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**भारत सरकार, रेल मंत्रालय
GOVERNMENT OF INDIA
MINISTRY OF RAILWAYS**



सत्यमेव जयते

कर्षण संस्थापन निदेशालय
TRACTION INSTALLATION DIRECTORATE

**डेटा लॉगिंग और रिपोर्टिंग के साथ लाइव-लाइन ओएचडी
मेजूरिंग गेज (एलएलओएमजी) के लिए निर्देश**

**INSTRUCTIONS FOR LIVE-LINE OHE MEASURING GAUGE (LLOMG) WITH
DATA LOGGING & REPORTING**

संख्या: टीआई/आई एन/0046

No. TI/IN/0046

		हस्ताक्षर/Signature
अनुमोदित Approved by	प्रधान कार्यकारी निदेशक (कर्षण संस्थापन) Principal Executive Director (TI)	DEEN BANDHU SINGH GUNJAL Digitally signed by DEEN BANDHU SINGH GUNJAL Date: 2026.02.16 16:25:56 +05'30'
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1.0 Scope:

This Instruction covers the all OHE structures like Single/Double/Multi Cantilever assemblies, turnouts, crossovers, overlaps and overline structures.

2.0 Background:

The objective is to measure critical parameters i.e. contact wire height for conventional and high rise, height of feeder wire, take off and take on at turnout and crossover, stagger, implantation & Cant at OHE structures at Single/Double/Multi Cantilever assemblies, turnouts, crossovers, overlaps and Overline Structures (OLS) with Live line OHE Measuring Gauge which are overdue for maintenance without taking Power Block / Traffic Block and without using Tower wagon. Turnouts, Crossovers and Overlaps are most critical locations which require rigorous maintenance. The biggest challenge in maintenance of these locations is non - availability of traffic/power blocks.

3.0 Functional Description:

- (i) Functional & Technical Specification is attached at Annexure-A.
- (ii) Live Line OHE Measuring Gauge used with mobile application is attached at Annexure-B.

4.0 PERIODICITY OF MEASUREMENT:

Periodicity of Measurement should be half yearly which may be lowered by PCEE as per site conditions.

5.0 AGENCY FOR IMPLEMENTATION

Zonal Railways, Construction units and RE project units.

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Annexure-A**1.0 FUNCTIONAL DESCRIPTION:**

The Live-line OHE Measuring Gauge (LLOMG) is engineered to accurately measure critical parameters of the Overhead Equipment (OHE) system, including contact wire height, stagger, implantation, and super elevation (cant) across complex track features such as turnouts and cross-overs, Utilizing a contactless measurement mechanism based on advanced outdoor laser technology, the device enables precise data acquisition without requiring power blocks, thereby minimizing disruption to rail operations and enhancing safety.

This laser-based system operates by emitting and detecting laser beams to capture real-time measurements of the contact wire's spatial parameters with high accuracy. The recorded data, reflecting the exact height, stagger, cant and implantation values at any given location, is then keyed / captured into a dedicated Android mobile application installed on a rugged handheld tablet. The application is designed for field usability, offering a simple and intuitive interface for data input.

Once data is captured, the application processes and analyzes the measurements, generating detailed reports that assist maintenance teams for evaluating OHE system health and plan proactive and timely maintenance of the OHE system. The application is also designed (future ready) for seamless integration with existing railway software platforms, including Railway Asset Management systems, through standardized APIs and secure data exchange protocols. This integration facilitates real-time or scheduled data synchronization, ensuring that measurement data is directly available within broader asset management and maintenance workflows, thereby enhancing operational efficiency and decision-making. This integrated approach ensures efficient, reliable, and safe measuring of overhead electrical infrastructure under live operational conditions.

The LLOMG should have the capability to correctly measure and record contact wire height difference at 'Take-off and 'Take-On' points at Turnout and crossover locations as marked by the user (normally at a distance of 5m to 10mtr or 15mtr from the obligatory mast location) {for this purpose, user shall arrange for marking of 'take on' & 'take off points on both the catenary wires at all turn out and crossover locations which should be visible from the track}, and digitally display the associated parameters along with contact wire height to facilitate accurate measurement and record keeping by the staff.

2.0 TECHNICAL SPECIFICATIONS:

The detailed technical specifications of this measurement gauge are as follows:

2.1 MEASUREMENT MODULE:**2.1.1 Height, Stagger and Implantation Measurement:**

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Laser Distance Mechanism for Contact Wire Height Measurement, Stagger and Structure Implantation: The Laser Distance Mechanism is a precision device designed for accurate measurement of the height & stagger of overhead contact wires and for aiding in the implantation of support structures. The system consists of a combination of laser sources securely mounted either on the top of a gauge or directly integrated with it. The LLOMG reads the height and stagger measurements in combination. First, the OHE height is measured, followed by the stagger measurement using their respective sensors. The stagger measurement can be verified using the scale provided at the bottom.

2.1.2 Laser Beam Alignment:

The laser beam is focused precisely on the contact wire at the point where the height reading is to be recorded. An inbuilt optical sighting mechanism ensures accurate targeting of the outgoing laser beam, even under bright sunlight conditions. The laser point focused on the contact wire at the point where the height reading is to be recorded must be visible with necked eyes and must be visible.

2.1.3 Measurement Requirement for OHE height:

SN	Type of OHE	Range	Accuracy
1	Conventional	4500 mm to 6000mm	± 5 mm
2	High Rise	Upto 7800mm	± 10 mm

2.1.4 Measurement Requirement for Implantation:

SN	Type of OHE	Range	Accuracy
1	Conventional and High Rise OHE	From minimum 2180mm to 10000 mm	± 10 mm

2.2 Stagger Measurement


The Stagger Measurement System is an integral part of the Live-line OHE Measuring Gauge (LLOMG), designed to provide accurate, reliable, and user-friendly measurement of contact wire stagger. It is especially suited for use in live overhead equipment (OHE) inspection and maintenance activities. The stagger automatic captured through lasers can be verified through measuring scale.

2.2.1 Key Specifications:

a LLOMG shall have measurement scale for stagger measurement conforming to below construction requirements:

- Material: High-quality light weight, mechanically robust with strong fibre body or Stainless steel, with rollers for long term durability and resistance to corrosion
- Finish: Appropriately coated to minimize glare and ensure visibility in varying lighting conditions.
- Etching: Deeply etched, dual-colour markings with clear font, ensuring long- lasting readability and enhanced visibility from a distance, even under varied field conditions.

b) Mounting and Integration

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- i) The stainless-steel scale is permanently fixed onto the body of the OHE Height & Stagger Gauge, ensuring stable and repeatable readings.
- ii) Seamlessly integrated into the gauge design, allowing simultaneous height and stagger measurements.

2.2.2 Measurement Specifications

Parameter	Specification
Measurement Range	+720 mm to -720 mm
Resolution	1 mm
Accuracy	±10 mm

2.3 Cant Measurement Unit for Live Line OHE Measuring Gauge:

The Cant Measurement Unit is a precision-engineered device designed for measuring the super elevation (cant) of railway tracks. Engineered for overhead inspection and field maintenance, it is mounted directly onto the Live Line OHE Measuring Gauge, ensuring seamless, real-time measurement in operational environments.

LLOMG shall be equipped with suitable cant measuring device and ensure necessary compensation for the super elevation in the track to achieve the desired accuracy in the measurement of height, stagger and implantations.

3.0 LIVE LINE OHE MEASURING GAUGE:

Build Quality: The Live Line OHE Measuring Gauge shall have a rugged, modular and sturdy design, manufactured using Mechanical grade fibre body / stainless steel and Aluminum body with necessary electrical insulation and roller to slide the LLOMG on the rail. The rail face resting brackets shall be fully insulated from the base of the gauge to ensure that the track circuit does not pick up when the gauge is placed on a circuited track.

The rail head seat of the OHE Height & Stagger Gauge shall incorporate a concealed pre-tensioned mechanism from one side to ensure firm and stable placement on the rail for better accuracy. Exposed pre-tensioning mechanisms are not acceptable, as they are prone to environmental degradation and may compromise reliability.

The gauge is permanently integrated with the controller and cannot be detached, ensuring calibration integrity and preventing damage. The overall weight of the LLOMG instrument shall not exceed 8–10kg, allowing for easy handling in field conditions. The size of LLOMG to be broad gauge track adjustment to fit any track.

EMI/EMC & Immunity: LLOMG shall be tested to IEC 61000-4-2/4-8, ensuring ESD safety, magnetic field immunity, and interference free performance.

Safety standard compliance: LLOMG shall comply with IEC61010-1:2010 ensuring electrical safety and operational reliability. The equipment should be suitably protected for use in wet (rainy) and dusty environments. A shock-proof body should be provided to prevent damage in case the device falls on the track or ballast.

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Testing and verification: All environmental, operating, and safety specifications shall be tested and verified by a NABL-accredited laboratory. Supporting documents must be submitted for technical evaluation and acceptance of the proposed product.

4.0 Minimum technical requirement for Laser mounted on LLOMG Gauge:

Description	Detailed requirement
Range	2 meters to 10 meters
Laser Class	Class II A, 650 nm, 1mW for stagger & implantation, 3.5 mW, 650nm red laser for height measurement, 1mW,
Accuracy	±3 mm
Operating Temperature	-10°C to +50°C , ensuring reliable performance across standard field conditions, tested as per IEC 60068-2-1:2007 and IEC 60068-2 2:2007
Protection Class	IP65 – providing protection against dust ingress and low-pressure water jets from any direction
Display	Equipped with a backlit digital display, the device allows for easy readability of measurements in various lighting environments, including direct sunlight
Battery Details	2600 mAh Li-ion Battery with USB Charging
Battery Backup	5-6 hours (continuous on condition)
Battery life	2000 cycles

* The personnel using laser shall be equipped with glasses to view the laser beam focused on contact wire.

5.0 Key features & Functionalities-LLOM Mobile Application

The Live Line OHE Measuring (LLOM) Mobile Application is a purpose-built Android-based solution designed to seamlessly interface with the Live Line OHE Measuring Gauge (LLOMG). It ensures reliable and efficient data capture, processing, reporting of critical OHE parameters in both real-time and offline environments. The application is optimized for reliability, ease of use, and scalability, tailored to meet the demanding requirements of railway field operations.

The LLOMG shall be supplied with a rugged tablet featuring a screen size of 8–10 inches, complete with a power adapter. The tablet shall run the dedicated LLOM application compatible with Android 13.0 and above, designed to operate in Kiosk mode. The application shall provide a user-friendly interface with a simple, intuitive design optimized for full-scale field operations.

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It will be capable of capturing, storing, and processing measurement data, generating reports and database. The application must support intelligent data handling, advanced security, predictive entry, and comprehensive synchronization and diagnostics.

The application shall enable both automated and manual recording of readings, including OHE contact wire height, stagger, implantation, and super elevation (cant), with the capability for simultaneous measurement of all parameter through a single button operation by capturing data directly from the integrated Laser Distance Meter and Cant Measurement Device.

Additionally, it shall allow users to manually input stagger readings and select associated assets using a predictive GPS-based auto-fill feature, ensuring efficient and accurate data entry during field inspections.

Furthermore, the LLOM Mobile Application shall be designed for seamless integration with the Railway Traction Distribution Management System via standardized RESTful APIs and/or secure data exchange protocols such as HTTPS with JSON/XML data formats. This integration will enable real-time or scheduled data synchronization, allowing direct input of OHE measurement data into existing railway asset management systems, thereby supporting unified asset measuring, maintenance planning, and operational workflows. The integration shall comply with relevant railway IT security standards and ensure data integrity and confidentiality throughout the exchange process.

5.1 Core Functionalities

- **Super-User / Admin Module:** One-time secure pairing of the tablet with a specific LLOMG unit to prevent unauthorized usage. WiFi is used to connect with the LLOMG for secure data transmission, without the use of any external cables or physical wired connections.
- **Role-Based User Interface:** Customizable UI tailored according to user roles and access levels for operational efficiency.
- **Kiosk Mode:** The app auto-launches on device startup and **locks down other tablet functionalities**, ensuring focused usage. The application needs to be initiated after the LLOMG is set up at location where the reading is to be performed.
- **Real-Time Data Capture:** Logging of OHE parameters (height, stagger, implantation, cant) from integrated measuring equipment.
- **Location-Based Data Entry:** GPS-assisted data logging with predictive auto-fill for quick asset identification and tagging.
- **Reports Module:** Dynamic report generation in multiple formats, with structured naming conventions for traceability. The generated reports shall be compatible with TDMS for data updation and integration.
- **Data Sharing:** The device shall be capable for supporting for secure backup, centralized access, and remote data retrieval with automatic conflict resolution and redundancy-enabled uploads whenever connectivity is available. The system shall also support Bluetooth based

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transfer of reports to nearby PCs and other compatible devices, ensuring flexible data sharing in both connected and offline environments.

- **Offline Operation:** Fully functional in disconnected environments; data stored locally with auto-sync when connectivity resumes.
- **Advanced Security & Admin Tools:** Fully encrypted application environment with remote admin access, debug console, and modular storage with integrity checks to ensure data protection.
- **Integration:** The LLOM Mobile Application provided by the supplier shall be future-ready for seamless integration with existing Indian Railways applications, enabling direct input and data exchange to support unified asset management and operational workflows.

Advanced Features

- **Asset Profile Rendering**
Upon data collection, the app will automatically **generate graphical layouts** of assets with the recorded readings.
- **Contact Wire Profiling**
Automatically **plots height and stagger profiles** of the contact wire in graphical format for **profile analysis** and reporting.

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Technical Specifications of Rugged Tablet		
Sl No.	Feature Description	Minimum Detailed Specifications
1	Physical Characteristics	a. 8 inch/20.3 cm: 600 nits, color WXGA 1280x800
		b. Corning Gorilla Glass
		c. Capacitive multi-touch
		d. Weight: Upto 500 Grams
		e. Volume up/down; power on/off; programmable buttons
		f. nano SIM Slot
2	Performance Characteristics	a. Qualcomm Snapdragon Octa-Core (8): 2.2 GHz b. Memory: 8 GB LPDDR4X SDRAM
3	Environmental Characteristics	a. Operating Temperature: 20C to +50C
		b. Humidity: 5% to 90% non-condensing
		c. Drop Specifications: (1.2m) to concrete across temperature (-20C to +50C)
4	Communication Characteristics	a. Minimum Bluetooth v5.1 Class 2, Bluetooth Low Energy (BLE)
		b. Wi-Fi (WLAN) IEEE 802.11 2x2 MU-MIMO; Wi-Fi™ certified; IPv4, IPv6 (Wi-Fi 6)
		c. Cellular (WWAN Data Only)
		d. Light-weight & sturdy design.
5	Ports	Docking connector (charge and data) USB-C side port (tablet charging and data only)
6	Camera	a. Rear Camera: 13 MP auto-focus camera with user controllable LED flash
		b. Front Camera: 5 MP.
7	Interactive Sensor Technology	a. Automatically adjusts display brightness and display backlight. Comes under tablet specs.
		b. e Compass automatically detects direction and orientation.
		c. 3-axis gyroscope; 3-axis accelerometer
8	Security features	Licensed antivirus/ anti-malware software with regular updates.
9	System Storage	In built memory of minimum 512 GB

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7.0 Type Test:

- 7.1 The type test shall be carried out by RDSO in accordance with relevant procedure laid down in governing standard.
- 7.2 ZR should ensure that the LLOMG is type tested by RDSO and, if firm is supplying the LLOMG for the first time to IR, ZRs shall forward the case to RDSO for taking up the prototype testing of LLOMG.
- 7.3 After successful prototype testing, ZRs shall process for acceptance test for bulk procurement.

8.0 ACCEPTANCE TEST

Visual Inspection:

The gauge shall be visually inspected to verify the proper functioning of the specified parameters and features of the LLOM Mobile Application. The inspection shall also check for any manufacturing defects or physical damage in the supplied gauge.

Compliance with Technical Specifications:

The system shall comply with all the technical specifications mentioned above. IP-65 NABL Certificate, IEC 60068-2-2 and IEC 61000-4-2/4-8

Manufacturer's Certificate:

A certificate issued by the manufacturer along with Calibration Certificate, test certificate & all Supporting Documents along with standard limits shall be submitted by the firm, confirming that the hardware and application of the gauge meet the specified technical requirements.

Rejection Criteria:

If the system fails any of the acceptance tests, it shall be rejected.

9.0 QUALITY ASSURANCE:

- a) All materials and workmanship shall be of good quality.
- b) Since the quality of the system is directly related to the manufacturing process and the environment in which it is produced, the manufacturer shall maintain a strict Quality Assurance (QA) program of an adequate and recognized standard. A test certificate shall be submitted by the manufacturer at the time of system supply.

10.0 Service Support and Maintenance:

The Manufacturer/Tenderer shall have an in-house facility for calibration and testing of the system. The firm shall also ensure the provision of a service center and the availability of spare parts as required. The equipment shall be designed and built with high-quality standards to minimize maintenance requirements, limiting them only to routine maintenance & calibration activities.

11.0 SERVICE LIFE AND WARRANTY PERIOD:

- a. **Warranty and Support:** The system shall carry a minimum warranty of 36 months, covering the complete gauge, including the tablet, the LLOM Mobile Application. The

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warranty shall include free repair or replacement of defective components due to manufacturing defects or poor workmanship. The supplier shall provide support for both hardware and software, including updates, bug fixes, and troubleshooting for the LLOM Mobile Application.

During the warranty period, the supplier shall:

- Provide on-site or remote technical support as required.
- Ensure a maximum service response time of 7 working days from the date of any complaint.
- Offer full support for mobile application performance, compatibility, and version updates

Spares Availability: The manufacturer/tenderer shall ensure the **availability of all essential spare parts for a minimum period of five (5) years** from the date of supply of the system.

12.0 DETAILS TO BE PROVIDED BY THE FIRM:

Documentation to be Provided at the Time of Bid Submission & Supply of Material:

The following details shall be submitted by the firm at the time of bid submission & supplying the product:

- **Description of the Working Principle – A clear and concise explanation of the working principle of the instrument.**
- **Visual Working Instruction Manual – A step-by-step, user-friendly manual including images or diagrams for proper understanding and operation of the system.**
- **Technical Catalogue and Test Reports – Technical specifications, features, and individual test reports for each unit of the system.**
- **Maintenance and Replacement Methodology – Detailed procedure for routine maintenance and step-by-step instructions for replacement of each unit or component of the system.**
- **Technical troubleshooting instruction through video.**

Handling Precautions

13.0 MARKING:

The following information shall be legibly and indelibly marked on the system at a suitable place-

1. **Name or trademark of the manufacturer.**
2. **Serial number of the instrument.**
3. **Calibration Date.**
4. **Month and year of manufacture.**

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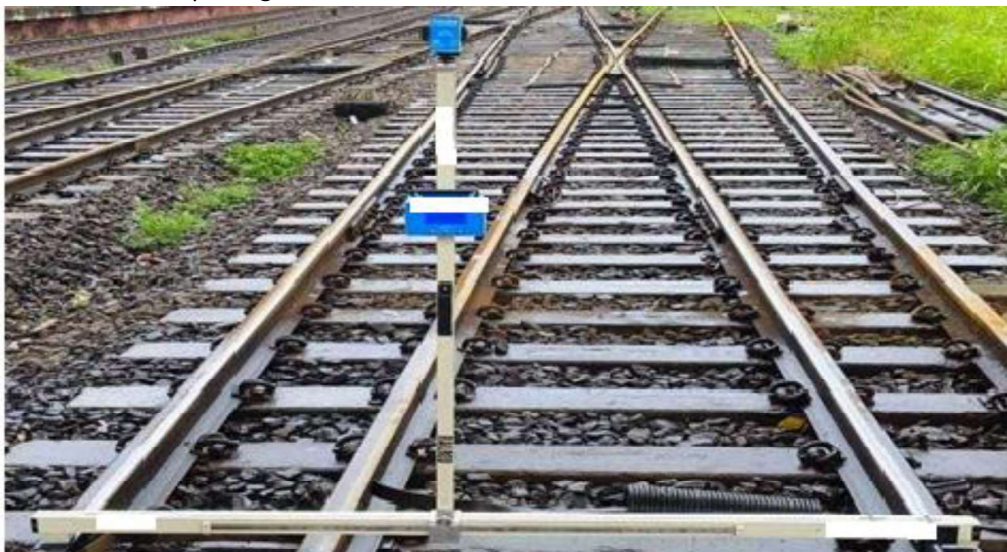
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14.0 Training, Demonstration, and Commissioning:

Adequate training for the operation and maintenance of the instrument and the LLOM Mobile Application shall be provided by the supplier to the purchaser. This training shall be conducted at the installation site, nearest railway station, or consignee location after installation. A demonstration of the system's full functionality shall be performed at the consignee location. The completion of the training and demonstration shall be treated as commissioning of the system.

Annexure-B

- 1.0 Live Line OHE Measuring Gauge used with android application for data capturing as under:

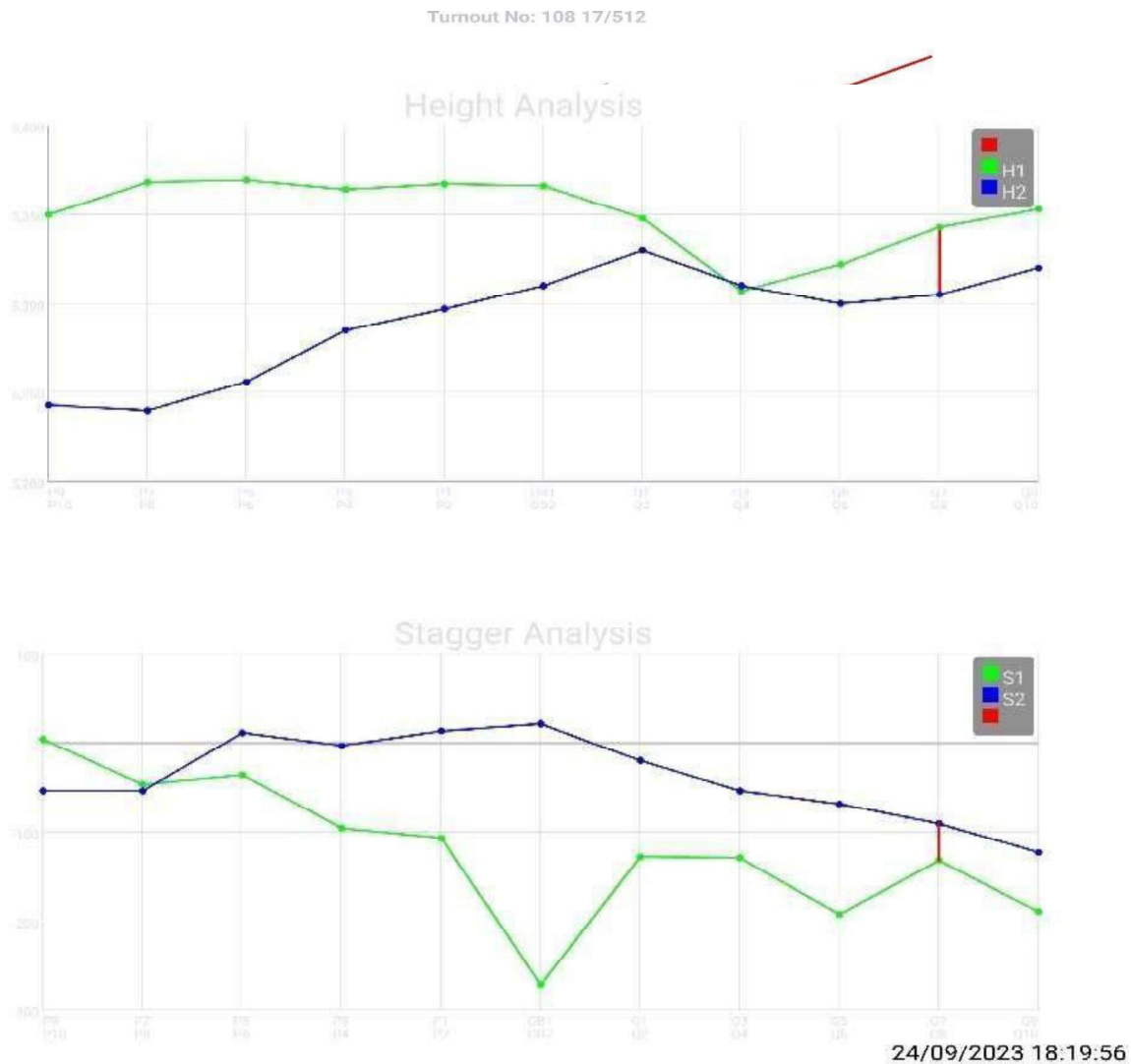


Turnout Mapping
(Image is for Representation only)

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OHE HEIGHT & STAGGER ANALYSIS GRAPH



JYOTI SRIVASTAVA <small>Digitally signed by JYOTI SRIVASTAVA Date: 2026.02.16 13:58:32 +05'30'</small>	AMIT KUMAR <small>Digitally signed by AMIT KUMAR Date: 2026.02.16 15:03:48 +05'30'</small>	GAURANG GUPTA <small>Digitally signed by GAURANG GUPTA Date: 2026.02.16 15:31:27 +05'30'</small>
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