Functional Requirement Specification (FRS) of Intelligent Field Devices (IFD) for IR-NIYANTRAC

1. INTRODUCTION:

In reference to Railway Board letter No. 2022/EEM/150/9 dated 09.09.2024, there will be recognized imperative to develop a centralized application for Intelligent Field Device device (IFD) dedicated to the data collection, monitoring, and control of all non-traction Railway assets. Data from IoT devices or Intelligent Field Devices (IFDs) shall be communicated directly to Indian Railway own IT application, viz., IR-NIYANTRAC (Indian Railway-Native IoT based Yield Analysis Telemetry Recording and Control). This initiative aims to enhance the efficiency and effectiveness of asset management across the railway network. The proposed system will facilitate real-time data acquisition, ensuring that all relevant information regarding Railway assets such as maintenance schedules, operational status, and performance metrics is readily accessible.

The Intelligent Field Device (IFD) will be designed to acquire electrical parameters and other relevant data from various non-traction assets within the railway network and the collected information is then transmitted to IR-NIYANTRAC, a web-based application software and service developed by CRIS (Centre for Railway Information Systems). The integration of IFD with IR-NIYANTRAC will enhance monitoring and control capabilities, improve operational efficiency and asset management.

2. OBJECT:

This FRS covers technical and operational requirements of Intelligent Field Devices (IFD).

3. **Environmental Service Condition**:

SN	**Parameter**	Value
1.	Operating Temperature	-20ºC to 55ºC
2.	Relative Humidity	upto 98% during rainy season
3.	Dust and Moisture protection	IP-66

4. GENERAL REQUIREMENT

4.1 The system will monitor energy parameters for the following assets:-

- Lifts
- Escalators
- Sub-Stations

4.2 The system will monitor Electrical parameters along with control of the following assets:-

- Platform Lights (30/70%)
- Street Lights

- Water Pump
- Water Tank
- Station Fan
- Tunnel Intake Fan
- Tunnel Exhaust Fan
- Tunnel Light (Normal)
- Tunnel Light (Emergency)
- DG Set

5. Functional Requirements

5.1 Intelligent Field Device (IFD) should be a single integrated unit having Analog / Digital Inputs / Outputs, Display screen, Communication, Power Supply and Filter protection along with battery and data backup.

5.2 The communication between the IFDs and IR-NIYANTRAC one M2M common services platform shall happen on standards of massage queuing based publish / subscribe transport protocol with acknowledgement feature and should have PING/other methods to detect continuous connection as assured delivery of data.

5.3 Local Intelligence in IFD: Schedules, local rules will be published through the application which will have to be stored and executed by the IFDs locally. These shall be effective irrespective of the availability of communication channel between the IFD and Common Services Platform.

5.4 Devices should have capability to configure data scan and publish frequency which shall be set through the IR-NIYANTRAC application.

5.5 Communication between sensor, IFDs, other local external devices could be through wired/ wireless technologies based on local site conditions and feasibility.

5.6 Vendor will have to encrypt any data transfer to the Common Services Platform as per the Certificate generation procedure as detailed in the enclosed message communication format. Railway shall ensure that all data transfer are through a secure communication channel.

5.7 It should be ensured that IFDs themselves are secure, including protection against firmware and software vulnerabilities and tamper proof to prevent unauthorized access to the devices. Vendor should ensure compliance with the TEC (Telecommunication Engineering Centre) code of practice for securing consumer Internet of Things (IoT).

5.8 The status of various functions shall be recorded and control for the following assets:

Asset	Type	Function/Parameters	Requirement
Lifts	Monitoring	Operational Status, Power Consumption, Voltage, current & frequency	Energy meter
Escalators	Monitoring	Operational Status, Power Consumption, Voltage, current & frequency	Energy meter
Sub-Stations	Monitoring	Power Consumption, Voltage, current & frequency	Energy meter
Sub Metering	Monitoring	Power Consumption, Voltage, current & frequency	Energy meter
Platform Lights	Monitoring	Power Consumption, Voltage, current & frequency	Energy meter
	Control	30%/70% lighting ON/OFF	Digital Output
Street Lights	Monitoring	Power Consumption, Voltage, current & frequency	Energy meter
	Control	ON/OFF Astronomical Timer	Digital Output
Water Pump	Monitoring	Power Consumption, Voltage, current, frequency, Water Pressure & Water Flow	Energy meter Pressure sensor Flow sensor
	Control	ON/OFF	Digital Output
Water Tank	Monitoring	Water Level	Level sensor to measure water level up to 3/6/10 meter (As per site requirement)
Station Fan	Monitoring	Power Consumption, Voltage, current & frequency	Energy meter
	Control	ON/OFF	Digital Output
Tunnel Intake Fan and Exhaust Fan	Monitoring	Power Consumption, Voltage, current & frequency	Energy meter
	Control	ON/OFF	Digital Output
Tunnel Light (Normal)	Monitoring	Power Consumption, Voltage, current & frequency	Energy meter
	Control	ON/OFF	Digital Output
Tunnel Light (Emergency)	Monitoring	Power Consumption, Voltage, current & frequency	Energy meter
DG Set	Monitoring	Power Consumption, Voltage, current & frequency	Energy meter
	Control	ON/OFF	Digital Output

5.9 Connectivity: Considering the essential nature of two-way communication with the IR-NIYANTRAC central server for real-time monitoring, alerts, and control, it is imperative for the IFD to have direct IP-based connectivity. The mode of connection

shall be determined based on specific site requirements and must include at least one of the following options:

- GPRS
- 4G or 5G Cellular
- Wi-Fi
- Ethernet

Each IFD shall have it's own identity code which shall be transmitted along with data to central monitoring unit.

Event recorded at each station shall be continuously transmitted to central monitoring unit with in time interval of 10 sec max. In case loss of data, retransmission of data shall take place.

5.10 Working Voltage: The system shall operate on a single-phase 230V AC ±10% input supply or a three-phase 400V AC ±10% input supply as per IS 12360:1980 or latest.

5.11 Battery Backup System: The IFD shall incorporate a battery backup system to maintain functionality during power outages for a minimum of 4 hours at full load.

5.12 Construction: The IFD cabinet, featuring IP-66 protection and constructed from SS sheets, shall be utilized for housing PCB cards to ensure a modular and ergonomic design that facilitates ease of maintenance. The cabinet shall be powder-coated for durability and enhanced ergonomic. Additionally, it shall be equipped with provisions for securely locking the equipment.

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