

## ANNEXURE A

### Specifications of Signal Location Announcement System (SILAS)

#### 1.0 Technical Specifications of SILAS

Parameters	Details
Physical dimension	(L) 125 mm x (D) 85 mm x (H) 85 mm with tolerance of 10%.
Weight	500 gram to 1000 grams
Input voltage	110 VDC (Voltage range 77V-135V)
MCB	Dedicated MCB for complete system with 2A or suitable rating.
Supply Hardware (Existing can be used if available in already installed Audio Alert Unit)	2 core cable of 1 sqmm for power supply (Approx. 10m) and for taking input of yellow signal passing from AAWS indication panel (Approx. 2m) and Cable for installation of photo diode in indication Panel of AAWS (for sensing yellow signal passing).
Software	SW inbuilt in device
Display	Small LCD display of size minimum 2.42 inch to indicate route and any message as required.
Speaker	5W inbuilt in device
Input Panel	To enter route number and to reset device. 4 Key pad switch panel as a user interface comprising the following keys: Menu, Up, Down, Enter.
LED indications	<ol style="list-style-type: none"> <li>10 mm Red LED (Working on 12V DC) for power on indication.</li> <li>Device or component healthiness and failure indication should there on device</li> <li>GPS healthiness indication</li> </ol>
IP Rating	IP61 [Tested in NABL lab report no. E-4608-M]
Temperature tolerance	Should work in entire range 0° to +60° C
Data Logger	Minimum 30 days data recording of events in the form of text.
USB Slot	To download and feed the data
GPS Antenna	<p>Make: Ublox, model NEO-M8N or equivalent with mounting bracket which supports GPS/Galileo/GLONASS/BeiDou satellites and having the following specifications:</p> <ol style="list-style-type: none"> <li>Horizontal position accuracy: 2.5 to 4 meters.</li> <li>Sensitivity Tracking &amp; Navigation: -159 dBm to -167 dBm</li> <li>It shall support NMEA-0183 Protocol.</li> <li>L1 Frequency C/A Code with 12 [or higher] independent Tracking Module (Channels).</li> <li>Time-To-First-Fix: Cold start 25sec to 45sec, hot start- 1sec, Aided start 2 sec to 7 sec.</li> </ol> <p>GPS antenna along with its cable of sufficient length shall be provided with each SILAS unit. The antenna shall be portable which can be fixed on EMU cab outside. Mounting should be strong enough to keep the antenna fixing intact even under vibrations experienced by a running EMU. The length of the antenna cable should be sufficient to connect between antenna &amp; SILAS unit installed in EMU cab.</p>

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## 1.1 Others

The climatic and environmental conditions prevailing in India are the following. The SILAS shall be designed to work satisfactorily in these conditions:

Parameter	Specification
Atmospheric temperature	(i) Maximum temperature of metallic surface under the sun: 60°C. (ii) Minimum temperature: 0°C
Humidity	98 -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 with lightening.
Atmospheric Conditions	Extremely dusty in certain areas.
Coastal area	Humid & salt laden atmosphere with maximum pH value of 8.5, sulphate of 7 mg per liter, maximum concentration of chlorine 0 mg per liters and maximum conductivity of 130 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.

## 2.0 Terminology:

2.1 Signal: Fixed location multi-aspect signals in Automatic signaling system on all the lines of Mumbai suburban network of western Railways i.e. UP-Through line, UP local line, Down Through line & Down local line on Main line and UP & Down lines on harbour lines Both STA lines etc.

2.2 Pre-warning distance & Warning Announcement:

2.2.1 Audio announcement of upcoming signal number and signal position (Right side or left side or extreme left or extreme right) will be made twice i.e. 350 meters and 250 meters from the upcoming signal only in English language.

2.2.2 Audio announcement of Next station halt at a distance of 800m and 600 m from stop mark of platform only in English language.

2.2.3 Audio announcement of "Neutral Section ahead" 500m before NS

2.2.4 Audio announcement of "PSR ahead" 350m before starting of PSR

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### 3.0 Functional Requirement:

#### 3.1 General :

- 3.1.1 SILAS shall be suitable and functional for all sections of Western Railways operating on Automatic signaling system including tunnels and creek area.
- 3.1.2 SILAS shall be suitable for all types of EMUs e.g. Siemens, Alstom, Medha (AC, Non-AC and Underslung AC), BHEL.
- 3.1.3 It will be a Microcontroller based system having program and memory to execute the announcement.
- 3.1.4 It should check speed of train and distance of train from the next upcoming signal.
- 3.1.5 SILAS shall be suitable for EMU speeds up to 110 KMPH.
- 3.1.6 SILAS unit shall be able to integrate with the existing Advanced Auxiliary Warning System (AAWS/AWS) installed in the driving cabs of EMU rakes of Mumbai suburban network for taking input of yellow signal passing.
- 3.1.7 The SILAS unit directly draws power from its MCB of 110 v dc installed in the driving cab of the EMU rake, hence the Unit always remains in ON state.
- 3.1.8 Silas unit will take input from Photo diode supplied and installed by firm in indication panel of AAWS.

#### 3.2 Location Identification & Route log

- 3.2.1 SILAS unit shall be a GPS based system having GPS receiver and antenna which shall detect location of the EMU and shall continuously calculate the distance remaining to the upcoming signal already uploaded in the system as per the route selected by the Motorman. Accordingly, In running train it will make announcements as per pre warning distance.
- 3.2.2 This unit shall be capable of detecting its location correctly within 2.5 to 4 meters when switched on the track for which the route data is already programmed in the unit and after movement it correctly announces the upcoming signal number and its location
- 3.2.3 SILAS unit shall be programmed with GPS coordinates of all signals as identified by the user along with their short description & location in audio form. The GPS coordinates are to be collected by carrying out route survey and same must be programmed into the SILAS unit by firm.
- 3.2.4 The SILAS unit shall be capable of storing multiple route data in its memory. The following routes selection should be possible:

1. For CCG-VR section: UPLL, DNLL, UPTH, DNTH.
2. For CCG to BVI Section: UPLL, DNLL, UPTH, DNTH.
3. For MMCT to BVI section: UPLL, DNLL, UPTH, DNTH, UPML, DNML

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4. For GMN-CSMT section: UPHB, DNHB.

5. For VR-DRD section: UPML, DNML

6. Other routes as required

3.2.5 The system shall enable the motorman to easily select among the loaded routes using soft keypad also for core or addition of new lines without any hardware changes if required.

3.2.6 In case rake diverted from defined route to other route then system automatically change route without any manually feeding of route and announcement of signal no and its position should be as per current route but next halt station announcement should be as per train journey.

3.2.7 User friendly application should be developed by supplier for handled over railways for further modifications in route data such as change in signal no, signal location, GPS coordinates, etc. The modified database can be fed into SILAS without taking out the unit from cab i.e. on position.

3.2.8 Supplier firm should give full support for product life of 10 years to modify or add routes if required.

3.2.9 Small display of suitable size minimum 2.42 inch should be provided which will indicate the selected route and same should be announced in speaker.

3.2.10 In case of device getting hanged or malfunctioned during its operation, there should be provision to RESET device through keypad.

### 3.3 Pre-warning Distance & Announcements

3.3.1 SILAS audio announcement should be done when come in pre-warning distance range on following priority basis:

- i) Announcement of Signal aspect
- ii) Announcement of Signal No. and Location
- iii) Next station announcement
- (iv) announcement of PSR.
- (v) announcement of Neutral section.

NOTE- Priority may be change as per advice of Sr.DEE/RS/BCT or representative as per operation requirement.

3.3.2 Audio recording of signal numbers of all signals with position left/right of all lines need to be already loaded into the system memory with its GPS coordinate and will announce signal aspect as per feedback of AAWS.

3.3.3 For next station announcement, Train Manager then enters the train journey of the EMU train through the software i.e. Mobile application at the start of every journey and route will be selected automatically and the selected line/route will be announced on speaker and indicated on display.

  
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3.3.4 SILAS should give warning announcement as per the following scheme:

Signal Aspect	Signal Name	Audio warning	Pre-warning distance
Yellow	As per the route survey, Signal name must be programmed into SILAS unit.  'RIGHT' 'LEFT' 'EXTREME RIGHT' 'EXTREME LEFT'	'NEXT SIGNAL IS RED, BE CAREFUL'.  Audio announcement will be made continuously till next Double Yellow or Green signal is passed.  '[Signal name] + [Signal location]'	Announcement 'NEXT SIGNAL IS RED, BE CAREFUL' will be made as yellow signal crossed, in one languages (English).  Additionally, audio announcement '[Signal name] + [Signal location]' will be made at 250 meters from the upcoming signal.
Any other signal aspect	'RIGHT' 'LEFT' 'EXTREME RIGHT' 'EXTREME LEFT'	[SIGNAL NAME]+[SIGNAL LOCATION]	Audio announcement will be made twice i.e. 350 meters and 250 meters from the upcoming signal, in one languages (English)
Next Halt Station announcement	---	'Next Halt Station is <u>Name</u> '	Audio announcement will be made twice i.e. at 800m and 600m before approaching station stop mark in one languages (English)
Permanent Speed restrictions	----	'Permanent Speed Restrictions Ahead'	Audio announcement will be made at 350m before PSR in one language (English)
Neutral Section	----	'Neutral section is coming'	Audio announcement will be made at 500m before approaching neutral section in one language (English)

  
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- 3.3.5 However, if signal passed is 'Yellow' the SILAS unit must announce "NEXT SIGNAL IS RED, BE CAREFUL" in English language continuously till next Double Yellow or Green signal is passed. This shall be achieved by obtaining the trigger of 'Yellow' signal aspect from the existing AAWS installed in driving cab. Additionally, audio announcement '[Signal name] + [Signal location]' will be made at 250 meters from the upcoming signal.
- 3.3.6 Prior to commencement of voice recitation, the SILAS unit should verify that the time available, considering the speed of the train, before crossing the upcoming signal is adequate for completing announcement. In case of less inter-signal distance and if it is not possible to announce twice at 350m and 250m, only announcement at 250m to be done and there must not be any announcement after passing of respective signal.
- 3.3.8 In case rake diverted from defined route to other route then system automatically change route without any manually feeding of route and announcement of signal no and its position should be as per current route but next halt station announcement should be as per train journey.

### 3.4 Speed Chart

3.4.1 Following parameters are required to analyse in speed CHART by using app or software developed by firm and generate reports as given below.

- 1 Check the speed while crossing each Yellow and RED signal
- 2 Check and Verification of approach and entry speed at stations. (Platform Entry Speed)
- 3 check the speed while crossing critical signals defined by TRO
- 4 Check speed for Observation of permanent speed restrictions. (Speed Restrictions Compliance)
- 5 Checks the motorman's response to brake feel before start of trip
- 6 Check and give Remote Live monitoring of location of EMU rake

### 3.5 Software & Server & Data Logger

3.5.1 Firm will design and develop of web page for tracking monitoring of EMU rakes.

#### A. Web page design requirement:

1. Development of secured log in page for administrators.
2. GPS coordinates sent by SILAS unit installed in particular cab should be sent to server through GSM module and GSM antenna. These live coordinates of EMU D'cab, to be used for mapping EMU D'cab on developed user interface web page.
3. Development of user interface to view all running rakes in single screen with flag having details of train e.g. cab no, direction of trip (UPLL, DNLL, UPTH, etc), etc.
4. Screen should show all lines e.g. UPLL, DNLL, UPTH, DNTH, UPHB, DNHB, UPML, DNML
5. Suitable flag symbol for each D'cab should move on particular line.
6. On clicking on flag of particular cab, further details should be shown for it e.g. expected time of arrival at all stations.

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7. Facility for searching and tracking the particular D'cab by entering alpha-numeric D'cab number.
8. On clicking particular station rakes approaching and leaving that particular station should be displayed.

B. Development of application to assign trip no to particular D'cab remotely.

C. Cloud server support for 2 years. SIM cards for GSM module will be provided by Railways. Each SILAS unit shall be equipped with GSM module.

3.5.2 Each SILAS unit shall have Data logger to store events in text form essential for diagnostic purpose for a period of 30 days. Events should get logged in device for working line/route, Signal number and location encountered with date, time and GPS location, speed at each signal etc. Failure events should also be logged. It should be possible to download the events through USB slot by inserting pen drive or through mobile application by connecting laptop as well as should able to generate report and download reports as mentioned in 3.3 as well as whatever required

3.5.3 SILAS system shall have the ability to accept GPS coordinates data and the Audio files related to signal location, name directly through either laptop-based tool or mobile application based tool or through USB pen drive or via On Time Programmable (OTP) device. In case of OTP the initial programming or subsequent modifications in signal name and location audio files may be required to be carried out by OEM by using Laptop based tool or Pen drive in field by the user.

3.5.3 The format of maintaining route data and sample data is required to be provided in Operating & Maintenance manual.

3.5.4 Apart from this, user-friendly software tool having following features as minimum is also required to be provided:

- a. To construct route data file by feeding the site of the signals and other application data such as Signal names recitation voice files.
- b. To download route files to SILAS unit.
- c. To upload already stored data in SILAS to create a route data file.
- d. To interpret data stored in file in a user-friendly format.
- e. Firm share all type software with railways use in this device for maintenance and training also will be provided by firm.

3.5.5 The data files thus prepared through windows based tool or Mobile application may be transferred to the SILAS unit either directly from laptop through USB or through pen drive or through Wi-Fi.

3.5.6 Cloud server set up and maintenance for 2 years include all rake information and time table and data log.

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### 3.6 Tests & Verification:

Following tests to be performed on SILAS system.

- (i) Visual inspection.
- (ii) System level functional tests as per format approved Railway.
- (iii) Performance Test.
- (iv) Supply over voltage, Surges and electrostatic discharge test.
- (v) Salt mist test.
- (vi) Vibration and shock.
- (vii) Water tightness test for on board external components.

Note- TEST Reports to be submitted for approval of the prototype system with TPI certificate.



  
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