

w.e.f. ... Sept, 2017..	Instruction No. .... TI/IN/0035. ....	Technical Instruction for Testing of OHE Structure's ... Foundation	Page 1 of 6
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GOVERNMENT OF INDIA  
MINISTRY OF RAILWAYS



सत्यमेव जयते

TECHNICAL INSTRUCTION NO. TI/IN/0035

Technical Instruction for Testing of OHE structure's Foundation

September, 2017

ISSUED BY

TRACTION INSTALLATION DIRECTORATE  
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**1.0 Scope:**

**1.1** In order to validate the design of OHE structure's Foundation this Technical Instructions based on IEC 1773-1996 & additional requirements has been prepared. This Technical Instruction will be applicable for testing of new design of OHE Structure's foundations. OHE structure may be installed either with grouting in core hole or erected with base plate.

**1.2** This instruction is not applicable for the following clauses of IEC-1773

- (i) Clause 4.1(a): To verify design methodologies.
- (ii) Clause 4.1(b): To verify construction procedures.
- (iii) Clause 4.1(c): To established geotechnical design parameter and/or a design methodology for a specific application.
- (iv) Clause 4.1(e): To determine the average failure load and coefficient of variation of the design type in specified soil conditions.
- (v) Clause 4.1.2: Reduced scale tests

**2.0 Background:** Indian Railway have been using parallelepiped type side bearing, side gravity, Pure gravity, dry black cotton and wet black cotton soil foundation etc. Recently RDSO has developed design of cylindrical type of foundations as an alternative to conventional side bearing & side gravity and also developed design of foundation on rock soil.

Validation of the new design of foundations is required by conducting load test.

**3.0 Objective:** The objective of this document is to frame instructions for testing of new design OHE mast foundation as per IEC 1773-1996 (herewith after mentioned as IEC -1773). IEC 1773 provide procedures which apply to the investigation of the load carrying capacity and/ or the load response (Settlement or tilt) of the foundation as an interaction between the foundation and the surrounding soil. In additional to this, test for crack in the foundation, angular rotation of the foundation and test with broken wire condition are included.

**4.0 Minimum Requirement for the Testing of OHE Mast foundation as per RDSO design of foundation:**

- (a) Foundation will be casted as per relevant RDSO drawing.
- (b) Foundation is projected above the ground level as per the concern drawing.
- (c) Depth of loose soil 500mm below the ground level will be considered as ineffective depth.

**5.0 Instructions:** IEC -1773 should be complied. However, following clauses of IEC-1773 are brought out specifically for complying during the tests and relevant record of the same shall be made part of the test preparation plan and find test report:

SN	Clause no. of IEC 1773-1996	Heading
I	Clause 4	Categories of tests (Note: Clause 1.2 above)
II	Clause 5	Geotechnical data
III	Clause 6	Foundation Installation
IV	Clause 7	Test Equipment. It includes following: (i) Clause 7.1: Load application, Special note should be taken for Safety measure as per last Para of Clause 7.1

		(ii) Clause 7.2 : Test loading arrangement (iii) Clause 7.3:Reference Beam- Design test (iv) Clause 7.4: Displacement measurement device- Design test (v) Clause 7.6: Calibration of measuring instruments
V	Clause 8	Test procedures. It includes following: (i) Clause 8.1: Number of Test shall be decided by Railway Authority (ii) Clause 8.3: Loading procedure, as per Table 1 (Loading schedule) shall be complied however, Note given under table-1 will also be applicable .Test loading shall be done up to as agreed by the Railway Authority. Bending Moment and SBC reference shall be considered as per the relevant RDSO drawings. (iii) Test recording: Each test shall be recorded in a typical format of table D.1 of ANNEX-D of IEC 1773 and ANNEX A, B & C as attached herewith. (iv) The record of design test shall be as per sub clause 8.4.1 of IEC - 1773
VI	Clause 9	Test evaluation
VII	Clause 10	Acceptance criteria
VIII	clause 11	Test report

**6.0 Acceptance Criteria of settlement of foundation:** Compliance of the settlement value of foundation should not exceed the maximum permissible value of 5mm.

**7.0 Test requirement and acceptance criterion for test of crack:** Crack in foundation shall be checked by normal magnifying glass as below:

- At each stage of loading, observation for cracks on the surface of the foundation would be made. To have proper observation of any crack a thin layer of Plaster of Paris would be applied on the top of the foundation. The detail of the crack i.e. Length, width and location would be recorded.
- Observe the separation of the mast from the core concrete with respect to zero load.
- Observe, if any failure of the mast or the foundation.
- Observe, if any, heaving of the soil around the foundation.
- For the purpose of acceptance criteria, non-appearance of any crack or excessive strains in concrete or no failure of the mast up to 2D(2xDesign load) at least 3 samples. In case one of the 3 samples fails, repeat test would be done for 2 more samples in the repeat test shall pass. Appearance of any hair cracks which closes on the removal of the load will be considered as a crack since it is foundation; it may permit the entry of water.

**8.0 Test requirement and acceptance criteria for test of broken wire condition:**  
For broken wire condition for 2500 kg,  $1.25 \times 2500 = 3125$  kg,  $1.5 \times 2500 = 3750$  kg impact of sudden load considered for testing. Passing criteria as per 6.0 & 7.0 should be complied.

**9.0 Test requirement and acceptance criteria for test of Tilting or inclination:** In case of tilting or inclination, considered permissible limit is 0.2 degree and tilting shall be restore back after removal of imposed load. Passing criteria includes above clause 7.0 also.

w.e.f Sept,2017	Instruction No. TI/IN/0035	Technical Instruction for Testing of OHE Structure's Foundation	Page 4 of 6
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**10.0 Test requirement and acceptance criteria for test of rotation:** Test of rotation about vertical axis of the foundation should not exceed 1degree.

**11.0 Testing Report of Safe bearing Capacity:** Following parameters shall be mentioned:

- (a) Safe bearing capacity of soil shall be calculated as plate load test given IS: 1888-2002 (Method of load test on soil).
- (b) If soil fails, in shear before 50mm settlement, then ultimate bearing capacity, safe bearing capacity including factor of safety (minimum 2.5),and value of settlement on which soil is failed in shear shall be mentioned. The value of settlement on which safe bearing capacity of soil has been determine shall be mentioned.
- (c) If soil fails in shear after 50mm settlement, then ultimate bearing capacity in shear & safe bearing capacity including factor of safety (minimum 2.5) and the safe bearing capacity of soil on the basis of settlement shall be mentioned. The value of settlement on which safe bearing capacity of soil has been determine shall be mentioned.
- (d) The calculation as per the formula for footing settlement, figures drawn base on the referred figure-5 & figure-6mentioned in the clause 5.2 and 5.3 of IS: 1888-2002 shall be made part of the test report.
- (e) During testing of foundation value of settlement which arises during determination of safe bearing capacity of soil should not exceed the limit.
- (f) The value of safe bearing capacity shall be determine on the basis of least value of two criteria (i) shear failure of soil (ii) settlement of foundation.

**12.0** Any deviation from this Technical Instruction & IEC 1773 shall be brought out by the test executing authority acceptance of deviation shall be by competent Railway Authority.

**13.0** After conducting the above mentioned test the design shall be reviewed with respect to the test result obtained at site by competent authority.

**14.0 Codal Reference:** The followings IS Codes and standard railway manuals are referred for prepared this document.

- (a) IEC1773 Code for practice for Overhead lines – Testing of foundation for structures.
- (b) IS 1904—1986- Code of practice for Design and construction of foundation in soil (Settlement check criteria)
- (c) IS 8009-1998- Code of practice for calculation of settlement of foundation
- (d) IS 6403-1997 –Code of practice for Determination of bearing capacity of shallow foundation (SPT calculation)
- (e) IS: 1888-2002 (Method of Load Test on soil)



