

TENDER SPECIFICATION
NO. CLW/ES/1 - 25
Alt. -

TOTAL No. OF SHEETS IN THIS SPECIFICATION

ALT.	-								
SHEETS	16								

SPECIFICATION FOR
OHE POWER PRESENCE/ABSENCE INDICATOR
FOR
25 KV. AC ELECTRIC LOCOMOTIVES
CLASS: WAP-4/WAG-7 LOCOMOTIVES

ISSUED BY:
DY. CHIEF ELECTRICAL ENGINEER(D-I),
CHITTARANJAN LOCOMOTIVE WORKS,
P.O. CHITTARANJAN - 713331,
DIST: BURDWAN, WEST BENGAL, INDIA.

AE/SEE-D
CHKD.
DRN.

SPECIFICATION FOR OHE
POWER PRESENCE/ABSENCE
INDICATOR FOR WAG-7/WAP-4
LOCOMOTIVES.

DY. CEE (D).




CHITTARANJAN LOCOMOTIVE
WORKS
WEST BENGAL, INDIA.

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DATE: 16 /02/2006

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DETAILS OF ALTERATIONS

ALT.NO.	DATE	DESCRIPTION	SIGNATURE	REMARKS

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1.0 **SCOPE:**

1.1 The technical specification covers the minimum requirement of designing manufacturing testing and supplies condition of 'OHE Power Presence/Absence Indicator' and its installation on 25 KV. AC 50Hz., WAG-7/Wap-4 type electric locomotives of Indian Railways.

1.2 Any deviations from the specification with a view to improve the performance utility and efficiency of the equipment, proposed by the manufacturer, will be given due consideration if full particulars with technical justification thereof are furnished.

2.0 **SERVICE CONDITIONS:**

2.1

The 'OHE Power Presence/Absence Indicator' with its mounting arrangement will be robust and so designed to be able to withstand satisfactorily the following vibrations and shocks normally encountered in Traction Duty:

- i) Max. Vertical acceleration = 1.0 g
- ii) Max. Longitudinal acceleration = 3.0 g
- iii) Max. Transverse acceleration = 1.0 g

('g' being acceleration due to gravity)

2.2 The vibrations are of sine wave form and the frequency of vibration is between 1 Hz to 50 Hz. The amplitude 'a' expressed in millimetre is given as a function of 'f' by the equation:

$a = 25/f$ for values of 'f' from 1 Hz to 10 Hz.

$A = 250/f^2$ for values of 'f' exceeding 10 Hz and up to 50 Hz

2.3 In the direction corresponding to the longitudinal movement of the vehicle, the equipment is to withstand for 02 minute to 50 Hz vibration of such a value that the max. acceleration is equal to 3.0 g. (amplitude 'a' = 0.3 mm.).

2.4 The equipment and accessories of equipments shall not exhibit harmful resonance for the frequencies in the above range.

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3. SCOPE OF SUPPLY:

One loco set comprises of two identical systems for CAB-1 & CAB-2, as described in clause No. 5.4 with necessary mounting hardware, are to be supplied for WAP-4/WAG-7 type locomotives.

4.0 GENERAL:

4.1 OHE AC Power presence/absence indication system is the equipment, is used to indicate the presence/absence of AC power in the overhead traction line without raising pantograph or closing DJ circuit breaker. However, the equipment will indicate the following:

1. Presence of AC 25 KV power in the overhead line.
2. Absence of AC 25 KV power in the overhead line.
3. Sensor failure/loss of sensor mounted on roof/sensor connecting cable failure.

4.2 It is to be noted that,

- i) Minimum height of conductor wire from rail level is 4800 mm. (approx.)
- ii) Maximum height of conductor wire from rail level is 5500 mm. (approx.)
- iii) Approximate height of the locomotive cab (where the sensor is to be mounted) from the rail level is 3915 mm. and 3725 mm. for WAP-4 and WAG-7 loco respectively.

4.3 CONTRACTOR'S RESPONSIBILITY.

The contractor's responsibility will extend to the following:

4.3.1 Supply of detailed instruction for installation of the equipment on the locomotive. For this purpose the supplier should also depute his representative during installation of the first two equipments in the locomotive at each location (CLW/Shed/Workshop).

4.3.2 Commissioning, testing & field trials of the prototype equipment in service. The supplier shall arrange to carry out detailed test & field trial jointly with CLW/purchaser.

4.3.3 All hardware used shall be with metric threads only. High tensile fasteners are to be used only from the firms M/s. Unbrako, M/s. Sundaram fasteners or M/s. LPS. The spring washers of "FORBE" Make only shall be used. Fasteners of make other than mentioned above can be used only after taking prior approval from CLW.

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4.3.4 The supplier shall quote for spares, which may be required for satisfactory maintenance of the equipments for a period of 1 year after completion of warranty period.

4.3.5 The design shall be developed as per requirement given in the specification. The detailed design shall be submitted to CLW for scrutiny and approval before commencing of the manufacturing. Here "approval" means the "approval of design features" only. The suppliers shall be responsible for performance of complete system.

4.4 **Warranty:**

The supplier shall be responsible for any damage to equipment provided locomotive due to defective design, materials, workmanship for a period of 12 months after commissioning on the locomotive or 18 months from the date of supply whichever is earlier. The supplier shall replace all such equipment during the warranty period at his own cost. The period of warranty will be extendable in case of recurring problems attributable to defective design, material or manufacturing. The supplier warrant that everything to be furnished hereunder shall be free from all defects/faults in material, workmanship and manufacture and shall be of the highest grade consistent with established and accepted standards of material of the type ordered and in full conformity with specification and drawings. The supplier's liability respect of any complaints, defects and/or claim shall be limited to the furnishing installation of replacement parts free of any charge.

The supplier shall be responsible for carrying out all the modifications at his own on any part of the equipment during the period of warranty required for satisfactory operation of the equipment as per technical specification. For any technical decision the final authority from the purchaser side is CLW.

4.5 **DOCUMENTATION:**

The tenderer must submit the following information with the offer in printed form neatly compiled in a booklet form. Offer with incomplete information may not be considered.

- Mechanical drawings of complete system with details of dimension, mounting arrangement and weight shall be provided.
- System description, circuit diagram along with bill of material of the equipments, circuit description, working principle and salient features details

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of microprocessor/micro controller used, functional block description of PCBs used, control system hierarchy, protocol used and interfacing.

- c) QAM (Quality assurance manual)
- d) ISO 9000 certification.

5. TECHNICAL SPECIFICATION

5.0 SYSTEM:

The system shall consist of two identical modules for each cab i.e cab-1 & cab-2 as described in clause 5.4.

5.1 INPUT:

Supply voltage for the equipment shall be from a DC supply source normally consisting of accumulator battery and battery charger. The normal voltage and variation will be as follows:

DC input supply : 110 Volts normal, Variable from 70V to 125V DC.

- 5.2 The construction shall be mechanically robust so as to assure permanence in all mechanical, electrical, electronic or magnetic adjustments when used in accordance with manufacturer's recommendations.

- 5.3 The equipment shall be designed for high degree of reliability.

5.4 EQUIPMENT DESCRIPTION/DETAILS:

5.4.1 EQUIPMENT SUBSYSTEM:

- 5.4.1.1 **Sensor mount with guard:** This will be mounted on the roof of Electric locomotives through a hole in the roof. The collar of the mount is to be welded on the roof to prevent water ingress. This is to be mounted centrally i.e. directly beneath the OHE and the guards must be parallel to the OHE (Reference Drawing enclosed).

The sensor mount shall be so designed that once it is mounted on the Electric locomotive cab roof, the repair of sensor can be done from within the cab without switching off the OHE.



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This guard will remain earthed so that even in the unusual event of OHE breakage and falling over the sensor, the OHE will get earthed before transmitting any high voltage to the cab and there will be no danger of the driver getting exposed to higher voltages.

- 5.4.1.2 **Sealed Sensor:** This will be mounted from within the cab through the hole of sensor mount. This will be mounted with an O-ring to prevent ingress of water in the cab during rains. The sensor will be sealed with resin to protect its electronics from vibration, weather hazards etc. (Reference Drawing enclosed).

The induced signal will be processed in the cab roof sensor itself and then a 12V data stream will be passed down to the indicator in the cab. Whatever may be the amount of induction from OHE only 12V signal will go into the cab equipment and there will be no danger of the driver getting exposed to higher voltages.

The sensor will not be a pliable naked piece of wire. It will be rugged and sealed with its processing electronics, which can withstand highest electric locomotive speed 160kmph and wind speed encountered in Indian railways without mechanical movement or damage.

- 5.4.1.3 **Connecting Cable:** This will be a two-core cable with screen. The ends will be soldered to polarized (Military grade, MS 3106F-10SL-3S) connectors to prevent any inadvertent wrong connection. This cable will be connecting the Sealed Sensor with the Control cum power supply unit. Another five core cable with screen to be supplied for connecting the Control cum power supply unit with the Display unit. The ends of this cable will be soldered to a polarised (Military Grade MS 3106F-18-12S) connector.

- 5.4.1.4 **Control cum Power supply unit:** This unit will accept 110V DC supply from the battery of Electric locomotive and will convert it to the working voltage of the system. This also generates the necessary Signals for status indication, indicated through the Display unit.

- 5.4.1.5 **Display unit:** This will be mounted in Driving CAB and indicate the following by receiving appropriate signals from Control cum Power supply unit :

25kV power on: Green LED only glows.

25kV power failure: Red LED only glows.

Sensor failure/Sensor wire failure/loss of sensor: Yellow LED glows.



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6.5 ATMOSPHERE DURING HOT WEATHER:

Extremely dusty and desert terrain in certain areas. The dust concentration in air may reach a high value of 1.6 mg/cm².

6.6 COASTAL AREA:

The equipment shall be designed to work in coastal area in humidity and salt laden and corrosive atmosphere. The maximum values of the some of the parameters shall be as follows:

- a) Maximum pH value : 8.05
- b) Sulphate : 7mg/lit.
- c) Max. concentration of Chlorine : 6mg/lit.
- d) Maximum conductivity : 130 micro siemens/cm.

6.7 VIBRATION:

The equipment shall be designed to withstand the vibrations and shock encountered in service satisfactorily as specified in IEC1287 (1995-07) and 60571 (1998-02) publication for the Electronic equipments used on Rail Vehicle and relevant IECs as applicable to other equipment and vibration described in cl. No. 2.

6.8 ELECTROMAGNETIC POLLUTION:

High degree of electromagnetic pollution is anticipated in locomotive machine room, where the equipment will be mounted. Necessary precaution should be taken in this regard.

6.9 SPIKES & SURGES:

Provision shall be made for suppression of transients (spikes & surges). The equipment shall withstand, without damage.

7. TESTS:**7.1 CATEGORIES OF TEST**

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7.1.1 TYPE TEST:

Type test shall normally be carried out on one unit of equipment of the approved design.

7.1.2 ROUTINE TEST:

Routine test shall be carried out on each piece of equipment of each order.

7.1.3 TESTING DETAILS:

Test mentioned in Table I shall be carried out on the OHE Power Presence/Absence Indication system

Table - 1

S. No.	Kind of Test	Clause	
		Type tests	Routine tests
1.	Visual inspection	Yes	Yes
2.	Performance test	Yes	Yes
3.	Reversal polarity	Yes	Yes
4.	Effect of voltage variation	Yes	---
5.	Weather proof test*	Yes	---
6.	Water tightness test**	Yes	---
7.	Dielectric test	Yes	---

Note: *For the system.

**For sensor only.

7.2.1 VISUAL INSPECTION:

The purchasers shall carry out visual inspection to ensure that the equipment under test is of acceptable workmanship and in conformity with manufacturers design specification accepted.

1. Fitment of seated sensor in the sensor mount with guard.
2. Fitment of connecting cable with sensor and indication and cum power supply unit.
3. Mounting arrangement.
4. Identification markings

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7.2.2 PERFORMANCE TEST:

These tests are carried out to check and ensure that the performance of the equipment is in order and meets the specification requirements. These test shall be 37±3°C, relative humidity between 45% and 80% and magnetic field not significantly from that of the earth. The operating voltage shall be nominal voltage specified in **Clause 5.1.**

7.2.21 GENERAL WORKING:

The complete system will be mounted under simulated OHE with voltage of 500V AC. The sensor mount will be mounted on a jack, which can be raised or lowered. The whole system will be connected with 110V DC power supply and operation of the sensor tested with raising or lowering the jack.

7.2.2.2 ACCURACY:

The jack will have a scale to measure the distance between the simulated OHE (500V AC) and top of sealed sensor.-The sensor operating range will be as per information supplied by the supplier during quotation

7.3 REVERSAL OF POLARITY:

The system will be designed to accept reversal of polarity. The power supply wires (110v dc) will be reversibly connected with the system deliberately for one minute. The system has to work without any damage to the system. No deterioration of reading will be found. On reconnecting in the correct manner the system should work properly as well.

7.4 EFFECT OF VOLTAGE VARIATION:

The complete system will be designed to accept voltage variation from 70V DC to 125V DC. While the complete system will work the supply voltage will be first raised to 125V DC and kept for one minute. The system should work without getting burnt. A similar test will be done at 70V DC for one minute and the system should work without blinking.

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7.5 WEATHER PROOF TEST:

The weather proofed parts of the system shall be placed in a similar attitude of actual installation in a chamber at a temperature of $55 \pm 5^\circ\text{C}$ for a period of 30 minutes, and then subjected to a fine air born spray of ordinary tap water for 15 minutes. The temperature shall then be allowed to recover upto $37 \pm 5^\circ\text{C}$ after which the water shall be found not to have penetrated the system. The system shall operate correctly after this test.

7.6 WATER TIGHTNESS TEST:

The water proofed parts of the system (the sensor unit) shall be placed in a simulated installed position and immersed for one hour under water at a pressure of 0.13 bar (1.5m head of water) at $37 \pm 5^\circ\text{C}$ after which it shall be tested and seen working satisfactorily.

7.7 DIELECTRIC TEST:

The aim of the test, to be carried out on the equipment printed circuit board (by sampling as indicated in Note 1 of clause 19 of IEC 571), is to prevent the mounting of components too close to the surrounding metal parts. The test shall be carried out with the circuit board connected in its place of operation. The test voltage of a nominal frequency of 50Hz shall be applied for 1 min. between all the terminals of the circuit board short circuited & metal rack of the electronic assembly. For circuit board with a metallic supporting frame, the test voltage shall also be applied between all short-circuited connections of the plug connector and the metallic supporting frame. The r.m.s. value of the test voltage shall be:

1000V for rated supply voltages between 72 and 125V.

The tests shall be considered as satisfactory if neither a disruptive discharge nor a flashover occurs.

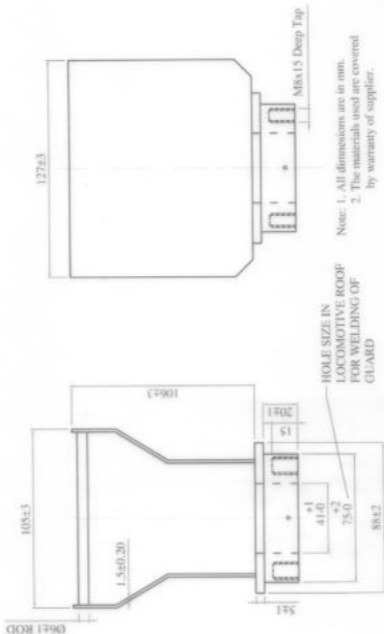
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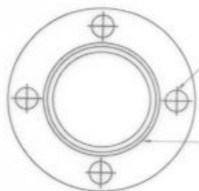
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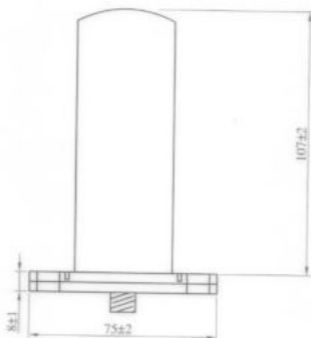
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Four holes of $\varnothing 9 \pm 0.5$ mm. at 60 ± 1 mm. P.C.D.

O-ring groove at 45 ± 1 mm. P.C.D. approx. 3mm. deep and 1.5mm. wide.



- Note: 1. All dimmensions are in mm.
2. The materials used are covered by warranty of supplier.

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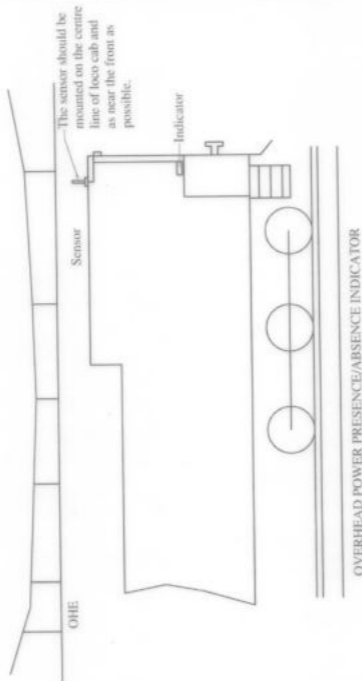
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H.D. Mitra
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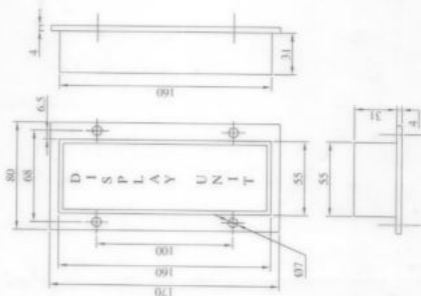
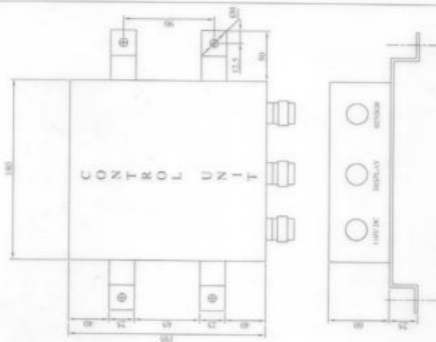
Note: The sensor frame guides should be parallel to the side of the cab.

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Note: 1. All dimensions are in mm.

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