

General Technical Specification 2000 kVA, 11/0.750 kV Compact Substation (CSS)

1. Scope:

Supply, installation, testing, and commissioning of 2000 kVA, 11/0.750 kV Compact Substation (CSS) suitable for Railway site requirement, consisting of HT RMU, dry-type transformer, and LT Panel (LTDB), pre-wired, pre-assembled, and tested as an integrated compact unit, fully enclosed and weatherproof. **The CSS, RMU and Vacuum Interrupter inside VCB, & relay shall be of same make.**

2. HT RMU (Ring Main Unit):

- Configuration: 11kV 630A Motorized 5-Way (2 nos. LBS + 3 nos. VCB + Bus Metering Panel), RMU.
- Insulation: SF₆ gas insulated.
- Busbar: Copper busbar;
- Standards:
 - IEC 62271-100 (for VCB)
 - IEC: 62271-102 (for LBS)
 - IEC 62271-200 (for gas-insulated switchgear)

Inter connection between RMU to transformer HT side thorough 11 kV grade, 95 sq.mm XLPE cable.

The LBS offered shall conform to IEC: 62271-103 as amended to date. The LBS shall be triple pole, spring assisted, Motorized operated SCADA compatible.

VCB shall be used for distribution network of HT switchgear. Circuit Breaker complete with operating mechanism, self powered, Static type O/C, E/F protection relay with associated Current Transformers shall be used for control and protection of Transformer. Make of VCB, VI bottle, RMU, Numerical relay should be of same make

The above Load Break Cable Switch, VCB, Bus bars should be mounted inside a robotically welded / Laser welded sealed for life, stainless steel tank of not less than 2.5 mm thick. The operating mechanism of the switches and breakers shall be outside the SF₆ tank and accessible from front. The tank should be filled with SF₆ gas at adequate pressure. The degree of protection for gas tank should be IP67. There shall be provision for filling the SF₆ gas at site. Moreover the Stainless Steel Gas Tank shall conform to the sealed pressure system as per IEC and ensure the gas leakage to less than 0.1 % per year as per IEC. OEM shall have comprehensive gas leakage testing facility including Helium leakage testing at their factory.

Protection Relays: The CB shall be fitted with Static type self powered relay inside the front cover to avoid any tampering. Self Powered Numerical Protection Relay is designed for use in unmanned substation where dependable auxiliary power source is not available. The relay derives power for its operation from main current transformers. Relay shall have 2 Digital Input and 2 digital output. The relay has feature of IDMT, as well as, instantaneous protection for both over current & earth elements. Relay should have features to communicate with FRTU having RS232 & RS485 ports with Modbus protocol for FRTU communications.

Current Transformer: 50-100/1-1A CL 1.0; 2.5VA for Metering & 50-100/1-1A 5P10; 2.5VA for protection.

Bus Metering Panel shall include below items:

1. **Potential Transformer :** 3 nos Single phase PT (11 kV/ $\sqrt{3}$, 110 V/3, 50VA, Cl: 1, Cl: 3P)
2. **MF:** 1 no. Digital Multifunction meter with CL –1.0
3. **Battery & Battery Charger**

RMU shall be SCADA Compatible for Future provision, However supply of FRTU shall not be in the scope of supply.

3. Dry Type Cast Resin Transformer (CRT):

- Rating: 2000 kVA, 11/0.750 kV, 50 Hz, Dyn11, AN cooling.
- Insulation: Class F (as per ECBC 2017),

Losses as per ECBC 2017

100% load loss : 20,000W;
50% load loss : 7500W
OCTC : -5% - +5% (1.25% per stage)

- Enclosure: IP00 for inside CSS installation.
- Earthing: Two distinct earthing terminals as per IS/IE Rules.

4. LT Distribution Board (LTDB): Shall be SCADA Compatible

- Main ACB: 750V, 1600A, 4P, 50kA, microprocessor-based, fixed type – 2NOS. (1 FOR Incoming + 1 FOR Bus coupler)
- Busbar: 4P AL busbar rated for 160% of full load current, with 100% neutral.
- Accessories:
 - Multifunction Digital Meter – 1 No.
 - 750/110V, 3Ph, 50 VA PT – 1 Set
 - 750/230V, 1Ph, 15 VA CT – 1 Set
 - Cast Resin CTs – 1600/5A, 15 VA, Class 1.0, 3 Nos.
 - LED indication lamps, interlocks, protection relays, terminal blocks, etc.
- Standard:
 - IS 8623 / IEC 61439 (LT Panels)
 - IS 13947/IEC 60947-2 (ACB and Switchgear)
 - IS 2705 (CTs), IS 3156 (PTs)
 - IS 1248 (Measuring Instruments)

LT Panel shall be SCADA Compatible for data monitoring only.

5. Enclosure & Construction:

- Outdoor duty, powder-coated 2.0mm thick CRCA steel enclosure with **IP54** protection for HT RMU & LT Panel Compartment & **IP23** for Transformer Compartment.

- Base channel for anchoring; provisions for ventilation and cable entry/exit.
- All equipment should be mounted, wired, tested, and ready for plug-and-play operation.

6. Type Tests / Routine Tests Required (Documents to be submitted by Tenderer):

Type Test Reports from NABL-accredited lab or CPRI/ERDA.

Routine Test Certificates to be furnished at the time of supply.

Component-wise standards and test requirements:

- RMU: IS 9920 / IEC 62271 –1 Short-circuit, temperature rise, dielectric, internal arc withstand
- CRT: IS 11171 / IS 2026 / IEC 60076 – Short-circuit, temp rise, impulse, insulation resistance
- LT Panel: IS 8623 / IEC 61439 – Temperature rise, dielectric, IP protection
- ACB: IS 13947-2/ IEC 60947-2 – Breaking capacity, dielectric strength, thermal stability
- CT/PT: IS 2705 / IS 3156 – Accuracy, burden, insulation resistance
- Meter: IS 13779 / IEC 62052 – Accuracy, functional test
- Cables: IS 7098 Part II – Dielectric, flame retardant, insulation resistance

7. Requirements:

- All items shall conform to Railway-approved make/brand.
- Vendor to provide GA drawing, wiring diagram, foundation plan, and technical leaflets.
- Items should be tested at any of the testing facilities of the OEM in the presence of Railway representatives before dispatch.

NOTE:These technical details / general specifications are indicative only. The tenderer is advised to examine the areas to be covered under the scope of the work, so that the tenderer can have a clear concept of sites for meeting the requirements. Place, time, and quantity may be changed at the time of execution of the work as per prevailing site condition. Tenderer shall contact Sr. SE/Elect/G/ASN for visiting the site.

Drawing signed and stamped from OEM must be approved by competent Railway authority before supply of material. The decision of Railway Administration over the standardisation of the job & make for entire work will be final.

CODES & STANDARDS:

All equipment and material shall be designed manufactured and tested in accordance with the latest applicable IEC standards.

The Compact Sub- Station offered shall in general comply with the latest issue including amendments of the following standards.

Title	Standards
High Voltage Low Voltage Pre-Fabricated Substation	IEC:61330/62271-202

High Voltage Switches	IEC60265
Metal Enclosed High Voltage Switchgear	IEC60298/62271-200
High Voltage Switchgear	IEC60694/62271-100
Low Voltage Switch gear and Control gear	IEC60439/60947
Power Transformers	IEC60076/ IS:1180, IS:2026, IS:11171

Test on Compact Sub- Station (CSS) at Original Equipment Manufacturer's Work shop:

(a) The routine tests shall be made on each complete prefabricated substation, (b) Voltage tests on auxiliary circuit (c) Functional test & (d) Verification of complete wiring or as per RITES norms as decided by Sr.DEE/G/ASN.

Test Witness: Routine test shall be performed in presence of Railway representative. The Vendor shall give at least ten (10) days advance notice of the date when the tests are to be carried out.

Test Certificates: Certified reports of all the tests carried out at the works shall be furnished in three (3) copies for approval of the Owner.

Inspection :Inspection of the Compact Sub Station (CSS) will be done by RITES at OEM authorized testing facility. For which cost will be borne by the successful bidder.

(All electrical equipment, switchgears and complete accessories of CSS must be as per OEM standard to be recommended by OEM only and design to be submitted by OEM only)

Note: The CSS shall be Factory assembled, Factory Tested & Transported as one Unit to the Customer End for Installation.

Warranty: The complete equipment must be guaranteed for satisfactory operation for a period 30 months from date of supply and 24 month from date of installation whichever is earlier. The equipment shall be guaranteed for satisfactory performance for a period as above mentioned period or as per Railway. The equipment found defective/failed within the above guaranteed period shall be replaced or repaired by the firm free of cost within stipulated time specified by higher authority from Railway.

DRAWINGS, DATA AND MANUALS:

To be submitted for Approval and Distribution

Sl.no	Document to be submitted for Approval	Approval/ Information
i.	Electrical single line diagram showing rating of all equipment.	For Approval
ii.	General Arrangement Drawing and BOM of CSS	For Approval
iii	Data Sheets of CSS, HT breaker, Transformer & LT breakers	For Approval
iv	Foundation Plan & Loading Details of CSS	For Approval

v	CSS area Layout and Cross Section Considering acoustic enclosure, exhaust piping, cable trenches, cable trays, fuel trenches etc.	For Approval
vi	Other foundation drawing, earth drawing, structural drawing, specifications or any required drawing not mentioned in Scope of the Work must be got approved before inspection & supply of items.	For Approval
vii	Any other relevant drawings, documents or data necessary for satisfactory installation, operation and maintenance to be submitted.	For Information
viii	Type test certificates	For Information
ix	O&M, Storage &Erection instruction manual (The manuals shall clearly indicate method of installation, check-ups and tests to be carried out before commissioning of the equipment.)	For Information
x	As built &Commissioned/final document	For Information

These Drawings or any other required drawing (if any) must be got approved by Sr. DEE/G/ASN or AEE/G/ASN before inspection & supply of items. These Drawings should have proper spaces for signature of checking authority & approval authority.

Test Report:

Agree to provide all relevant documents Test Report/supporting document /reports etc. (from authorized government designated agency) to the buyer by the firm at the time of bidding or on demand.

Training: Training to be given to the minimum recommended railway staffs along with detailed circuit of electrical & electronics for further maintenance. Cost of this provision is deemed to be included in the scope of this work.

Documentation:

Detailed technical manuals, handbooks, warranty card and factory quality assurance checklist, test results and any other certifications, if any, shall be supplied along with the consignment.

Supplied manuals/handbooks must cover detailed technical specifications and installation, operation, maintenance and system safety procedures.

The receipts for taxes paid, if any, for the supplied equipment should also be submitted.

Any other relevant documents, instructional manual, specifications or data necessary for satisfactory installation, operation and maintenance to be submitted as & when required.

INSPECTION OF SITE: These technical details / general specifications are indicative only. The tenderer is advised to examine the areas to be covered under the scope of the work, so that the tenderer can have a clear concept of sites for meeting the requirements. Place, time, and quantity may be changed at the time of execution of the work as per prevailing site condition. Tenderer shall contact **Sr. SE/Elect/G/ASN** for visiting the site.

The description of scheduled item is indicative. Entire Electrical Work is to be done in line of relevant RDSO's **Guideline for Fire Suppression Systems in Escalator/Lift Control Panels, LT Panels, HVAC**

panel and CSS (Compact Substation) at Indian Railway or IS/IEC or PCEE/ER's specification & design, **Electrical General Service Manual ,Volume-I (Power Supply) & latest** or OEM Standardisation or equivalent international standard for detail technical specification and all other clauses, terms & conditions for design, manufacture, testing, supply, installation and commissioning followed by statutory rules and common prudence and shall confirm to the rules & regulations of Railways.**The decision of Railway Administration over the standardisation & make for execution of the work will be final.**

The eligible contractor must furnish the detail of material which is proposed to be supplied or used inevitably got approved from Sr.DEE(G)/ASN or Sr.SE/Elect/G- the Supervision-in-charge of the work or authorized representative of Sr. SE/Elect/G before commencement of work. Decision of Railway administration over the standardisation & make of all the material for the items of work schedule will be final.

PUBLIC PROCUREMENT POLICY (MAKE IN INDIA):Bidder must follow Public Procurement Policy (Make in India) Order 2017, dated 15/06/2017, issued by Department of Industrial Promotion and Policy, Ministry of Commerce, circulated vide Railway Board letter no. 2015/RS(G)/779/5 dated 03/08/2017 and 27/12/2017.The definition and calculation of local content in accordance with the Make in India policy as approved by PCEE/ER is 50% of Minimum Local Content (MLC).

NOTE:-

These technical details / general specifications are indicative only. In case of any ambiguity in the General specification or Technical Details it may be collected from Sr. DEE (G)/Asansol's office if required. All items pertaining to Electrical should confirm to relevant IS or equivalent international standard. Any deviation must be got approved by Sr.DEE/G/ASN.

Any typographical error shall not be construed to be benefit of the Contractor; In all cases the interpretation and decision of Sr.DEE/G/ASN shall be final and binding upon the contractor.

The issues not covered under these tender documents shall be governed by General Conditions of Contract April-2022 or its time to time latest amendments if any.

**Sr. Divl. Electrical Engineer (Genl.)
Eastern Railway, Asansol**

Annexure-T

Format for Data Sheet of Transformer:(to be filled up and submitted by the successful bidder)

Sl	Particulars	Parameter
1	NAME OF THE MANUFACTURER	
2	RATED KVA	
3	NO LOAD VOLTAGE RATIO	
4	VECTOR GROUP REFERENCE	
5	NO LOAD LOSSES AT RATED VOLTAGE *	
6	LOAD LOSSES AT RATED CURRENT AT 75° C *	
7	RESISTANCE VOLTAGE AT RATED KVA, 75 °C AND 50 Hz. *	
8	REACTANCE VOLTAGE AT RATED KVA, 75°C AND 50 Hz. *	
9	IMPEDANCE VOLTAGE AT RATED KVA, 75° C AND 50 Hz. *	
10	RESISTANCE OF WINDINGS AT 75° C	HV PER PHASE
		LV PER PHASE
11	ZERO PHASE SEQUENCE IMPEDANCE (ESTIMATED)	
12	EFFICIENCY (AT 75°C) AT FULL LOAD	1.0 P.F
		0.8 P.F. (LAG)
13	EXCITING CURRENT REFERRED TO PRIMARY 50 Hz.	
	a) 90% RATED VOLTAGE	
	b) 100% RATED VOLTAGE (NO LOAD CURRENT)	
	c) 110% RATED VOLTAGE	
14	MAGNETISING INRUSH CURRENT (peak) UNDER CONDITIONS OF RESIDUAL MAGNETISM & INSTANT OF SWITCHING (ESTIMATED) * INDICATES GUARANTEED PERFORMANCE PARTICULARS	
15	SYMMETRICAL SHORT CIRCUIT CURRENT (ASSUME INFINITE SOURCE)	
16	TIME OF WISTAND WITHOUT INJURY UNDER MAX. SYMM. SHORT CIRCUIT CONDITION	
17	THERMAL TIME CONSTANT	
18	CURRENT DENSITY AT RATED LOAD	HV WINDING
		LV WINDING
19	TYPE OF COOLING	
20	MAX. FLUX DENSITY IN CORE AT RATED VOLTAGE	
21	TOTAL WEIGHT WITH DRY AND ACCESSORIES	
22	WEIGHT OF CORE AND WINDINGS	
23	IMPULSE LEVELS WITH 1.2 /50 MICROSECOND WAVE FORM	HIGH VOLTAGE
		LOW VOLTAGE
24	DETAILS OF FITTINGS AND ACCESSORIES MAKE, TYPE REF	MAGNETIC DRY LEVEL GUAGE
		BUCHHOLZ RELAY
		DIAL THERMOMETER FOR WINDING TEMPERATURE
	TEMPERATURE RISE OF WINDINGS	

*Indicates Guaranteed Performance Particulars.