

# Standard Operating Procedure (SOP)

## Procurement and Installation of Weighbridge Automation Device by Vehicle Owners from Suggested Vendors

### 1. Objective

The purpose of this SOP is to provide a clear process for Weighbridge Owners to buy and install approved automation devices only through Suggested vendors, as per the Directorate of Mines and Geology, Rajasthan guidelines. This ensures transparency, compliance with rules, accurate weighing, real-time data sharing, and better monitoring of mineral transportation.

### 2. Scope

- All Weighbridge Owners must purchase and install automation devices only through Suggested vendors as per this SOP.
- Only Suggested vendors, authorized by the Directorate of Mines and Geology, Rajasthan are allowed to supply, install, and commission the weighbridge automation devices.
- Any new installation, retrofit, or upgrade of weighbridges must be approved and verified by the Directorate of Mines and Geology, Rajasthan before commissioning.

### 3. Roles and Responsibilities

Stakeholder	Responsibilities
<b>Weighbridge Owner</b>	Select vendor, make payment, verify and handover Weighbridge for installation, ensure compliance.
<b>Suggested Vendor</b>	Supply certified device, install, configure, and integrate with the Govt. Regulatory system.
<b>Directorate of Mines and Geology, Rajasthan</b>	Publish vendor list, verify compliance post-installation, Support to integrate with Govt. Regulatory Application.

### 4. Process Workflow

Steps	Activities
<b>Step-1</b>	<b>Access Suggested Vendor List</b> <i>Weighbridge owner visits the Rajasthan-Mines portal and downloads/view list.</i>
<b>Step-2</b>	<b>Vendor Selection and Order Placement</b> <i>Contact chosen vendor, confirm order, and make payment.</i>
<b>Step-3</b>	<b>Device Allocation and Appointment Scheduling</b> <i>Vendor assigns device serial number and installation slot</i>
<b>Step-4</b>	<b>Installation and Configuration</b> <i>Install, configure and integrate with the controller.</i>
<b>Step-5</b>	<b>Data Integration and Compliance Update</b> <i>Vendor updates details in Raj-Mines' Weighbridge automation portal. Authority verify and generates Installation Certificate.</i>
<b>Step-6</b>	<b>Testing &amp; Integrate with Government Portal</b> <i>Authority engaged SI for testing the configuration and integrate. Then on successful testing, the same will be integrate with the Government Portal.</i>
<b>Step-7</b>	<b>Completion and Documentation</b> <i>Weighbridge owner receives installation certificate, warranty, user manual.</i>

### 5. Service Level Agreement (SLA)

- Device Installation Time : Within 30 working days of order confirmation.
- Device Replacement : Within 48 hours in case of failure under warranty.
- Technical Support : 24x7 helpline for connectivity and functional issues.

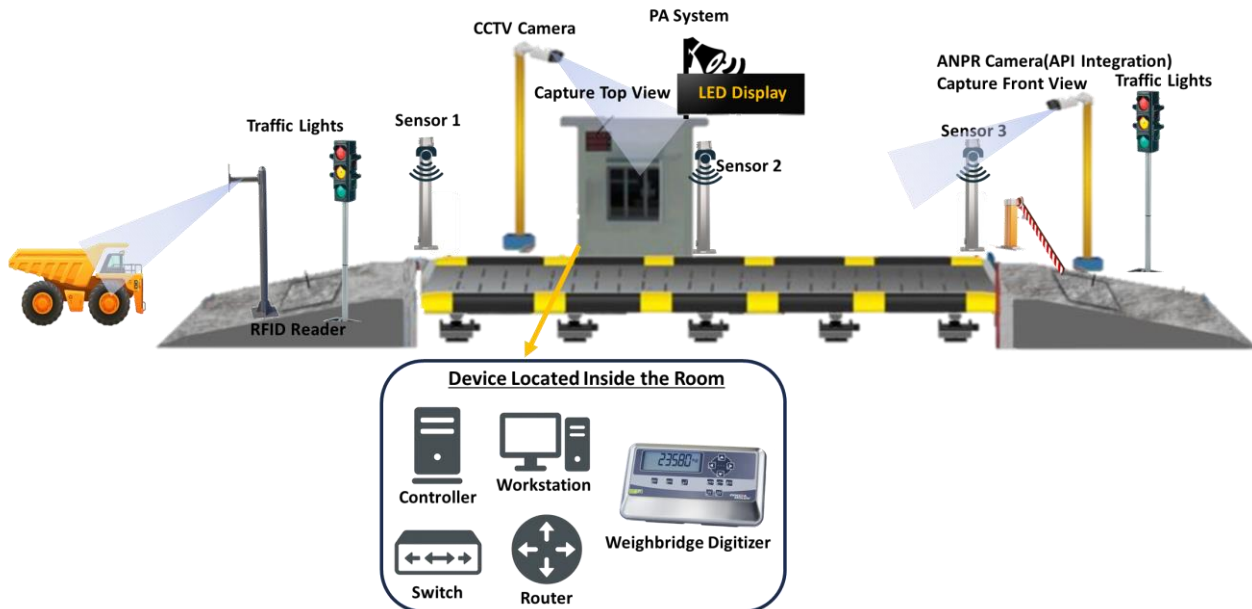
## 6. Compliance and Penalty

- Non-installation within stipulated time may attract penalty as per Directorate of Mines and Geology.
- Vendor must maintain device uptime  $\geq 99\%$  and ensure data integration with the Govt. Regulatory System.
- Failure to comply may result in vendor delisting.

## 7. Activities to be performed by Suggested Vendor

- Supply Department-approved devices and all accessories (RFID reader, cameras, boom barriers, sensors, LED display, sensors, cabling, UPS, poles, camera, Audio system, controller etc.).
- Install and mount equipment as per approved drawings ensure power, earthing and weatherproofing.
- Configure and integrate devices with the Government Regulatory application (e-Rawanna) and Weighbridge-Automation System.
- Perform on-site testing & UAT provide test reports and obtain client sign-off.
- Provide operation manuals, training, and an asset register with serial numbers and warranty details.
- Offer 12-month warranty support and post-warranty AMC options with defined SLAs respond promptly to faults and re-inspections.

### 7.1. Positions for device installation at the Weighbridge

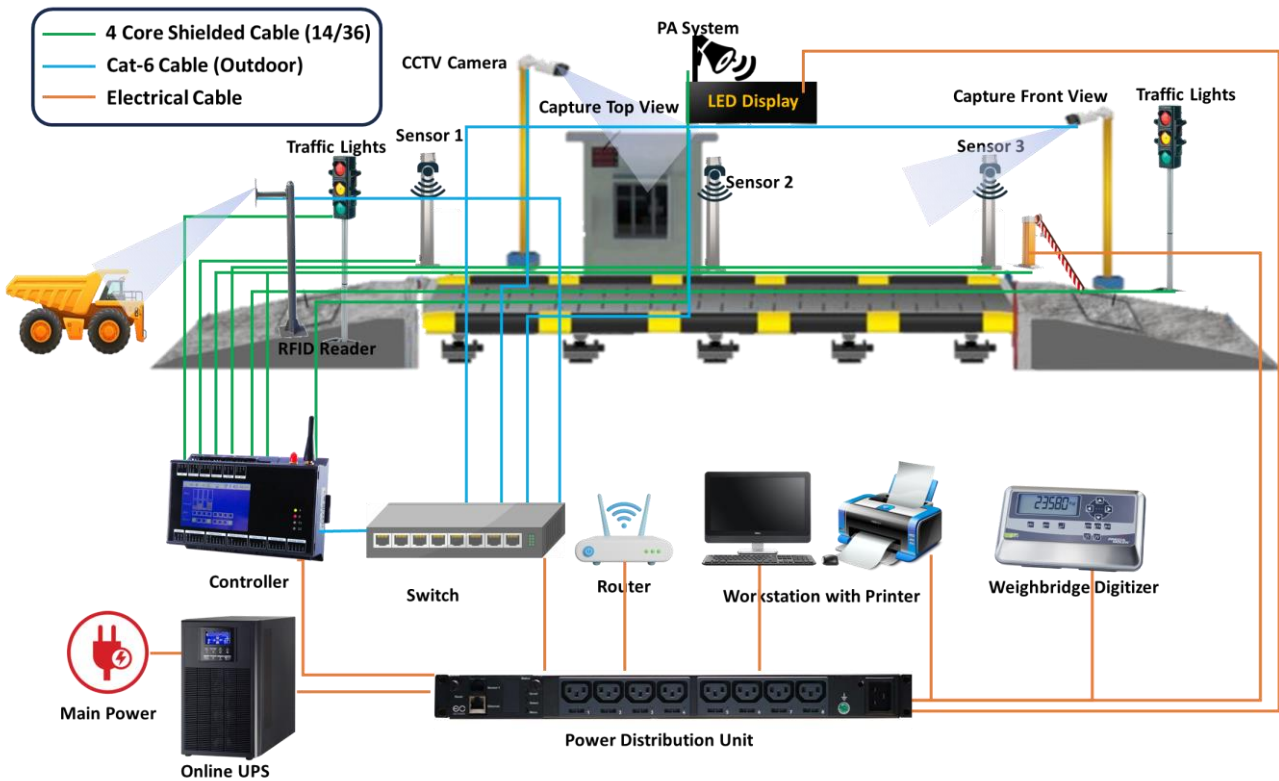


Sl#	Device	Position	Details / Function
1	RFID Readers	Installed at Entry position of WB.	Installation will be done at Weighbridge to read the RFID Tag/FasTag pasted on vehicle mirror.
2	Boom Barriers with Safety Sensor	Installed at exit ramps of the WB.	Installation will be done at exit of the weighbridge to allow the vehicle to exit.
3	Traffic Lights	Positioned at entry and exit ramps of the WB.	Installation will be done Entry & Exit of the Weighbridge to guide the driver.
4	IP Bullet Camera	Mounted on poles at Middle of WB and exit of the ramp.	Installation will be done at Weighbridge to capture top & Front Photo during the weighment.
5	IR Illuminator	Mounted on poles with ANPR Camera.	Installed at the weighbridge to enable night-time infrared visibility.
6	LED Display Board	Above or beside operator cabin	Installation will be done at Weighbridge to display various messages/instruction during weighment.

Sl#	Device	Position	Details / Function
7	Vehicle Position Sensors	At entry, Middle and exit, of the WB platform	Ensure trucks are properly positioned before recording weight, and capture data of the entry and exit of vehicle position on WB Platform.
8	Weighing Indicator	Inside operator cabin, connected to load cells	Shows weight and connected with the E-Rawana Desktop.
9	Controller	Inside operator cabin, connected to network device and other passive devices	Installation will be done at Weighbridge to Manage Weighbridge Hardware and Integrate with Application.
10	Networking & Server System	Inside operator cabin (rack-mounted)	Switches, router, Controller and server for connecting weighbridge devices to the central system.

\*The position of device may change subject to site feasibility

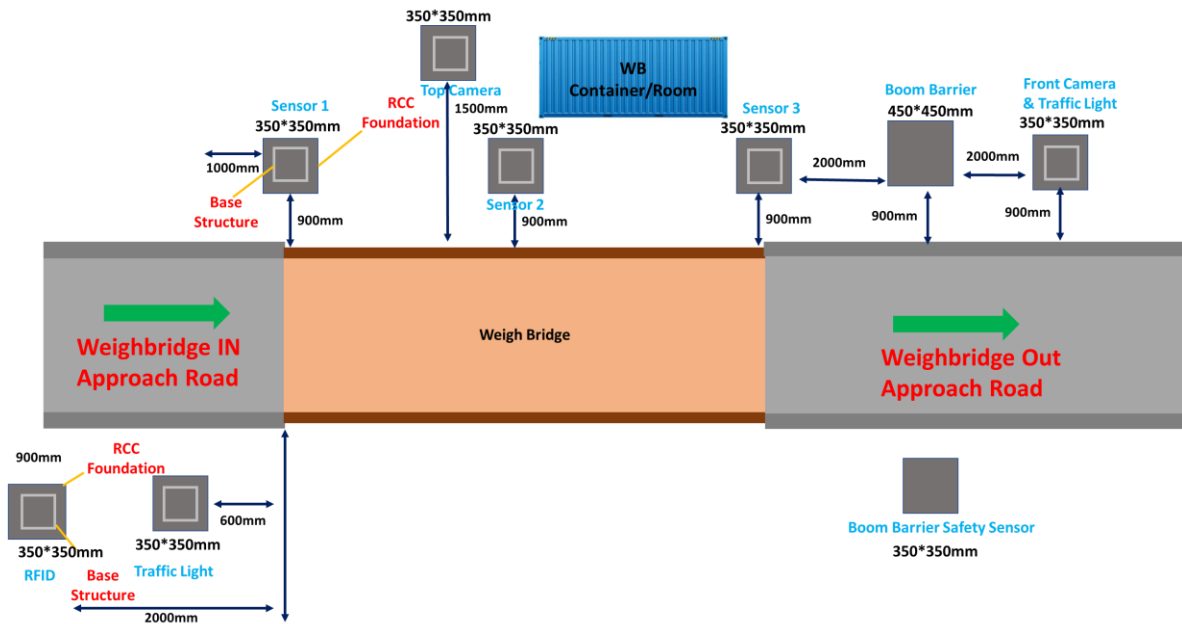
### 7.2. Wiring & Cabling Architecture of Weighbridges



### 7.3. Hardware communication Layer/protocol

Device	Communication Layers				
	Input & Sensing Layer	Weighbridge Control Layer	Communication & Networking Layer	Processing & Operation Layer	Power & Backup Layer
RFID Reader	Socket				
Sensors	Digital I/O				
Traffic Lights	Digital I/O				
Boom Barrier	Digital I/O (Relay Type)				
Digital Weight Indicator		RS232			
LED Display		MQTT/API			
IP Bullet Camera			Ethernet & RTSP		
Switch			Ethernet		
Router/Wi-Fi Device			TCP/IP		
Weighbridge Controller				MODBUS RTU (Ethernet/RS485)	
Computer (Workstation)				API	
Printer				USB	
UPS					
Power Distribution Unit (PDU)					

## Civil Construction at Weighbridges

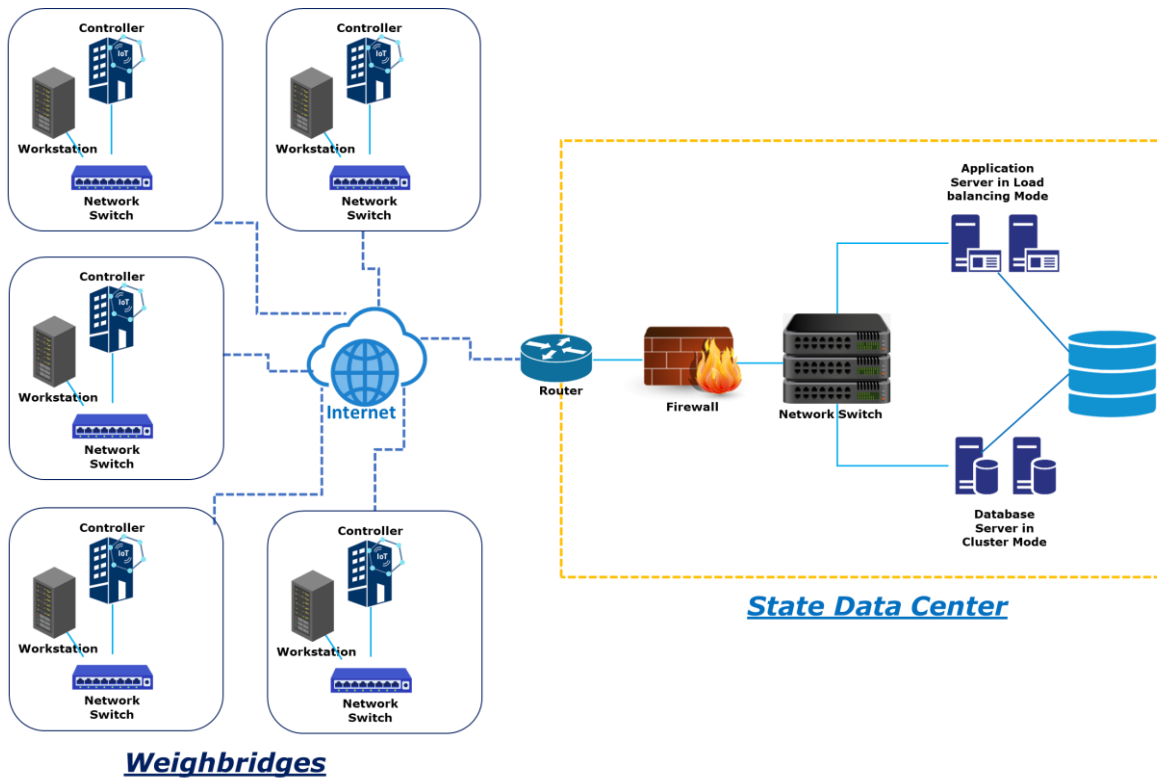


\*The above is the standard layout of the civil structure. It may change subject to site feasibility

### Base Structure Guidelines for Equipment Installation:

- All sensors should be installed on a base structure aligned with the same height as the weighbridge base level.
- The base structures for Traffic Lights, Cameras, and RFID Readers must be installed at a height greater than 1 ft above the weighbridge plate.
- The Boom Barrier base structure must be installed at a height greater than 2 ft above the weighbridge plate.

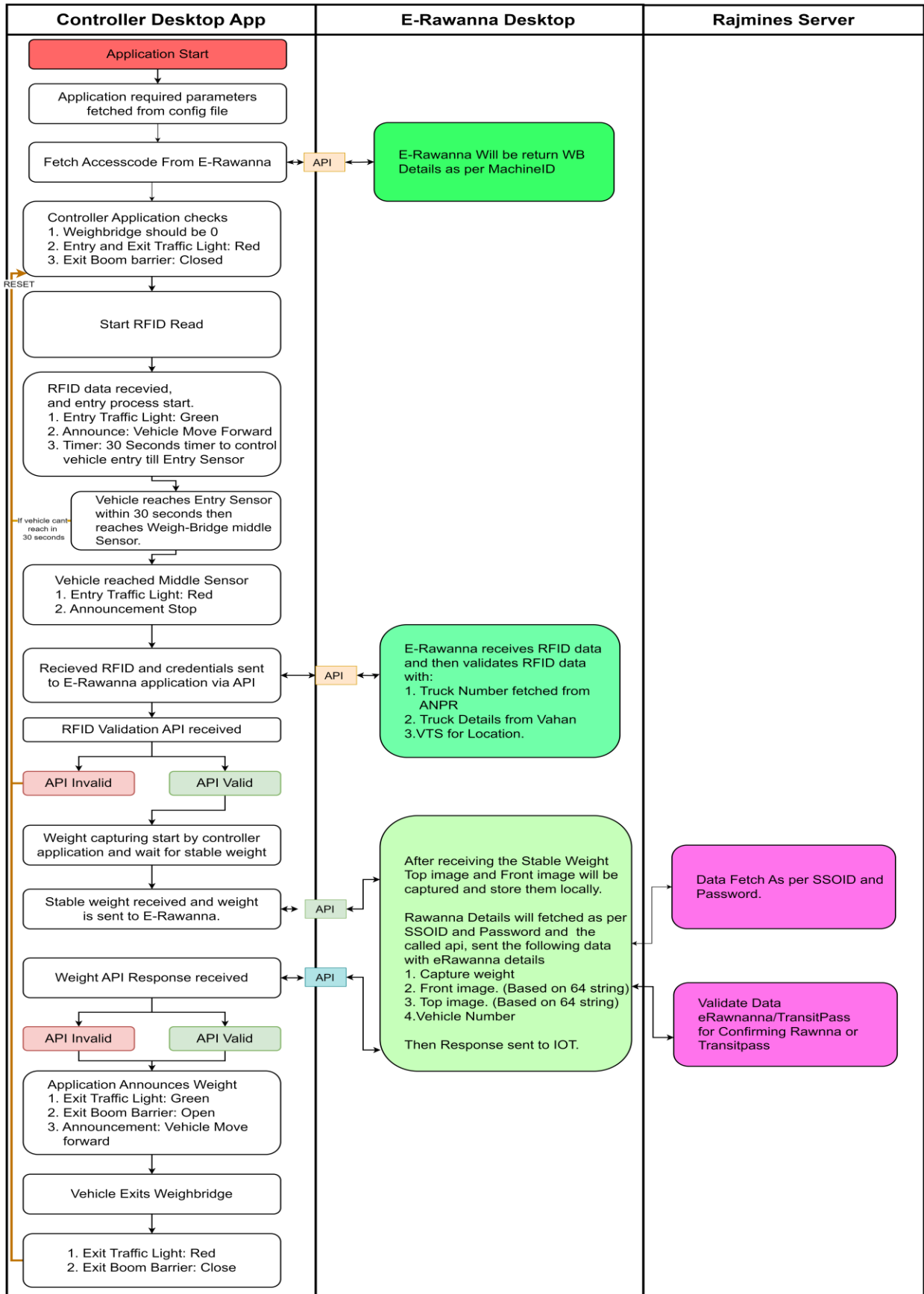
## 7.4. Network Architecture



- The desktop application (e-challan) will directly communicate to e-Rawana application (in SDC) through internet. (Protocol to be used 443)

- The controller connected with all the installed devices will be communicate with desktop application through local LAN (Port to be used 80)

### 7.5. Controller Configuration & Process Flow



## 7.6. Integration

The Suggested vender shall integrate below components.

**a) Hardware: The various hardware components which the system shall be integrated with shall include:**

(CCTV camera, Boom Barrier, Traffic Lights, Controller & sensors, Public Announcement (PA) Systems, RFID Reader, LED Display, Weighbridge digitizer, ANPR Solution)

**b) Govt. Regulatory System – e-Rawanna & Weighbridge Automation Software**

The Suggested vender will integrate all the installed devices with Weighbridge Automation Software and e-Rawanna system. The integration activities must be done considering the functionalities mentioned above.

## 7.7. Bill of material Details for per Weighbridge with the hardware activity details

**a) Device required for Automation**

Sl#	Item	Unit	Qty	Purpose
1	RFID Reader	Nos	1	Installation will be done at Weighbridge to read the RFID Tag/FastTag pasted on vehicle mirror.
2	Position Sensors	Nos	3	Installation will be done at the weighbridge to detect and accurately position the vehicle during entry and weighment.
3	LED Display	Nos	1	Installation will be done at Weighbridge to display various messages/instruction during weighment.
4	PA System	Nos	1	Installation will be done at Weighbridge for Voice based announcement System to guide the driver.
5	IP Bullet Camera – Type1 (Top View)	Nos	1	Installation will be done at Weighbridge to capture Top view Photo during the weighment.
6	IP Bullet Camera – Type2 (Front View)	Nos	1	Installation will be done at Weighbridge to capture Front view Photo during the weighment also used for Name plate reading.
7	IR Illuminator	Nos	1	Installed at the weighbridge to enable night-time infrared visibility.
8	Traffic Lights	Pair	2	Installation will be done Entry & Exit of the Weighbridge to guide the driver.
9	Boom Barrier with Safety Sensor	Nos	1	Installation will be done at exit of the weighbridge to allow the vehicle to exit.
10	Controller	Nos	1	Installation will be done at Weighbridge to Manage Weighbridge Hardware and Integrate with Application.
11	Pole, Installation, Wiring & Cabling	Lot	1	Supplies & Cabling all necessary power and data connectivity to installed equipment.
12	Workstation	Nos	1	Installation will be done at Weighbridge for installation of WB Automation desktop app. This will be used to manage the I/O device and Controller. Also it is used for e-Rawanna Desktop application access.

**b) Other IT devices required at WB**

Sl#	Item	Unit	Qty	Purpose
1	PoE Network Switch & Network accessories	Nos	1	Installation will be done at Weighbridge to provides network connectivity.

2	Electricity Supply & Power backup provision	Lot	1	Provision of continuous electricity at the weighbridge location.
3	Internet Connectivity	Lot	1	Dedicated 10 Mbps Internet Leased Line (ILL) connection with a) Public Static IP b) NAT and Port Forwarding support through Service Provider-supported router.
4	Printer	No	1	For printing the e-Rawana

## 8. Hardware Specifications

Refer Annexure-5

### 9. Documentation Checklist

- Proof of Payment.
- Compliance Certificate for the device with MAF.
- Delivery challan
- Testing & UAT Certificate
- Installation Certificate issued by the vendor.
- Training
- Preventive Maintenance report

### 10. Annexure

- Annexure 1: Installation Checklist
- Annexure 2: Payment Receipt
- Annexure 3: Installation Certificate
- Annexure 4: AMC and Support Details
- Annexure 5: Device Technical Specifications

### Annexure 1 Installation Checklist

Weighbridge Owner Name	
Weighbridge Registration Number	
Location Name	
Date of Installation	
Mount RFID readers with correct angle & sealing	
Mount top & front cameras test focus & IR	
Install LED display & verify as per solution	
Install boom barrier and verify as per solution	
Install position sensors & validate the Weighbridge Logic	
Testing the network connectivity to SDC/Cloud	
Apply surge protection & earthing	
Integrate the WB Automation solution with Govt-Regulatory as per the requirement	
Take post-installation photos & update drawings	

**Annexure 2**  
**Payment Receipt**

Receipt No : \_\_\_\_\_

Date : \_\_\_\_\_

Received from : \_\_\_\_\_

Amount Paid : ₹ \_\_\_\_\_

Mode of Payment : \_\_\_\_\_

For weighbridge No : \_\_\_\_\_

Vendor Name & Signature : \_\_\_\_\_

**Annexure 3**  
**Installation Certificate**

**Certificate No.:** \_\_\_\_\_  
**Project:** Procurement & Installation of Weighbridge Automation Device  
**Weighbridge Location / Site:** \_\_\_\_\_  
**Vendor (Suggested):** \_\_\_\_\_  
**Vehicle Owner / Client:** \_\_\_\_\_  
**Rajasthan Mines Inspector (if present):** \_\_\_\_\_  
**Installation Date:** \_\_\_\_ / \_\_\_\_ / \_\_\_\_  
**Commissioning Date:** \_\_\_\_ / \_\_\_\_ / \_\_\_\_

**Equipment Details**

Delivery Item	Make / Model	Quantity	Serial / Asset No.
_____	_____	—	_____
_____	_____	—	_____
_____	_____	—	_____
_____	_____	—	_____
_____	_____	—	_____
_____	_____	—	_____
_____	_____	—	_____

**Tests & Verification**

- **UAT (User Acceptance Test):**  
 Passed  Passed with Observations  Failed  
*UAT Remarks:* \_\_\_\_\_
- **Integration with Government Regulatory System (e.g., e-Rawanna):**  
 Successful  Pending  Failed  
*Integration Test Timestamp / Record ID:* \_\_\_\_\_
- **Documentation Handover (Physical & Soft copies):**  Yes  No  
*(Documents: Delivery challan, invoices, type-approval, manuals, warranty)*

**Training & Support**

- **Operator / Admin Training Conducted:**  Yes  No  
*Date:* \_\_\_\_ / \_\_\_\_ / \_\_\_\_ — *Attendees:* \_\_\_\_\_
- **Warranty Period Provided:** From \_\_\_\_ / \_\_\_\_ / \_\_\_\_ to \_\_\_\_ / \_\_\_\_ / \_\_\_\_
- **AMC Offered:**  Yes  No — *Details / SLA Summary:* \_\_\_\_\_

**Signatures (Handover & Acceptance)**

**Vendor Representative**

Name: \_\_\_\_\_  
Designation: \_\_\_\_\_  
Company: \_\_\_\_\_  
Signature: \_\_\_\_\_ Date: \_\_\_\_ / \_\_\_\_ / \_\_\_\_

**Weighbridge Owner Representative**

Name: \_\_\_\_\_  
Designation: \_\_\_\_\_  
Location: \_\_\_\_\_  
Signature: \_\_\_\_\_ Date: \_\_\_\_ / \_\_\_\_ / \_\_\_\_

**Rajasthan Mines Inspector (if present)**

Name: \_\_\_\_\_  
Designation: \_\_\_\_\_  
Signature: \_\_\_\_\_ Date: \_\_\_\_ / \_\_\_\_ / \_\_\_\_

**Annexure 4  
AMC & Support Details**

Vendor shall provide the following AMC and support services:

- 1) AMC Duration: \_\_\_\_\_ years (From \_\_\_\_\_ To \_\_\_\_\_)
- 2) Support Availability: 24x7 / Business Hours
- 3) Response Time: \_\_\_\_\_ hours
- 4) Contact Details for Support:  
    Phone: \_\_\_\_\_  
    Email: \_\_\_\_\_
- 5) Escalation Matrix:  
    Level 1: \_\_\_\_\_  
    Level 2: \_\_\_\_\_  
    Level 3: \_\_\_\_\_

## Annexure 5 Technical Specifications

### 1. RFID Reader and Antenna

- **Frequency & Compliance**

Operating Frequency: 865-867 MHz (as per WPC regulations in India)  
 RF Protocol: EPC global Gen2 (ISO 18000-6C)  
 Antenna Type: Inbuilt or additional  
 RF Power Output: Adjustable (up to 1W or 30 dBm, as per WPC limits)

- **Read Performance**

Read Range: 3 to 12 meters  
 Reading Speed: Up to 200 tags per second  
 Tag Type: Passive UHF RFID tags (Gen2 UHF)  
 Multi-tag Reading: Supports anti-collision for multiple tag reading

- **Connectivity & Interfaces**

Communication: Ethernet, Socket Communication (Mandatory)  
 Power Supply adapter: 9V to 24V DC input

- **Environmental & Mechanical Features**

Operating Temperature: -20°C to +60°C  
 Protection Rating: IP65 or higher (for outdoor use)  
 Mounting: Pole-mount or wall-mount options  
 Housing Material: Rugged, weatherproof enclosure

### 2. Position Sensors

SI#	Parameter	Technical Specifications	Compliance (Yes/No)
1	Type	Ultrasonic Sensor	
2	Sensing range	200-4000 mm or better	
3	Adjustment range	240-4000 mm or better	
4	Transducer Frequency	Approx. 85 kHz or better	
5	Opening Voltage	12 V DC, ripple 10%ss	
6	No-load supply current	<50 mA	
7	Degree of protection	IP 65	
8	Output type	2 switch outputs PNP, NO/NC, programmable	

### 3. LED Display

SI can supply and install either Type-1 or Type-2 LED Display.

#### 3.1 Protocol: MQTT (Type – 1)

SI#	Parameter	Technical Specifications	Compliance (Yes/No)
1	Type	P10 Red Color LED	
2	LED Intensity	5500mCD or higher	
3	Visibility Range	Greater than 20 Meter	
4	Refresh Rate	50Hz-100Hz	
5	Display Support	True type fonts and adjustable based on the Operating system requirement	
6	Size	36" X 12" or above	
7	Communication	Ethernet	

8	MQTT Configuration	<p>Display Configuration</p> <ol style="list-style-type: none"> <li>1. Set the <b>hostname</b> as the computer IP address.</li> <li>2. Set the port number to <b>1883</b>.</li> <li>3. Set the subscribe topic to <b>"iot_display/application_to_display"</b>.</li> <li>4. Set the publish topic to <b>"iot_display/display_to_application"</b>.</li> </ol> <p>After receiving data on the topic <b>"iot_display/application_to_display"</b>, display the received data on the screen, and also publish the same received data on the topic <b>"iot_display/display_to_application"</b>.</p>	
9	Language	English & Numeric	
10	Rating (For Outdoor Use)	IP 56 or better	

### 3.2 Protocol: API (Type – 2)

SI#	Parameter	Technical Specifications	Compliance (Yes/No)
1	Type	P10 Red Color LED	
2	LED Intensity	5500mCD or higher	
3	Visibility Range	Greater than 20 Meter	
4	Refresh Rate	50Hz-100Hz	
5	Display Support	True type fonts and adjustable based on the Operating system requirement	
6	Size	36" X 12" or above	
7	Communication	Ethernet	
8	API Configuration	<p><b>URL: "/display_data"</b></p> <p><b>Method :POST</b></p> <p><b>Payload: {"data": " " }</b></p> <p><b>Response : {"status": 200 }</b></p>	
9	Language	English & Numeric	
10	Rating (For Outdoor Use)	IP 56 or better	

### 4. Public Announcement System

SI#	Parameter	Technical Specifications	Compliance (Yes/No)
<b>Amplifier</b>			
1	Power Output	37W Max., 30W RMS at 10% THD, 27W RMS at 5% THD	
2	Output Regulation	≤ 2 dB, no load to full load at 1kHz	
3	Input Channels	2 × Mic. 0.5mV/2.5kΩ, 1 × Aux 50mV/330kΩ	
4	Speaker Outputs	4Ω, 8Ω, 16Ω & 100V	
<b>Speaker</b>			
1	Input Power	30W RMS/45W Max.	
2	Frequency Response	240-10,000Hz	

### 5. IP Bullet Camera – Top View

SI#	Parameter	Technical Specifications	Compliance (Yes/No)
1	Image sensor	1/2.8" Progressive scan CMOS sensor	
2	Resolution	Minimum 2 Mega Pixel; 1920X1080 @ 25/30 FPS or better	
3	Lens	Focal Length: Motorized varifocal (2.8-12) mm	
4	IR Range	IR 30-meter or higher	
5	Communication Interface	Ethernet RJ45 10M/100M	

SI#	Parameter	Technical Specifications	Compliance (Yes/No)
6	Power requirement	PoE+/ 12VDC	
7	Environmental Protection	IP66 or above	
8	Network protocols	IPv4, IPv6, HTTP, HTTPS, NTP, RTSP, SRTP/RTSPS, TCP, UDP, MQTT(Optional)	

#### 6. IP Bullet Camera – Front View

SI#	Parameter	Technical Specifications	Compliance (Yes/No)
1	Image sensor	1/1.8" progressive scan RGB CMOS or Better	
2	Day and night	Automatically removable infrared-cut filter	
3	Shutter speed	1/25 s–1/100000s (manual/auto) or Better	
4	Max speed for detect	80km/h	
	Lens	Varifocal f10 mm – 50 mm	
5	Video compression	H.265, H.264M, H.264H, and MJPEG.	
6	Resolution	4 Megapixel (2688 × 1520) or better	
7	Frame rate	30fps (2688 × 1520), Main Stream	
8	Network protocols	IPv4, IPv6, HTTP, HTTPS, NTP, RTSP, SRTP/RTSPS, TCP, UDP, MQTT(Optional)	
9	Application Programming Interface	Open API for software integration. ONVIF Profile G, ONVIF Profile S, and ONVIF Profile T compliant.	
10	Network security	IEEE 802.1X (EAP-TLS), IEEE 802.1AR, HTTPS/HSTS, TLS v1.2/v1.3, Network Time Security (NTS), X.509 Certificate PKI, IP address filtering	
11	Casing	IP67	
12	Power	Power over Ethernet (PoE) IEEE 802.3af/802.3at	
13	Connectors	100BASE-TX PoE	
14	IR illumination	IR with power-efficient, long-life 855 nm IR LEDs Range of reach 20 m (65.6 ft) or more depending on the scene	
15	Operating conditions	-20°C to +65°C or Better	
16	Certifications	CE, FCC, UL	

#### 7. External IR Illuminator

SI#	Technical Specification	Compliance (Yes/No)
1	Type: External IR illuminator with high performance and sufficient LEDs with high brightness for mining environment (dust, fog, night operation, rain, etc.)	
2	Wavelength: ≥850 nm (Infrared)	
3	Illumination Range: Minimum 50 meters	
4	Environment Protection: IP66 or better	
5	Auto Adjustable / Adjustable angle to focus on number plate; Beam Angle options: 10° (standard), 15°, 30°, 45°	
6	Surge Level: Common mode 6KV, Differential mode 3KV, or use external surge level	
7	Certifications: CE, FCC, RoHS, Eye Safety Test Report as per IEC62471:2006	
8	Protection Function: Transient over peak suppression or use external surge level	
9	Housing Material: Die-casting aluminium alloy	
10	<b>Power Input:</b> As per OEM Standard	
11	Eye safety certificate / Equivalent test report to be submitted	

### 8. Traffic Light in Pair (Red & Green)

SI#	Parameter	Technical Specifications	Compliance (Yes/No)
1	Description-Two colour (Red and Green)	Stop/Go -Red and Green Traffic Light	
2	LED LIFE	1,00,000 HRS	
3	Type	SMD 3528 or Better	
4	Housing	200MM/300MM-Standard	
5	LED	High bright	
6	Input Voltage	12V DC	

### 9. Boom Barrier with Safety Sensor

SI#	Parameter	Technical Specifications	Compliance (Yes/No)
1	Type	Outdoor	
2	Ingress Protection	IP 54 or Higher	
3	Interfaces	Wired (Open, Close, COM)	
4	Max. Boom Pole Length	3 Mtr. Barrier	
5	Opening & Closing Time	<=5.0 seconds	
6	Safety Sensor	Mandate to installed (As per requirement)	

### 10. Controller

SI can supply and install either Type-1 or Type-2 Controller

#### 9.1: Controller Supporting Modbus RTU (RS485) (Type – 1)

SI#	Parameter	Technical Specifications	Compliance (Yes/No)
<b>8-Channel I/O Controller</b>			
1	Input / Output Channels	<ul style="list-style-type: none"> <li>• 8-channel isolated digital input/output module</li> <li>• <b>Communication: MODBUS RTU (RS485)</b></li> <li>• Baud rate: 4800–115200 bps configurable</li> <li>• Power: 12V DC</li> <li>• LED indicators per I/O channel</li> <li>• DIN rail mountable</li> <li>• Operating temp: -20°C to +70°C</li> <li>• ESD &amp; surge protection on RS485 port</li> </ul>	
<b>12V 4-Channel Relay Module</b>			
2	Relay Module	<ul style="list-style-type: none"> <li>• 4-channel relay output board</li> <li>• Coil voltage: 12V DC</li> <li>• Contact rating: 10A @ 250V AC / 30V DC</li> <li>• Opto-isolated control</li> <li>• Status LED indicators</li> <li>• Compatible with Modbus I/O outputs</li> <li>• DIN rail mountable</li> </ul>	
<b>USB to RS485 Communication Converter</b>			
3	USB to RS485 Communication Converter	<ul style="list-style-type: none"> <li>• Interface: USB Type-B to RS485</li> <li>• Baud rate: 4800–115200 bps</li> <li>• Isolation protection preferred</li> <li>• Plug-and-play</li> <li>• Compatible with Windows/Linux</li> <li>• LED indicators for TX/RX</li> <li>• DIN rail mountable</li> </ul>	
4	USB Cable	<ul style="list-style-type: none"> <li>• Twisted pair, shielded cable</li> <li>• USB Type-A to USB Type B</li> <li>• Conductor size: 0.5 mm<sup>2</sup> or higher</li> <li>• PVC insulated, industrial grade</li> <li>• Length as per site requirement</li> </ul>	
<b>12V DC SMPS Power Supply</b>			
5	Power Supply (Module)	<ul style="list-style-type: none"> <li>• Input: 100–240V AC, 50/60Hz</li> <li>• Output: 12V DC, 10A (min)</li> </ul>	

SI#	Parameter	Technical Specifications	Compliance (Yes/No)
		<ul style="list-style-type: none"> <li>• Overload, overvoltage, short-circuit protection</li> <li>• Efficiency ≥80%</li> <li>• Enclosed, industrial-grade</li> <li>• CE/ISO certified</li> <li>• DIN rail mountable(optional)</li> </ul>	
<b>Enclosure</b>			
6	Enclosure	Type: Wall-mounted / Pole-mounted / Outdoor Application: Housing of above mentioned items Standard Compliance: IEC 60529 (IP Rating) or similar Protection Class: IP 65 & Outdoor support Doors: Hinged front door with concealed hinges and gasket sealing Cable Entry: Bottom or top gland plate, detachable, 2.0 mm thickness Body Material: Cold Rolled Close Annealed (CRCA) Sheet Steel, 2.0 mm for body Ventilation: Louvers with dust filters / optional cooling fan for heat dissipation Electrical & Earthing: Provision must be there Mounting and Accessories: Wall mounting brackets / Floor stand (with base frame) Relative Humidity: up to 95% non-condensing Installation Location: Indoor / Outdoor / Coastal / Industrial area	

### 9.1: Controller Supporting Modbus RTU (Ethernet) (Type – 2)

SI#	Parameter	Technical Specifications	Compliance (Yes/No)
<b>8-Channel I/O Controller</b>			
1	Input / Output Channels	<ul style="list-style-type: none"> <li>• 8-channel isolated digital input/output module.</li> <li>• <b>Communication: MODBUS (Ethernet)</b></li> <li>• Output Relay Contact Capacity : 10A each @ 240VAC, 10A @ 28VDC .</li> <li>• Input Isolation : Optically isolated</li> <li>• DI Register Address : 0,1,2,3,4,5,6,7</li> <li>• DO Register Address : 0,1,2,3,4,5,6,7</li> <li>• Power: 12V DC</li> <li>• LED indicators per I/O channel</li> <li>• DIN rail mountable</li> <li>• Operating temp: -20°C to +70°C</li> <li>• ESD &amp; surge protection</li> </ul>	
<b>12V DC SMPS Power Supply</b>			
2	Power Supply (Module)	<ul style="list-style-type: none"> <li>• Input: 100–240V AC, 50/60Hz</li> <li>• Output: 12V DC, 10A (min)</li> <li>• Overload, over voltage, short-circuit protection</li> <li>• Efficiency ≥80%</li> <li>• Enclosed, industrial-grade</li> <li>• CE/ISO certified</li> <li>• DIN rail mountable(optional)</li> </ul>	
<b>Enclosure</b>			
3	Enclosure	Type: Wall-mounted / Pole-mounted / Outdoor Application: Housing of above mentioned items Standard Compliance: IEC 60529 (IP Rating) or similar Protection Class: IP 65 & Outdoor support Doors: Hinged front door with concealed hinges and gasket sealing	

SI#	Parameter	Technical Specifications	Compliance (Yes/No)
		Cable Entry: Bottom or top gland plate, detachable, 2.0 mm thickness Body Material: Cold Rolled Close Annealed (CRCA) Sheet Steel, 2.0 mm for body Ventilation: Louvers with dust filters / optional cooling fan for heat dissipation Electrical & Earthing: Provision must be there Mounting and Accessories: Wall mounting brackets / Floor stand (with base frame) Relative Humidity: up to 95% non-condensing Installation Location: Indoor / Outdoor / Coastal / Industrial area	

#### 11. Pole & Accessories

SI#	Parameter	Technical Specifications	Compliance (Yes/No)
1	Pole Details	Pole shall be hot dip galvanize	
2	Civil Construction details	The pole shall be installed on a precast or cast in- SITU RCC foundation on studs with nuts & washers and with a set of four foundation bolt for greater rigidity basis the soil bearing capacity of the actual site.	
3	Size	As per the project requirements	

#### 12. System

SI#	Parameter	Technical Specifications	Compliance (Yes/No)
1	Architecture	Intel i5 processor or better	
2	Form Factor	Tower or Rack	
3	Processor	1x 8 Core	
4	Memory	16 GB DIMM Memory or More	
5	Expansion Slots	Up to 4 x PCIe 3.0	
6	HDD	2 X 1 TB SSD	
7	HBA/RAID Support	Software RAID	
8	Network Interface	2x 1GbE ports std; optional 1GbE, 10GBASE-T, and 10Gb SFP+; 1x dedicated 1GbE management port	
9	Operating System	Windows 11	
<b>Monitor</b>			
1	Size	21 inch Full HD LED Monitor	
2	Connectivity	1VGA Port,1 HDMI Port	

#### 13. PoE Network Switch

SI#	Parameter	Technical Specifications	Compliance (Yes/No)
1	Port Density	24-port 10/100/1000TX switch	
2	PoE	PoE ports with Minimum 190W total power budget	
3	VLAN	Support VLAN feature	
4	L2 Protocol	Support L2 Protocol	
5	Management Interface	CLI/GUI	

#### 14. Internet Connectivity

Dedicated 10 Mbps Internet Leased Line (ILL) connection with

- a) Public Static IP
- b) NAT and Port Forwarding support through Service Provider-supported router

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