, helping the crew stay vigilant and avoid issues like SPAD (Signal Passed at Danger) or skipping the Caution Order. Pressing the same button again should stop the warning announcement.
- 7.1.6 Each document/ manual of the manufacturer shall contain the history of the changes in version along with accompanying changes in the manual, if any.

7.2 Loco Pilot Interface

- 7.2.1 The Fog PASS unit shall have the following User interface comprising of the following:
- a) Tablet PC device shall have an anti-Glare coloured Display module of size 7" or larger, subject to meeting overall weight requirements. Display having minimum 1024x 720 pixels or better:
 - (i) Line 1&2: For displaying the short description & remaining distance to first approaching landmark once it is within pre-warning distance. This line shall have big font size (3/4" height).
 - (ii) Line (2 or 3) & (3 or 4): For displaying the short description & remaining distance to the next two approaching landmarks. These lines shall have

- comparatively smaller font size (1/2" height) as compared to line 1.
- b) User interface shall be designed using touch screen. The navigation keys shall be touch screen based as well as key based to have redundancy (to enable LP in selecting the functions if either fails) to perform following functions: -
 - (i) Menu
 - (ii) Up
 - (iii) Down
 - (iv) EnterTouch Screen shall support minimum Impact rating of IK10 to protect against fall, damage on impact etc.
 - c) Six LEDs each of 3 mm dia on the user interface board with following LED scheme:
 - (i) Battery charging indication LED
 - (ii) Battery low indication LED
 - (iii) GPS/GNSS availability indication LED (Steady Yellow)/Error Detected (Yellow Blinking)
 - (iv) Up Track Selected indication LED
 - (v) Down Track Selected indication LED
 - (vi) Auto Mode Selected.The indications at SN (iv), (v) & (vi) above may be provided on display screen.
 - d) Speaker: A speaker for voice warning to the driver. This shall have volume control through the keys of 7.2.1 (b). The level with maximum volume shall not be less than +85 dB at 1 meter. Audio Announcement shall be clear.
 - e) A Power switch to switch ON/OFF the device.
 - f) GPS speed shall be displayed in a large bold font in the bottom right corner of the display.
 - g) Gradient information shall be provided in the bottom of the screen.
 - h) The Percentage of battery charged available shall be shown on the display screen of FogPASS unit.
 - i) The Foggy/ Non Foggy Selection should be displayed on the screen as an indication. "F" for Foggy and "NF" for Non-Foggy on the top right side of the screen.

7.3 Power Supply & Battery Backup

7.3.1 The system shall be low power consuming device.

7.3.2 The battery shall be in-built, rechargeable & of Li-ion type with over charging cut-off feature. The battery capacity shall be sufficient to provide 14 hours back-up when fully charged.

7.3.3 Pre-charged set will be provided to Loco Pilots.

7.3.4 Charger

7.3.4.1 A charger shall be provided for charging the in-built battery.

7.3.4.2 The input supply to the charger shall be taken from locomotive which shall be

110V DC \pm 35V in electric locomotives & EMU/DEMU and 72V DC \pm 25V in diesel locomotives. The suitable charging port in the loco will be provided by Railway authority. The charger shall also be suitable to work with 230V₋+15%/-30% AC input supply.

- 7.3.4.3 The FSD unit shall be able to receive an input using a standard DC jack from the available supply in loco as mentioned under Clause 7.3.4.2. USB charging jack shall not be permitted to prevent misuse in the driver cab. The charger with any of the input supply shall be capable of charging the fully discharged battery in not more than three hours.
- 7.3.4.4 FogPASS unit shall have an indication to indicate when battery is fully charged. The battery percentage should be displayed on the screen to indicate its status. Additionally, when the battery reaches 100% charge, power should be automatically cut off to prevent battery-related failures.
- 7.3.4.5 Low battery LED indication shall be provided when the remaining battery backup goes below one and half hours to two hours.
- 7.3.4.6 An arrangement to indicate the following status of the battery shall be made on FogPASS:
 - Low battery indication
 - Battery under charging indication
- 7.3.4.7 The life of the battery should not be less than 24 months from the date of commissioning and 30 months from date supply.

7.4 Data Input & Output

- 7.4.1 The memory to store route data, landmark data & event data shall be non-volatile & shall be sufficient to hold route & landmark data of minimum 20000 route kilometers and event log as per clause 7.4.3 of at least 15 days.
- 7.4.2 The system shall accept data about the landmark in the format as defined in Annexure 1 & 2.
- 7.4.3 The event log shall store, selected mode (Foggy/Non-Foggy), each landmark passed during the journey along with date, time & speed. The location of warning and snooze event with date & time shall also be logged.
- 7.4.4 A USB port compliant to USB 2.0 & 3.0 shall be provided for downloading of events on a USB drive directly through keypad and it should not require any manufacturer specific software for this purpose and shall also be used for uploading/ downloading the route log, programming and configuring various parameters, downloading of stored events. The system shall communicate with remote server using inbuilt LTE/4G/5G for uploading/ downloading the route log, programming and configuring various parameters, downloading of stored events. The data shall be viewable on server with a 3-dimensional graph containing the following information: (i) Landmark (ii)Speed while passing and (iii) Time.
- 7.4.5 The facility to add/edit/delete the route data & landmarks shall be protected through a password to ensure authentic operation.
- 7.4.6 The supplier shall also provide computer software for uploading of location data pertaining to the section through computer software.

7.5 Electrical Protection

The unit shall have suitable protection against short circuit and overload.

7.6 Other Requirements

- 7.6.1 The FogPASS unit shall have IP 54 compliant shock resistant case made of polycarbonate or high impact ABS material with minimum IK10 rating(other than the touch screen). The Touch Screen Module shall comply with minimum IK 8 impact rating .The battery shall be housed within the unit and shall be serviceable for easy replacement at the end of battery life. All the openings/port shall be provided with anti-dust cap & shall be integral part of designs.
- 7.6.2 The system shall have an audio out jack (3.5 mm dia.) for interfacing the unit to additional speaker having built-in amplifier to amplify the audio warning level, if required in future.

8.0 Performance & Environmental Requirements

- 8.1 The unit shall meet the requirements of RDSO specification no. ELRS/SPEC/SI/0015/ Rev 1-October 2001 for "Reliability of Assurance s pecification for Electronic components for use in rolling stocks."
- 8.2 The climatic and environmental conditions prevailing in India are the following. The FogPASS shall be designed to work satisfactorily in these conditions:

Atmospheric temperature	(i) Maximum temperature of metallic surface under the sun: 75 °C. (ii) Minimum temperature: -10°C (Also snowfall in certain areas during winter season.
Humidity	100% saturation during rainy season.
Reference site Conditions	(i) Ambient temperature: 50 °C (ii) Humidity: 100% (iii) Altitude: 1776 m above mean sea level.
Rainfall	Very heavy in certain areas.
Atmospheric Conditions	Extremely dusty and desert terrain in certain areas. The dust content in air may reach a high value of 1.6 mg / m ³ . In many iron ore and coal mine areas, the dust concentration is very high affecting the filter & air ventilation system.
Coastal area	Humid & salt laden atmosphere with maximum pH value of 8.5, sulphate of 7 mg per liter, maximum concentration of chlorine 6 mg per liters and maximum conductivity of 130 micro siemens/cm.
Vibration	The equipment, system and their mounting arrangement shall be designed to withstand satisfactorily the vibration and shocks encountered in service as specified in IEC 61373.

Wind speed	High wind speed in certain areas, with wind pressure reaching 150 kg/m ³ .
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9.0 Contents & Packing

9.1 The FogPASS Tablet PC unit shall consist of:

- (i) FogPASS Tablet PC with in-built battery.
- (ii) Built-in GPS/GNSS antenna within FogPASS unit.
- (iii) External GPS/GNSS antenna with magnetic base & cable of suitable length & connector at other end to connect to FogPASS unit. Cable connecting the external GPS antenna and the FogPASS device shall be robust and nylon braided.
- (iv) Charger as mentioned in Clause 7.3.4.
- (v) Software for uploading route details, downloading event log & generating managerial reports.
- (vi) Cable for connecting PC/ Laptop to FogPASS Tablet PC device.
- (vii) Swiveling stand
- (viii) Do/Don'ts shall be part of user manual.

9.2 This FogPASS Tablet PC unit shall be so packed that it can withstand bumps and jerks encountered in a road/ rail journey including handling during its transit.

10.0 Documentation

10.1 Manufacturer shall provide following documents with equipment:

- (i) Manual of installation and maintenance
- (ii) Manual for programming route & landmark data and pre-warning distance.
- (iii) Manual for downloading & analyzing event log.
- (iv) Diagnostic procedure including troubleshooting charts.
- (v) User's Manual for Loco Pilots (Bilingual).

11.0 Tests & Verification

11.1 **Type Tests:**

- (i) Visual inspection as per clause 11.4
- (ii) EMC as per European Standard EN 50121
- (iii) System level functional tests as per format approved by RDSO
- (iv) Verification of Interference with Walkie –Talkie set of loco crew(During field trials)
- (v) Performance Test as per clause 10.2.2 of IEC 60571
- (vi) Cooling Test as per clause 10.2.3 of IEC 60571
- (vii) Dry heat test as per clause 10.2.4 of IEC 60571
- (viii) Damp heat test as per clause 10.2.5 of IEC 60571
- (ix) Supply over voltage, Surges and electrostatic discharge test as per clause 10.2.6 of IEC 60571
- (x) Transient burst susceptibility test as per clause 10.2.7 of IEC 60571
- (xi) Salt mist test as per clause 10.2.10 of IEC 60571
- (xii) Vibration and shock test as per IEC 61373
- (xiii) Water tightness test for on board external components as per clause 10.2.12 of IEC 60571
- (xiv) Verification of source of Microprocessor and other ICs through invoices.

11.2 Acceptance Tests

Following shall constitute acceptance test:

- (i) Visual inspection as per clause 11.4
- (ii) System level functional tests as per format approved by RDSO.

11.3 Routine tests

- (i) Visual inspection as per clause 11.4
- (ii) System level functional test

11.4 Visual Inspection

The equipments shall be visually inspected to ensure followings:

- (i) General workmanship.
- (ii) Quality of soldering and component mounting.
- (iii) Legend printing.
- (iv) Green masking.
- (v) Indications and displays.
- (vi) Mounting and clamping of connectors.
- (vii) Proper housing of cards.
- (viii) Disabled all other application except FogPASS application.

11.5 Field Trial

After successful prototype development and testing, FogPASS unit shall be subjected to field trial. Quantity of FogPASS unit to be subjected to field trial and field trial period shall be as mentioned in RDSO's ISO procedures laid down in Document No. EL-WI-8.1-1 dated 04.12.2024 (titled "Work Instruction for Development of Vendor") and subsequent versions/amendments thereof OR on U-VAM.

12.0 Information to be given by the Purchaser

The relevant data for landmark for the purpose of format as mentioned in Annexure 1 & 2 shall be provided to the supplier.

13.0 Applicable Documents

SN	Subject	Spec
1.	Specification For Reliability of electronics used in rolling stock Application	RDSO spec no :ELRS /SPEC/ SI /0015-Oct 2001
2.	Railway applications – electromagnetic compatibility – Part 3-2: rolling stock – Apparatus	EN 50121-3-2/ IEC 62236-3-2
3.	Railway applications – electromagnetic compatibility – Part 2: emission of the whole railway system to the outside world.	EN 50121-2/ IEC 62236-2

4.	Railway applications – rolling stock equipment – shock and vibration test	IEC 61373
5.	Electronic equipment used on rail vehicles.	IEC 60571

14.0 Abbreviations

Abbreviations	Full Form/Description
AC	Alternating Current
DC	Direct Current
GPS	Global Positioning System
FogPASS	Fog Pilot Assistance System for Safety.
GSM	Global System for Mobile
LCD	Liquid Crystal Display
LED	Light Emitting Diode
GNSS	Global Navigation Satellite System
NAVIC	The Indian Regional Navigation Satellite System (IRNSS), with an operational name of NAVIC (acronym for Navigation with Indian Constellation)
LTE	Long Term Evolution- Wireless Communication Standard
4G	4 th Generation Wireless Communication
5G	5 th Generation Wireless Communication
AES 128	Advanced Encryption Standard (AES) is a widely used encryption algorithm established by the U.S. National Institute of Standards and Technology (NIST) in 2001. AES is a symmetric block cipher that encrypts data in blocks of 128 bits using keys of 128, 192, or 256 bits. AES 128 encryption uses a 128-bit key.
ABS	Acrylonitrile butadiene styrene (ABS) (chemical formula $(C_8H_8)_x \cdot (C_4H_6)_y \cdot (C_3H_3N)_z$) is a common thermoplastic polymer.

Annexure - 1

FogPASS File Structure

Name of File AAAAAAAA.csv

Header of File SRT_AAAA_AAAA_VNNN.NN

Title for illustration (not to be stored in Data File)	Landmark ID			Landmark Latitude	Landmark Longitude	Landmark Gradient	Landmark Pre-Warning Distance (in multiples of 100m)	Landmark Up/Down Status
	Location Code	Landmark Type	Landmark Name					
Data Format	AAAA	NN (See List)	$\frac{A}{N} \frac{A}{N} \frac{A}{N} \frac{A}{N}$	NNNN.NNNN	NNNN.NNNN	NNNBB	NNN	N (See List)
	13					
Sample Records	JP	12	136A	2645.1157	7521.3654	300UP	500	2
	GKP	44	36A	2358.3465	7826.3598	037DN	600	1
	NDLS	43	6A	2812.7486	7656.9542	150UP	300	1
Note : <ul style="list-style-type: none"> (i) Data Preparation tool should not allow entry of "Space" or any "non-printable/ other than alpha-numeric characters" to data file. (ii) The firm may use its own structure, provided all aforesaid fields and their corresponding syntax are incorporated, so as to fulfill all functional requirements enumerated in this specification related to train operations by Loco Pilots. 								

Landmark Up/Down Status List			
Code	Description	Display String	Voice Message
0	Not defined		---
1	Up	Up	Up
2	Down	Down	Down

Location Code Voice File Structure

Filename: [Location Code].s or [Location Code].mp3 or [Location Code].wav

Compression 1 in 8 or better

Audio Content : Full name of station

Voice Message Structure

Structure Location+ Landmark Type

Landmark Type List			
Code	Description	Display String	Voice Message
00	Not defined		---
01 - 09	Spare		---
10 - 39	Signals & Main Movement Signages		
10	Distant	Dist	Distant
11	Inner Distant	Inr-Dist	Inner Distant
12	Home	Home	Home
13	Routing Home	R-Home	Routing Home
14	Starter	Str	Starter
15	Starter Area	Str-Area	Starter Area
16	Intermediate Starter	Int-Str	Intermediate Starter
17	Advanced Starter	Adv-Str	Advanced Starter
18	Gate	Gate	Gate
19	Gate Distant	G-Dist	Gate Distant
20	Gate-cum-Distant	Gate-c-Dist	Gate-cum-Distant
21	Auto	Auto	Auto
22	Semi-Auto	Semi-Auto	Semi-Auto
23	Gate-Auto	Gate-Auto	Gate-Auto
24	IB	IB	IB
25	IB Distant	IB-Dist	IB Distant
26	IB Inner Distant	IB-Inr-Dist	IB Inner Distant
27	Advanced Starter-cum-Gate	Adv-c-Gate	Advanced-cum-Gate

Landmark Type List			
Code	Description	Display String	Voice Message
28	Advanced Starter-cum-Distant	Adv-c-Dist	Advanced-cum-Distant
29	Advanced Starter-cum-Gate Distant	Adv-c-G-D	Advanced-cum-Gate Distant
30	Warner	Warner	Warner
31	Outer	Outer	Outer
32	Warning Board	Warn-Bd	Warning Board
33	Main Line Starter	ML Str	Starter
41 -49	Engineering Landmarks		
41	LC Gate	LC	LC
42	Manned LC Gate	LC	LC
43	Unmanned LC Gate	LC	LC
44	Bridge	Bridge	Bridge
45	Curve	Curve	Curve
46	PSR	PSR	PSR
50	Neutral Zone	Neut-Zone	Neutral Zone
60	Halt Station	Halt	Halt Station
Rest Codes – Spare			