

## SECTION 2

### ELECTRICAL

#### 2.1 Introduction

This part of Tender document contains general, technical and other specifications for design and erection of complete 25 kV A.C. 50 Hz single phase Traction Overhead equipment, Switching stations, Booster Transformer stations, L.T. Supply Transformer stations, Traction Sub-Stations and associated Transmission line works, SCADA System, Electrical General Works, Signalling works, Telecom works, Civil Engineering works etc.

This part also gives typical designs relating to Overhead Equipments, Switching Stations, Booster Transformer Stations and Traction Sub-Stations along with technical specifications of materials, components, fittings etc.

The entire Railway Electrification work shall be executed as per relevant IS/ Specifications/ Drawings (latest version applicable in all cases up to the date of tender opening) and good industry practices. A list of the relevant Specifications / IS available is included in Annexure.

#### 2.2 List of Standard Specifications and IS

This Annexure contains list of documents, technical Specifications and IS referred to in various paragraphs of the Tender. The list of relevant Drawings for RE works has been included in the Schedule-I (Drawings) of RFP document.

All references to drawings, charts, schedules, specifications, IS etc. given in this Annexure or elsewhere in the tender document shall be taken to be the latest versions including all amendments up to the date of tender opening.

All other items not covered under the Drawings/Specification shall be referred to as per relevant IS and Railways practices in force.

The Drawings and RDSO specifications can be purchased from the office of CEE/CORE, Allahabad or TI Directorate of RDSO, Lucknow on payment basis.

##### 2.2.1 List of Standard RDSO's Specifications for OHE, TSS and SCADA

S.N.	TITLE OF SPECIFICATION	RDSO SPECIFICATION NO
1.	Annealed stranded copper conductor for jumper wire.	ETI/OHE/3(2/94) with A&C slip No.1of (4/95)
2.	Copper busbar	RE/30/OHE/5 (11/60)
3.	Structural Steel tubes.	ETI/OHE/11 (5/89)
4.	Hot dip zinc galvanisation of steel masts (Rolled and Fabricated) tube and fittings used on 25 KV AC OHE.	ETI/OHE/13(4/84) with A&C slip No. 1of (5/86),2 of (4/90) & 3 of (4/90)

5.	Stainless steel wire ropes	TI/SPC/OHE/WR/1060 with A&C slip No 1 of (11/06) & 2 of (05/07)
6.	Solid core porcelain insulators for 25 KV 50 Hz single phase overhead lines	TI/SPC/OHE/INS/0070 (04/2007)
7.	25 KV single and double pole isolators.	ETI/OHE/16(1/94) with A&C slip No.1 of (06/2000) & 2 of (3/2004)
8.	Steel fasteners & Stainless Steel fasteners	TI/SPC/OHE/Fasteners/0120
9.	Aluminium alloy section and tubes	ETI/OHE/21(9/74)
10.	Standard for drawings for Traction Overhead equipment	ETI/OHE/25(3/66)
11.	Light Weight Section Insulators assembly. OR Section Insulator assembly without sectioning insulator.	TI/SPC/OHE/LWTSI/0060 (8/2006) OR ETI/OHE/27(8/84) with A&C slip No.1 of (10/92)
12.	Enamelled steel plates	ETI/OHE/33(8/85)
	Retro-reflective Structure Number Plates & Caution/Warning Boards	ETI/OHE/33A(12/97) Rev-7
13.	Galvanised steel wire	ETI/OHE/36(12/73) with A&C Slip No.1 of (5/98)
14.	3 pulley Type Regulating Equipment	TI/SPC/OHE/ATD/0060 (8/2006) with A&C Slip No1 of (10/2006) & 2 of (5/2007)
15.	Fitting for 25 KV 50 HZ AC Overhead equipment	ETI/OHE/49(9/95) with A&C Slip No 1 of (3/97) and CORE's A&C slip No. 2 of (4/2000), 3 of (08/01), 4 of (03/2002) & 5 of (10/2010).
16.	Cadmium copper conductor for overhead Railway Traction	ETI/OHE/50 (6/97) with A&C slip No.1 to 3.
17.	Principles of OHE layout plans and sectioning diagrams for 25 KV AC traction	ETI/OHE/53(6/88) with A&C slip no.1 of (12/88), 2 of (8/89), 3 of (6/90), 4 of (8/92) & 5 of (11/2006)
18.	19/2.79mm All Aluminium alloy stranded catenary wire.	ETI/OHE/54(2/85) with A&C slip No. 1 of (11/89) & 2 of (10/92)
19.	Bimetallic (Al- Cu) strip	ETI/OHE/55(4/90)
20.	Short Neutral Section Assembly (Phase Break)	TI/SPC/OHE/SNS/0000 of (2/2000)
21.	Code for bonding and earthing for 25 KV, AC single phase, 50 Hz traction system.	ETI/OHE/71(11/90) with A&C slip no. 1 of (8/91) & 2 of (3/93)
22.	Insulated Cadmium copper catenary 19/2.10 mm dia for provision under	TI/SPC/OHE/INSCAT/0000 of (4/2000)

	overline structures in the 25 KV AC Electric Traction.	
23.	Battery charger for 110 V battery, 40 AH.	ETI/PSI/1(6/81)
24.	Lightning arrestor-7.5 KV	ETI/PSI/3(8/75) with A&C slip No.1 of (2/91)
25.	220 KV or 132 KV or 110 KV or 66 KV or 25 kV Potential transformers	TI/SPC/PSI/PTs/0990 with A&C slip No.1 to 5 (01/09)
26.	25 KV Dropout fuse switch & operating pole for use with 10 KVA and 100 kVA 25 kV/ 230 V L.T. Supply transformer.	ETI/PSI/14(1/86) with A&C slip no 1 of (4/87)
27.	25 kV/240 V, 5 kVA, 10 kVA, 25 kVA & 50 kVA, 50 Hz single phase oil filled Auxiliary Transformers.	ETI/PSI/15(8/03)
28.	Low maintenance Lead Acid 40AH & 200 AH cells.	RDSO/PE/SPEC/TL/0040-2003(Rev-0) with A&C slip no 1 of (9/2005)
29.	150 KVA, 25 KV, single phase, 50 Hz. Dry type Cast resin Booster Transformers	ETI/PSI/97(6/87) with A&C slip No.1 of (9/88)
30.	100 KVA & 150 KVA, 25 KV, single phase, 50 Hz, oil filled Booster Transformers	ETI/PSI/98(8/92) with A&C slip No.1 of (9/92), 2 of (1/94) & 3 of (6/94)
31	25 kV Single pole, Double Pole, Pole Mounted, Out Door Vacuum Circuit Breaker (VCB) and Vacuum Interrupter (BM)	TI/SPC/PSI/LVCBIN/0120 (December, 2013) (Revision – 0)
32	Hard drawn grooved copper Contact wire	ETI/OHE/76(6/97) with A&C slip No.1 of (4/01), 3 of (03/05), 4 of (12/06), 5 of (7/09), 6 of (5/12) & 7 of (12/13)
33	Metal Oxide Gapless type Lightning Arrestor for use on 25kV side of Rly. traction sub stations & switching stations	TI/SPC/PSI/MOGTLA/0100(07/10)
34	Technical Specification for Silicon Composite Insulators for 25 kV A.C. 50 Hz single phase overhead traction lines.	TI/SPC/OHE/INSCOM/1070 (01/07) or TI/SPC/OHE/INSCOM/1071 (04/13)
35	Specification for solid core porcelain cylindrical post insulator for systems with nominal voltage of 66kV, 110kV, 132kV & 220kV.	TI/SPC/OHE/POST/0100(01/2010)

36	25kv/240V L.T. supply Transformer, 100 KVA	ETI/PSI/15 A (7/82) with A&C Slip No.1(9/89)
37	Battery charger for 110V Battery, 200 AH	ETI/PSI/24(6/81)
38	Low tension Distribution panels for Railway A.C traction sub-stations	ETI/PSI/29 (12/79)With A&C Slip No.1 (2/93)
39	Standard for drawings for power supply Installations.	ETI/PSI/31 (5/76)
40	Low Tension distribution panels.	ETI/PSI/63(7/82)
41	Technical specification for control and relay panel for 25kV AC TSS including specification for numerical type protection relays for traction transformer, 25kV shunt capacitor bank and transmission line for 25kV ac TSS on Indian Railways.	TI/SPC/PSI/PROTCT/6070(9/08) with A&C slip No.1
42	Technical specification for shunt capacitor & series reactor equipment for traction sub-station	TI/SPC/PSI/FC&SR/0100(01/10)
43	Technical specification for 25kV ac, 50 Hz, single phase, oil filled, current transformer with CT ratio of I -1000-500/5A (for general purpose), II-1500-750/5A (for heavy haul duties) for Railway ac traction sub-station.	ETI/PSI/90 (6/95) with A&C Slip No.1, 2, 3, 4, 5, 6, 7 (08/2007) & 8 (April 2009).
44	Technical specification for two zone static relay for distance protection for 25kV ac single phase 50 Hz traction overhead equipment.	ETI/PSI/101 (8/87) with A&C Slip No.1 (09/87)
45	Technical specification for current transformers. I. 220kV. 200-100/5A, II. 132kV. 400-200/5A, III. 110kV. 400-200/5A, IV. 66kV. 800-400/5A for Railway A.C traction substations.	ETI/PSI/117 (7/88) with A&C Slip No.1 (11/88), 2 (3/89), 3 (12/89), 4 (4/90), 5 (6/90), 6 (9/92), 7 (8/05), 8 (08/2007) & 9 (July 2008).
46	Specification for 21.6 MVA single phase, 50 Hz. i) 220/27kV ii) 132/27kV iii) 110/27kV, iv), 66/27kV traction power transformer for Railway A.C traction sub- station.	ETI/PSI/118 (10/93) with A&C Slip No.1 to 10 (08/12) or latest
47	Code of practice for earthing of power supply installations for 25kV A.C., 50 Hz, single phase traction system.	ETI/PSI/120 (2/91) with A/c Slip No1 (10/93)
48	Technical specification for i) 245 kV, (ii) 145 kV, (iii) 123 kV, (iv) 72.5 kV double pole & triple pole Isolator for	ETI/PSI/122 (3/89) with A&C Slip No.1(4/90)

	Railway traction sub stations.	
49	Specification for Metal Oxide gapless type lightning arrestors (combined) for use on 220/132/110/66 kV side of Railway A.C. traction sub-station.	ETI/PSI/137 (8/89) with A&C Slip No.1 (1/90), 2(2/91), 3(12/91), 4(8/94) 5 & 6 (9/05) & 7(07/2007)
50	Technical specification for 220 kV or 132 kV or 110 kV or 66 kV or 25 kV Potential Transformer	TI/SPC/PSI/PTS/0990 with A&C Slip No.1,2,3,4,& 5 (April 09)
51	Delta I type High resistive fault selective Relay for 25 kV AC Single phase 50 Hz traction system.	TI/SPC/PSI/PROTCT/1982 (12/2003) with A&C slip no. 1
52	Panto flashover protection relay for 25 kV A.C. single phase 50 Hz traction system.	TI/SPC/PSI/PROTCT/2983 (08/2001)
53	Technical Specification for SCADA system for 25 kV, AC Single phase Traction supply on Indian Railways	TI/SPC/RCC/SCADA/0130 (04/2014)
54	Technical Specification for Galvanised Steel Stranded Wire for Traction Masts	TI/SPC/OHE/GSSW/0090 (10/2009)
55	Technical specification for galvanized steel stranded wire for traction bonds	TI/SPC/OHE/GALSTB/0040 Rev.1
56	Setting up Earthing station at switching posts (SSP & SP) with conventional Earthing	Special Maintenance Instruction No. TI/SMI/0032 Rev-1
57	Design hand outs for Overhead equipments for running double stack containers under electrified routes (High rise OHE) with speed potential of 140 Kmph based on revised wind zones	TI/DESIGNS/OHE/2013/00001 (July'13)
58	OHE span in view of changes in wind zones in country	TI/OHE/GA/2013 dated 25/30.04.2013
59	Technical guidelines and Standard Instructions for Railway Electrification Works including OHE, TSS, Transmission line, SCADA, Electrical General Works, Signalling works, Telecom works & Civil Engineering Works	CORE/RE TENDER/EPC/2014/ STANDARD INSTRUCTIONS AND GUIDELINES