TECHNICAL CONDITIONS OF CONTRACT (TCC)

NAME OF WORK: SUPPLY OF 8 NOS. 11/0.415 kV, 500kVA PACKAGE SUB-STATION (PSS) FOR 1X660MW, UNIT#6 AMARKANTAK PROJECT, M.P.

BHARAT HEAVY ELECTRICALS LIMITED

TECHNICAL CONDITIONS OF CONTRACT (TCC)
CONTENTS

S. N.	Item Description	Quantity	UoM
1.	**SUPPLY OF 11/0.415 kV, 500kVA PACKAGE SUB-STATION (PSS) FOR 1X660MW, UNIT#6 AMARKANTAK PROJECT, M.P.** **Detail specification as per below.**	**8**	**No.**

Note: Vendor to quote Unit Rate (Per Package Sub Station) inclusive of GST on FOR Destination basis to BHEL Amarkantak site, M.P. including Supervision of commissioning charges.

Contract Specific Details-

1.0 PROJECT INFORMATION

The proposed site is located at Amarkantak Thermal Power Station Chachai Dist Anuppur Madhya Pradesh.

S. No.	Description	Details
1	Site Location	Amarkantak Thermal Power Station, Chachai, Dist. Anuppur, Madhya Pradesh
2	Latitude	23°10'04" N
3	Longitude	81°39'15" E
4	Place	Chachai Village
5	District	Anuppur
6	Nearest Railway Station	Anuppur (10 km)
7	Nearest Airport	Jabalpur Airport (approx. 220 km)
8	Nearest Road	NH-78 (Katni–Gumla) – 10 km

Note: - The bidder is advised to visit and examine the site of WORKS and its surroundings and obtain for himself on his own responsibility all information that may be necessary for preparing the bid and entering into the CONTRACT. All costs for and associated with site visits shall be borne by the bidder.

2.0 SCOPE OF WORK:

- The Package Substation shall be of modular type construction, housed in a single enclosure consisting of One No. of HT Breaker with VCB, Two Nos. of Load Break switch for One Incomer and One Outgoing for the part of ring main supply system (Loop IN & Loop Out system), and all other metering and protection, One No. 11kV/433V Copper Wound Dry type Transformer (Dyn11) with accessories and LT Distribution Board etc. with their accessories as detailed in the enclosed specification with all protections like over current, earth fault and under voltage etc.
- The sub-station should be suitable for outdoor application, compact and easily transportable and installable. The substation shall have minimum maintenance requirement with no accidental access to live parts and fully complied with all statutory requirements. Bus-bar of LV side from transformer to LT panel I/C should be provided with insulation sleeve.
- The package substation shall be metal clad housing fabricated out of:

  CRCA sheet steel of min 3mm thickness for outer enclosure and minimum 2mm for the rest (base thickness should be suitable for lifting the Package Substation with all its parts as a single entity)

  OR

  GI sheet with overall enclosure thickness of minimum 2mm and base of ISMC 150 having thickness of minimum 4mm.
- Sub-station shall have suitable mechanical strength for lifting arrangement. PSS should have foundation frame suitable for the gross weight with grouting arrangement as per relevant IS: and foundation bolts should be provided with each PSS. Foundation frame for the equipment should suitable to take equipment load which are to be installed in the Enclosure.
- If CRCA sheet steel is provided then all CRCA sheet metal components shall undergo rigorous seven tank process (degreasing, degusting, phosphate and sealing). Painting shall be of epoxy powder coating to shade RAL 7032 (Siemens Grey) and shall be weather proof type.
- Selection of HT/LT Board and Transformer components rating shall be as per enclosed specifications.

SYSTEM REQUIREMENTS	
System HT:	11kV, 3 Phase, 3 wire, 50Hz
System LT:	433V, 3 Phase, 4 wire, 50Hz
Installation:	Outdoor
Transformer:	500kVA rating Dyn11 (Dry type)
Interconnection of HT Panels and Transformer:	Epoxy encapsulated copper bus bar **OR** Copper cable of suitable rating shall be provided. The busbar shall have protective sleeve (heat shrinkable type). Clearances between Phases should maintained as per IS
LT Busbar	Aluminium (E91E or higher) **OR** Copper Busbar of suitable rating for interconnection of Transformer and LT Panel Incomer and Earthing.

Detailed Specification, Technical and other requirement of PSS are indicative and equipment should be supplied as per relevant IS/IEC/British standards. This TCC covers most of the requirement, if any clarification in any case, bidder shall contact the Purchaser. The Equipment wise general information is as follows:

2.1 HT SWITCHGEAR:

a) The switchgear shall be a part of package sub-station (PSS) and which in turn is part of ring main supply system of 11kV, 3 phases, 50Hz solidly earthed neutral system. Highest system voltage will be 12kV. The switch gear shall consist of Vacuum Circuit Breaker, Load break Switch (2 Nos. for Loop IN Loop Out), Protective relays (Numerical), Volt meter with selector switch, Ammeter with selector switch, CTs, PTs, Multifunction Meter, Indicating Lamps, On/Off Push Button, Power Pack for DC & emergency light.

b) The HT switchgear could be SF6 insulated Ring Main Unit with one VCB and two isolators for Loop IN and Loop Out.

c) 11 kV Breaker Compartment should be aligned leveled inside the enclosure of PSS. Vibration pads are to be provided to avoid looseness.

d) Power Pack of required rating to be built in from 230 V AC to 110 V DC/or as required for supply of DC coil. Even if the relay is self-powered power pack shall be required in line with 2.1.1 (g).

e) Instrument transformer (PTs, CTs), control wiring should be dressed by putting PVC channel with cover, CT wiring coming to Terminal Block should be suitable for ring type lugs arrangement to avoid looseness of CT wiring.

f) All doors/ covers should be air tight with neoprene rubber gasket for dust free enclosure.

g) Mechanical Hand trip lever should be provided outside of the Breaker Cabinet.

h) Emergency Trip Push button should be Outside of the PSS enclosure. It is required as a security measure for tripping the VCB without any delay.

i) HT breaker cabinet sheet steel shall be of minimum 2mm thickness for partition between sections and 2mm for partition between different panels of HT Switchgear.

2.1.1 Vacuum Circuit Breaker (11 kV):

a) The circuit breaker shall be a three pole vacuum circuit breaker with spring charging operating mechanism. Plug in isolating contacts and 4NO+4NC auxiliary contacts all mounted on a fixed / withdraw-able carriage.

b) The air clearance between phases and between phase to earth at the breaker incoming and outgoing terminals shall not be less than those indicated in the IS/IEC/British standards, corresponding to the basic insulation level of the circuit breaker as indicated in the criteria.

c) The temperature of the breaker contacts/terminals while carrying the rated continuous or the rated short circuit current of rated duration shall not exceed 40°C over ambient of 50°C. Further to minimize burning and pitting of contacts, all parts exposed to the arc created by current interruption shall be protected by special arc resistance material.

d) The circuit breaker shall be designed such that the peak short circuit current (i.e. 2.5 times the RMS short circuit current) specified can be interrupted without causing appreciable damage to main contacts.

e) The arc extinguishing chambers and the contact assembly shall be enclosed in an insulating tube made of FRP/tough glass/ceramic or other suitable arc resistant material with sufficient strength to withstand the internal pressure/forces developed while clearing rated short circuit current.

f) Surge Arrestor shall be provided wherever necessary.

g) 110V DC/as per design for operation of the Circuit Breaker and protection relays shall be taken from power pack (110V DC/as per design). This is to ensure the operation of breaker in case of power supply failure (at least 2 open and 2 close operations.)

h) Circuit Breakers shall have spring charging mechanism through electrical motor for normal operation and manual charging during power failure after exhausting the backup from the power pack.

i) Circuit Breakers shall be provided with spring charged, manually & electrically independent shunt trip for closing and series trip for opening.

j) Trip coil shall operate satisfactorily between 70% and 110% of rated voltage.

k) The closing and tripping circuits shall be self-opening on completion of their respective functions irrespective of position of the breaker ON/OFF switch.

l) A readily identifiable mechanical emergency trip device as well as provision for manual charging of spring through the cubicle door shall be provided for each breaker.

m) In case of circuit breakers with more than one operating spring, they shall be so interlocked such that the springs are charged to the same extent and the breaker can be closed only if all the springs are charged to the required values. Further in case of multiple pole/phase breakers equal current sharing between poles shall be ensured by means of current balance schemes.

n) In order to ensure the reliability and long operating life of the mechanism, the mechanism shall be light, with a high mechanical strength and abrasion resistance to avoid high rate of wear and tear and with few components. The number of components in the breaker and operating mechanism shall be kept to a minimum and they shall be designed to be free of undue stresses during normal or short circuit operations. Further they shall ensure a high frequency of operations indicated in technical particulars. All the moving parts of the mechanism requiring inspection, maintenance and lubrication shall be easily accessible.

o) Operation counter shall be provided on the breaker for recording number of ON/OFF operations.

p) A visual ON/OFF indication and spring charged indication shall be provided positively coupled to the operating mechanism and visible from front with the cubicle closed doors. Indications shall be provided for limit switches for spring charged and discharged condition. The mechanism shall be trip free as per IEC.

q) Door opening of Transformer Compartment, 11 kV Breaker should be provided with tripping the Power supply.

r) Each circuit breaker shall have 4NO+4NC of auxiliary contacts to control circuit changes for indication, protection, interlocking, supervision, metering and others.

s) Breaker auxiliary contacts available in test and service position and those available in service position only shall be clearly indicated.

t) Normally open and normally closed contacts shall be interchangeable at site.

u) All auxiliary contacts shall be positively operated by the main apparatus and all contacts shall be adequate to make, carry and interrupt the currents in the circuits.

v) Emergency push button to trip the VCB shall be provided outside the enclosure with the Ingress Protection of the enclosure applicable on the enclosure. An auxiliary terminal shall house the terminal blocks to receive the following external inputs from:

- Winding temperature indicator/alarm.
- 240V, single phase, 50Hz supply for panel's illumination.
- Separate terminal blocks shall be provided for control and power.

2.1.2 11kV Load Break Switch

a) HT load break switches are intended to connect and disconnect from the 11kV ring main system and shall be installed in the enclosure of PSS. Mounting should be properly aligned and leveled with suitable anti vibrating pads.

b) The load break switch shall be fault make, load break type. The load break switch shall have rated current, fault making capacity, short time thermal rating, dynamic through fault withstand capability as specified in the design criteria without HRC fuses in the circuit.

c) Load break switch shall be air break type in fixed design or SF6 Insulated.

d) The load break switch shall have quick make, quick break independent manual operating mechanism with mechanical ON/OFF indication.

e) It shall not be possible to open the cable door with load break switch ON.

f) 4NO+4NC auxiliary contacts rated to make and break 5A at 110V AC shall be provided.

2.2 DRY TYPE RESIN CAST TRANSFORMER

2.2.1 General

The transformer shall be 500kVA, 11/0.433kV, 3Φ, two winding, AN, Dyn11 transformer suitable for indoor installation with ±5% off circuit tap changer in steps of 2.5% as per technical specifications/IS: 2026 with all fittings and accessories enclosed. The transformer is fed from the HT switchgear by using Copper Bus bar or Copper Cable of suitable rating with HT heat shrink sleeve. On the LT side also, it is connected to LT switchboard through bus bar {Aluminium (E91E or higher) or copper}. Protective insulation sleeves to be provided on Copper/Aluminium Bus Bars. Alignment, leveling and Anti-Vibration Pads to be provided between foundation and Base Frame.

2.2.2 Transformer Rating and Overloading

a) The transformer shall be capable of delivering the rated current at a voltage equal to 105% of the rated voltage without exceeding the temperature limits.

b) Transformer shall operate satisfactorily without injuries heating at rated kVA, at any voltage within ±10% of rated voltage of the particular tap.

c) Transformers shall be designed for 50Hz +3%, -5%, unless otherwise specified in data sheet.

d) Transformers for two or more limits of voltage or frequency or both shall operate satisfactorily at its rated kVA without injuries heating under all the rated conditions of voltage or frequency or both, provided increase in voltage is not accompanied by decrease in frequency.

e) Overloading of Transformer shall be as per relevant IS/IEC-60076 Part-12. Off circuit tap switch, terminal bushings, other auxiliary components/equipment shall be designed for maximum permissible overloading.

2.2.3 Short Circuit withstand capability

a) Transformers shall be capable of withstanding thermal and mechanical stresses during 3Φ, line to line, double line to earth and line to ground dead short circuits at the transformer terminals, for a period specified, without any injury. Temperature of the windings prior to the short circuit to be considered for this shall be that corresponding to the maximum permissible value applicable to the overloading cycle specified.

b) For this purpose, infinite supply system and solidly earthed systems shall be considered.

2.2.4 Flux Density

a) The maximum flux density in any part of the core and yokes at normal voltage and frequency shall be such that the flux density under over voltage condition shall not exceed the maximum permissible values for the type of laminations used and the core construction adopted.

b) In case of transformers with variable flux, the voltage variation, which would affect flux density at every tap, shall be kept in view while designing the transformer.

c) Transformers shall be designed to withstand 110% of maximum density which is continuous for all transformers corresponding to rated voltage.

2.2.5 Magnetic Circuit

a) The cores shall be constructed from high grade, low loss, high permeability cold rolled non-ageing grain oriented silicon steel laminations.

b) Thickness of laminations shall be 0.3mm or less. Surface insulation of laminations shall be rust resistant and have high inter-laminar resistance. Insulation shall withstand annealing temperature as high as 850°C. The insulation shall be resistant to the action of hot cooling medium.

c) The insulation structure for the core to bolts and core to clamp plates shall be such as to withstand a voltage of 2000V AC for one minute.

d) Wherever the CRGO sheets are punched or sheared into laminations, laminations shall be annealed in a non-oxidizing atmosphere to relieve stresses and restore the original magnetic properties of CRGO sheets. The laminations shall be free of all burrs and sharp projections.

e) The design of magnetic circuit shall be such as to avoid static discharges, development of short circuit paths within itself or to the earthed clamping structure and production of flux components at right angles to the plane of the laminations which may cause local heating.

f) Ensured to comply relevant IS/IEC to meet the performance and comply with the requirement of electrical inspectorate authority of the state/ CEA.

2.2.6 Windings

a) Transformers shall be suitable for solidly earthed neutral system.

b) The coil clamping arrangement and the finished dimensions of any ducts shall be such as to not impede the free circulation of cooling media through the ducts.

c) The windings and connection of transformer shall be braced to withstand shocks, which may occur during transport or due to short circuits, repeated peak loads and other transient conditions during service.

d) Windings shall be subjected to a shrinkage treatment before final assembly, so that no further shrinkage occurs during service. Adjustable device shall be provided for taking up any possible shrinkage of coils in service if required.

e) The conductors shall be transposed at sufficient intervals in order to minimize eddy currents and equalize the distribution of currents and temperature along the windings.

f) Coil clamping rings shall be of steel or of a suitable insulating material. Axially laminated material other than bakelite paper shall not be used.

g) Completed core and winding assembly shall be dried in full vacuum to eliminate presence of moisture. After drying process, the full assembly shall be impregnated immediately.

h) No strip conductor, wound on edge shall have a width exceeding six times its thickness.

i) The winding material shall be copper.

j) Windings shall not have sharp bends, which might damage insulation and/or produce high dielectric stresses.

k) Coils shall be supported using dried and high-pressure compressed wedged type insulation spacers at frequent intervals.

l) All threaded connections shall be locked. Leads from the winding to the terminal board and bushings shall be rigidly supported to prevent injury during short circuits/vibration.

m) Permanent current carrying joints in the windings and lead shall be welded or brazed.

n) Clamping bolts/Nuts (HT Cadmium Coated) for current carrying parts inside the transformer shall be compatible with liquid under all service conditions.

2.2.7 Tapping's

a) Tapping as specified shall be provided on the higher voltage winding of each transformer and shall be arranged so as to maintain as far as possible the electromagnetic of the windings.

b) The taps shall be changed by links.

2.2.8 Temperature Measurement

a) Winding temperature shall be monitored with RTDs. The RTD leads shall be brought out and connected to temperature scanner.

b) Each scanner shall have potential free normally open contacts for alarm and trip contacts. Temperature setting of each contact shall be independently adjustable at site. A manual reset type maximum temperature indicator shall be provided for each scanner.

c) All contacts shall be rated to make 0.5A (min) and break 0.2A (min) at 110V AC. All contacts shall be wired to marshalling box.

2.2.9 Internal Earthing Arrangements

a) All metal parts of the transformer with the exception of individual core laminations core bolts and associated individual clamping plates shall be earthed internally with suitable breaded copper flexible with proper lugs.

2.2.10 Tests

a) All the transformers shall be subjected to the following routine test and on transformer shall be type tested at the manufacturer's work area. Test procedure as per IS: 2026 or as per relevant IS shall be adopted.

2.2.10.1 Routine Tests

- Transformer shall be fully assembled with all fittings and accessories including wheels to ascertain that all the parts fit correctly.
- Resistance of each phase winding at principal tap and at all other taps.
- Voltage ratio at all taps.
- Checking of voltage vector relationship.
- Impedance voltage at rated frequency and principal tap, lowest and highest taps.
- Load loss at rated current.
- Zero sequence impedance at principal tap, rated frequency.
- No load loss and no load current at rated frequency and 100%, 110% of rated voltage on HV side. Test shall be repeated with 415V, 3Φ supply connected to LV side (if the LV side rated voltage is more than 415V). No load & load losses shall be as per CBIP/IS with tolerance.
- One minute power frequency withstand voltage test.
- Induced over voltage withstand test.

- Polarity check, ratio check, measurement of secondary winding resistance, excitation, characteristic curve, insulation resistance of all bushing CTs.
- Calibration of winding temperature indicators.

2.2.10.2 Type Test

- The contractor shall submit type test certificates for similar (250kVA or higher capacity) dry type transformer supplied by him elsewhere for:
    - Short time withstand capacity test
    - Impulse voltage withstand test.
    - Temperature rise test.
- In case type test certificates for similar equipment are not available the same will be conducted in the presence of the Purchaser or his representative if purchaser so desires without any financial implications to the purchaser.

2.2.11 Additional Requirements

a) Fluorescent lamps for sufficient illumination shall be provided and for that power supply shall be provided from LT side of sub-station.

b) DC Fluorescent lamps for emergency lighting shall be provided.

2.3 LT SECTION

a) LT cubicles shall consist of 1 No. 415V, 50kA 3 pole ACB of suitable rating with shunt trip release, auxiliary contacts, manual operated type with in-built overload and short circuit releases (magnetic-thermal releases) along with all associated accessories for incomer to LT Distribution Board.

b) Necessary Bus bar interconnections for LT panel with secondary terminals of the transformer.

c) 3 No. indicating lamps (RYB) with necessary fuses and toggle switches, 1 No. 0-500V voltmeter with selector switch and ammeter with selector switch of suitable rating with matching CTs along with necessary interconnections with suitable size PVC insulated multi-strand copper conductor cable.

d) Energy meter shall be provided.

e) Outgoing feeders are mentioned in attached PSS SLD.

f) The distribution board is intended to provide power supply feeders to various LT distribution boards and to feed various contractors LT boards as shown in scheme.

g) The board has MCCB as outgoing feeders.

h) The Board shall be of metal clad single bus bar, fully compartmentalized.

i) The incomer and the associated items shall be housed in a partitioned panel, whereas the rest of the outgoing feeders shall be neatly distributed and compartmentally modular construction need to be adopted. However, it shall be ensured that sufficient working clearance and adequate space for cabling is provided.

j) LT side instrument transformers, indicating instruments, control circuits, control wiring and ferrules, inscription shall be as per the specification indicated under HT switchgear.

k) The rated continuous current of the equipment and components shall be as given in the schemes. These ratings shall be obtained with the components mounted in their housing as in service without exceeding the permissible temperature rise.

l) Defeat interlock shall be provided for the units comprising of switch or molded case circuit breaker as a means of isolation device, such that it is possible to open the door with device ON. It shall not be possible to close the door till the interlock has been reinstated.

m) LT side shall be fitted with a fluorescent lamp.
n) Bottom of LT board shall have removable gland plates in two pieces to accommodate minimum 16 runs of LT Armoured cable for 500kVA PSS, size varying from 120 sq. mm to 300 sq. mm.
o) Earth fault relay should be provided.

2.3.1 LT Circuit Breaker (ACB)

a) The breaker which is provided in incomer shall be of triple pole, air break and of non-drawout type. All current carrying contacts or the breaker shall be silver plated. The main contacts shall have ample area and contact pressure for carrying the rated current of the circuit breaker. Arc chute shall be provided on each pole and so fitted that it can be easily removed for inspection of the main contacts. Aux. supply required for control circuit shall be AC 220 V if DC is required DC Power Pack is to be supplied along with breaker.
b) The breaker shall have independent manual spring charged store energy mechanism. The operating mechanism shall be trip free and designed to reduce mechanical shocks to a minimum during operation. The operating mechanism shall operate normally even when the circuit breaker is closed on to fault.
c) All mechanism shall be designed to give trouble free service over extended periods and shall not deteriorate with normal usage, require attention more often than every 1000 operations of once a year whichever is earlier. Each breaker shall be equipped with mechanical "ON", "OFF" indications visible from the front of the panel.
d) ACB shall be provided with earth fault, earth leakage and over current protections.
e) ACB shall be of triple pole construction arranged for simultaneous three pole manual closing and opening and for automatic tripping at short circuit and overload. Neutral link shall be provided for Kiosks.
f) Operating mechanism shall be quick make, quick break and trip free system.
g) The ON, OFF & TRIP positions of the ACB shall be clearly indicated so as to be visible to the operator when mounted as in service. Operating handle shall be provided in front of the Kiosk.
h) ACB shall be capable of withstanding the thermal stresses caused by overloads and short circuits. The maximum tripping time under short circuit shall not exceed 20 milli-seconds. Rated breaking capacity (RMS) at 415V is 10kA. Rated making current (peak) is 21kA.
i) ACB terminals shall be shrouded and designed to receive cable lugs for cable sizes relevant to circuit ratings.
j) Mounting of ACB Compartment should be properly aligned, leveled and anti-vibration pad to be provided

2.3.2 Modular Case Circuit Breakers (MCCB)

a) Modular case circuit breakers (MCCBs) shall be provided for use in lieu of switch fuse for Kiosk incomer.
b) MCCBS shall be of triple pole construction arranged from simultaneous three pole manual closing & opening and for automatic tripping at short circuit and overload. Neutral link shall be provided for kiosks.
c) Operating mechanism shall be quick make, quick break and trip free system.
d) The ON, OFF & TRIP positions of the MCCBs shall be clearly indicated so as to be visible to the operator when mounted as in service. Operating handle shall be provided on front of the kiosk.

e) MCCBs shall be capable of withstanding the thermal stresses caused by overloads and short circuits. The maximum tripping time under short circuit shall not exceed 20 milli-seconds. Rated breaking capacity (RMS) at 415V is 10kA. Rated maximum current (peak) is 21kA.
f) MCCBs terminals shall be shrouded and designed to receive cable lugs for cable sizes relevant to circuit ratings.

2.3.3 Bus Bar and Connections

a) Bus bars shall be made of E91E grade aluminium alloy in LT Kiosk, cross section of bus bars selected shall ensure the thermal rating and dynamic stability for the short circuit rating specified.
b) High tensile cadmium plated bolts with suitable spring washers shall be used as bus bar joints.
c) Bus bars shall have protective sleeve with heat shrunk insulation. Wire mesh shall be provided wherever necessary to prevent in advert touching of bus bars.
d) Bus bars shall be supported on non-hygroscopic and non-inflammable insulators of material such as glass reinforced moulded plastic material, epoxy cast resin etc. Separate supports shall be provided for each phase of the bus bars. Insulation level of neutral bus bar shall be same as that of phase bus bars.
e) Bus bars shall be contained in a separate vermin-proof compartment within the kiosk and shall have bolted sheet steel covers for providing suitable access.
f) Bus bar clearances in the air shall be as per applicable standard for 500V, 3 phase system.
g) Temperature for bus bars, droppers and connections shall not exceed 90°C for an ambient of 50°C while carrying maximum continuous current.
h) The bus bar, bus bar connections and supports shall have sufficient strength to withstand thermal and electromechanical stresses produced by the specified short circuit level of the system.
i) Bus bars shall be capable of carrying the short time current. The duration of short time current shall be 1 sec. For the specified current and duration, there shall be no damage to the equipment.
j) Main bus bars and connections shall be prominently marked and displaced for standard sequence counting from rear to front, top to bottom, or left to right as viewed from the switching device operating mechanism side.
k) Bus bars and connections shall be provided with colour coded PVC sleeves. All live parts shall be properly shrouded with insulating material.
l) Earth bus bar shall be provided separately. Material of earth bus bar shall be Aluminium (E91E or higher) OR Copper Busbar of suitable rating.

2.4 OTHER

2.4.1 Enclosure

a) The Enclosure shall be suitable for outdoor application with the following minimum level of Ingress Protection:
HT Switchgear Compartment: IP54 minimum
Transformer Compartment: IP23 minimum
LT Switchgear: IP54 minimum
b) The package substation shall be metal clad housing fabricated out of:

CRCA sheet steel of min 3mm thickness for outer enclosure and minimum 2mm for the rest (base thickness should be suitable for lifting the Package Substation with all its parts as a single entity)

OR

GI sheet with overall enclosure thickness of minimum 2mm and base of ISMC 150 having thickness of minimum 4mm.

c) Sub-station shall have suitable mechanical strength for lifting arrangement. PSS should have foundation frame suitable for the gross weight with grouting arrangement as per relevant IS: and foundation bolts should be provided with each PSS. Foundation frame for the equipment should be suitable to take equipment load which are to be installed in the Enclosure.
d) Electrical continuity between all metal parts not alive and the earth terminals of the unit shall be ensure. Internal body earthing should be ensuring with copper breaded conductor with insulation as per required rating and IS.
e) Insulated partition shall be provided for Bus bars, CTs, PTs, outgoing cables & circuit breaker, relays and controls. Wire mesh shall be provided wherever necessary to prevent in advert touching of bus bars.
f) Hinged doors shall be provided for accessing the switchgear section. Three point locking arrangement with single operating handle shall be provided for all hinged doors. Hinge locks, lock covers etc. shall be fabricated from anti-corrosive material. The hinges shall be sturdy and robust. The doors shall be provided with additional members for strengthening to avoid any warping/bending and locking arrangement.
g) Panel lighting should be provided at the Front and Rear portion of the compartment.
h) Cubicles will be exposed to high winds, dust and rain. Neoprene gaskets of high quality shall be used. The top cover of enclosure shall have necessary slope to avoid stagnation of rain water.
i) Base frame shall be of sufficient thickness and tar painted to give corrosion resistance even if water accumulation is there.
j) All mechanical indications of breaker/LBS, operation shall be visible from outside. Suitable transparent cover shall be provided on the front door of compact unit.
k) Emergency push buttons shall be accessible from outside.
l) Safety shutters to cover live part to prevent accidental contact and explosion vents to release the gases during fault occurrences shall be provided.
m) Lifting lugs, base frame of adequate thickness, foundation bolts of min 19mm dia with suitable washers shall be provided. Lifting guides shall be provided at the top to prevent touching of wire ropes with body of unit while lifting the compact sub-station.

2.4.2 Instrument Transformers

2.4.2.1 Current Transformer (CT)

a) Separate cores shall be used for metering and protection either with dual core CT or two single core CTs.
b) All current transformers shall be designed to have over current factors to withstand the fault currents of the associated system as applicable to the switchboard.
c) Current transformers used for protection shall have an accuracy limit factor of not less than 10. Those used for metering shall have a saturation factor of 2.
d) All current transformers shall have 5A/1A secondary and shall be of resin cast with bar primary.
e) Polarity of primary and secondary of all the CTs shall be clearly marked.

2.4.2.2 Voltage Transformer (PT)

a) Voltage transformer shall be built up of CRGO electrical steel. The voltage transformers shall be resin cast dry type. The PTs shall be 3 nos. of single-phase type of suitable ratio and burden.

b) HT side and LT side of PTs shall be protected by HRC fuses. LT terminals shall be terminated on separate power terminal block located in the same panel.

2.4.3 Numerical Relays

a) All relays specified shall be flush mounted in dust proof cases and shall match the appearance of the instruments mounted on the same panel. Each relay shall be identified with relay number indicated in the approved control scheme.

b) Protective relays shall be of easy drawable/fixed type. Trip circuits shall be automatically broken and current transformer secondary circuits shorted, when a relay is withdrawn from its case. A marking strip shall be provided in front of each terminal block and diagram plate at the back of each case to identify connections.

c) Relay contacts shall withstand repeated operation and shall make or break the maximum currents in their circuit without deteriorating. All spare contacts shall also be wired up to the external terminals.

d) Relay coils shall carry their normal currents indefinitely and such currents as can occur under fault conditions. Relay mechanism shall not be affected by vibration or external magnetic fields, which may occur in normal operation.

e) All relays in tripping circuits shall have mechanically operated flag indicators. Indicators: mechanical or electrical shall also be provided on other relays to identify type of fault that may have occurred.

f) Indicators shall be capable of being reset without opening the relay case. It shall not be possible to operate the relay by hand or to alter its setting, without opening the case.

g) All relays shall operate satisfactorily from 70% to 110% of rated voltage.

2.4.4 Selector Switches

a) The rating and other features of the switches shall be suitable for the applications. The number of positions and the number of contacts required for each switch shall be as indicated in the schemes enclosed.

b) Selector switches shall be stay put type, provided with properly designated escutcheon plates clearly marked to show operating position.

c) Terminals carrying potential above 120V shall be shrouded to prevent accidental contact with personnel.

d) Ammeter selector switches shall have make before contacts.

e) The switches shall be suitable for semi-flush mounting with the front plate and operating handle projecting out. All connections to the switches shall be from the back.

f) The arrangement for front mounting of these devices shall be such as to make them reasonably dust free so as not to interfere with normal operation.

2.4.5 Indicating Instruments

a) All indicating instruments shall conform to IS: 1248 and integrating meters to IS: 722.

b) Indicating instruments shall be of size 96 x 96 mm and shall conform to 1.0 accuracy class. Meters shall be suitable to PT secondary of 110V (line) and CT secondary of 5A/1A. Scales shall be suitably provided depending on the ratio of instrument transformer. All indicating instruments shall have non-reflecting bezels, clearly divided and legibly marked scales and sharply outline pointers. They shall be provided with zero adjusting devices for external operation. Indicating instruments shall be taut band type.

c) One no. static type, class 1.0 accuracy energy meter shall be provided.

2.4.6 Indicating Lamps

a) Indicating lamps shall be complete with lens covers and holders (R, Y, B for Phase & ON=Green, Off-Red)

b) Each lamp shall be fitted with a durable resistance integrally wired in series within the lamp. Alternatively, lamps with built in transformers are acceptable.

c) The lamp cover (lens) shall be translucent.

d) Bulbs and covers shall be interchangeable, easily replaceable from the front without the need for any special means.

e) Terminals having potential above 120V shall be shrouded to prevent contact with personnel.

2.4.7 Terminals

a) Terminals shall be stud type of copper material.

b) Terminals shall be provided with transparent cover(s).

c) Separate terminals shall be available for each termination of loop-in and loop-out power connections.

d) Terminals shall be suitable for ring type copper cable lugs of size depending upon the circuit rating.

e) CT terminals shall be suitable for ring type lugs.

2.4.8 Control Circuits

a) Control switches shall be suitable for use in AC circuits up to 440V and rating of 5A.

b) All incoming control and power circuits shall be fed through isolating ON/OFF rotary switch and HRC fuses with insulating base and holder. Closing circuit, tripping and control circuit, and lamp circuit shall be segregated and protected by independent fuses.

2.4.9 Control wiring and ferrules

a) All wiring shall be carried out with 1100 volts grade core wires having multi-strand copper conductor.

b) All control circuit shall be with copper conductor having a minimum cross-sectional area of 1.5 sq. mm. The wire shall be insulated with PVC. CT wiring should be color coated (R, Y, B, N) as per the practice.

c) All control wiring shall be terminated by using eye type tinned copper lugs on to the stud type terminals. More than two wires shall not be terminated onto a single terminal.

d) All holes and tubes for wiring runs shall be bushed and shall have room for reasonable future additions. All cable runs shall clear injurious gases and heat emitted by control gear operation or shall be adequately protected from them.

e) Control cables when laid in HT bus bar chamber shall be taken through conduits. No joints or tees shall me made in wires between terminals. The wire shall be identified by numbered ferrules at each end, all in accordance with the connection diagram; equipotential terminals shall have the same ferrule numbers.

f) All ferrules shall be made of non-deteriorating materials. They shall be white except in case of warning ferrules, which shall be red. Ring type ferrules shall have the character engraved on it. The ferrules shall be firmly located in each wire so that they cannot move freely on the wire. Wiring across hinges shall be by flexible wires.

The colour code for control wiring shall be as enumerated below:	
Metering circuits:	Black

Closing, tripping, protection relays and main power supply circuits:	Red
Annunciation and indication circuits:	White

2.4.10 Inscription

a) Each unit and each component shall be clearly labeled to indicate its purpose.
b) Owner's nameplate at front and back of each cubicle shall be engraved.
c) Each component label shall include the component symbol shown on the connection or schematic diagram.
d) All components mounted inside the cubicle shall be provided with screwed inscription plate.
e) The characters to be engraved on the cubicle labels shall be furnished at later stage.

2.4.11 Earthing

a) An earth bar with adequate cross section shall be fixed preferably at the back of the switchboard. The earth bar (Inter cabinet earthing shall be done with copper breaded flexible earthing) shall be electrically continuous and shall run the full extent of each board. The earth bar shall be of same material as the bus bars and shall have minimum cross section of 300 sq. mm. Each unit shall be constructed to ensure satisfactory electrical continuity between all metal parts not intended to be alive and the earth terminal of the unit. Double earthing shall be provided to each equipment from the earth bus by suitable size of wire (or) flat.

2.4.12 Paintings

a) The switchgear unit cubicle shall be furnished with color code to be indicated at the time of drawing approval conforming to IS 5-1961/Latest. The sheet metal parts shall be subjected to following pre-treatment before final painting:
    - Degreasing
    - Pickling for complete rust removal
    - Phosphating
    - Corrosion resistant primer painting, two final coats spray painting shall be given.
    - The cubicle shall be painted with Internal-glossy white.
    - The external part of cubicle shall be painted Dark Grey.
b) The GI sheets shall be in line with IS: 2629/ IS: 277 / IS: 4759 or any other latest Indian Standard.

2.4.13 Space Heater

a) Space heater with isolating switch fuse unit shall be provided for each cubicle.

2.4.14 Labelling

a) Labels to identify all the main assemblies, sub-assemblies and components of the kiosk shall be provided.
b) Name and rating plate/marking shall be provided as required by relevant standard applicable to each component/assembly.
c) Labels shall be of two colors, three layer plastic materials with matte or semi-matte finish of the Anodized aluminum sheet.
d) Danger label shall be as per applicable standard and shall not be fixed on to removable parts.

e) All labels shall be securely fixed on to the equipment by means of self-tapping screws or other approved means.

f) Stick-on type labels of good quality and permanent mounting shall be acceptable for internally mounted components only.

2.4.15 Thickness of sheets

The sheet steel or GI sheet used shall conform to following thickness:

a) Enclosure Thickness: CRCA sheet steel of minimum 3mm **OR** GI sheet of minimum 2mm.

b) Base Thickness: ISMC 150 having thickness of minimum 4mm for GI **OR** base thickness should be suitable for lifting the Package Substation with all its parts as a single entity for CRCA sheet steel.

c) Thickness between HT Switchgear, Transformer & LT Switchgear compartments: Minimum 2mm.

d) Thickness between different panels of HT & LT Switchgear: Minimum 2mm.

e) All the thickness mentioned above are indicative and should be increased as per relevant IS/IEC to ensure normal operation without any vibration and noise problems.

2.4.16 Surface Treatment

a) All metal parts and the surfaces (exterior & interior) of equipment, unless stated otherwise in case reflectors shall be degreased by dipping in hot alkaline solution and rubbing with wire brush to remove oil & scale from them & then rinsed in water. Alternatively, they may be shot/sand blasted.

b) Parts shall be pickled by dipping in hydrochloric acid tank to remove the rust from the surfaces formed during storage of sheets and then rinsed to remove traces of the acid. The cleaning and pre-treatment of all metal parts shall be as per applicable standards.

c) All parts shall be subjected to a coat of red oxide primer paint.

d) All inside and outside surfaces of panel shall be spray painted with synthetic enamel of the shade.

e) The surfaces to be painted shall then be prepared by phosphatizing to protect them from further rusting & to create a good bond with the paint. The pre-treatment shall confirm to the applicable standard.

f) Paint thickness shall be as per applicable standard.

g) Electrostatic or powder painting shall be acceptable subject to purchaser's approval.

h) Wherever possible, finished parts shall be coated with peel able compound by spraying method to protect the finished product from scratches, greases, dirty and oily spots during handling and transportation.

2.4.17 Testing and Commissioning

a) Routine tests as per relevant IS standards to be conducted at works & site and test certificates shall be furnished.

b) All fittings, fabrications, hardware, etc. as specified shall be inspected and tested in accordance with IS recommendation. Type test certificates from National Test House or from reputed agency (including NABL accredited Labs) will be considered.

c) The testing shall be done in accordance with the applicable Indian Standards and codes of practice. The following test shall be specifically carried out for all lighting installation:

- Insulation Resistance
- Testing of earth continuity path.

- Polarity test of single phase switches.

2.4.18 Drawings and other documents

a) The following drawing shall be submitted for approval. Five Copies of approved drawings along with reproducible and soft copies in CDs shall be furnished at the time of supply of equipment for commissioning of the system. As built drawing, incorporating site modifications along with the reproducible and soft copies in CDs shall be furnished:
   - Dimensional GA drawing of switchgear indicating foundation details, cable gland plate location for each cable plan elevation of switchboard.
   - Cross sectional drawing of cubicle bus bar CTs, cubicle indicating details of busbar chamber, breaker chamber, cable chamber, cable breaker LV chambers indicating all electrical clearance between bus bars and earth, etc.
   - Front view of the switchboard indicating arrangement of relays, controls, operating heights.
   - Single line schematic diagram indicating feeder details.
   - Control schemes of each feeder/breaker with components specification.
   - Terminal plan and internal wiring drawings of all the cubicles.
   - Component specification of details.
   - Inter panel wiring drawings.
   - List of inscriptions.
   - Terminal plan and external connection diagram.

b) Operation and maintenance manuals to be provided with the supply of the system.

c) Manufacturing Quality Plan is to be submitted for getting approval from Purchaser.

2.4.19 Additional Requirements

a) Mimic: A single line diagram showing the direction of power flow shall be drawn on the front of load break switch. The mechanical operation of switch shall automatically indicate ON/OFF status of both main switch as well as the earth switch in the mimic diagram.

b) Ensure services shall be made available within week time.

c) Vendors shall submit the following only with offer for evaluation:
   - Quality Plans
   - Bill of quantity (BOQ)
   - Proposed open general arrangement (OGA) of Kiosk.

2.4.20 Packing

a) The material shall be packed as per manufacturer's standard. Packing procedures shall be to the purchaser's approval. Any major damage found during receipt / physical inspection of equipment installed in PSS should be attended by supplier. Ensure services shall be made available.

2.4.21 Guaranteed Performance Requirements

a) The vendor shall guarantee satisfactory performance of the equipment supplied under all conditions and requirement as laid down by this specification for twelve months from the date of commissioning or eighteen months from the date of receipt of material at site whichever is earlier.

2.4.22 Transportation and Insurance

a) Transportation and transit insurance shall be in the scope of Bidder.
b) Unloading of the consignment shall be in the scope of Purchaser.

2.4.23 Supervision during commissioning

a) Supervision during commissioning of PSS shall be provided by the bidder within this scope. A total of 12 PSS is in this scope. The supervision during commissioning will include one man-day of the service engineer at site per PSS at the bidder's cost.
b) The date and time will be intimated by BHEL a week in advance.
c) There will be a total of 12 man-days in a combination of not more than four times.

TECHNICAL CONDITIONS OF CONTRACT (TCC)
CHAPTER IV – LIST OF STANDARDS APPLICABLE FOR 11kV/433V PACKAGE SUBSTATION

3.0 TIME SCHEDULE

3.1 TIME SCHEDULE

Total Period for supply at site shall be within 75 days from the Date of Purchase Order.

Tentative Schedule for Completion of Package:
The Bidder has to submit drawings, documents and readiness of equipment for approval as given below:

S. No.	Description of Activity	Completion by
01	Submission of Drawings: a) 11 kV / 415 V Switch Gear GA drawing and Make details. b) Foundation detail drawing. c) Scheme drawing, d) Details of Make for Protective Devices in HT and LT Power System, MCCB. e) Aux. supply scheme. f) Power Pack details and make for DC coil voltage. g) Manufacturing Quality Plan. h) Approval for Packaging Arrangement.	Within one week from the date of Purchase Order for approval.
02	Readiness for Testing / Inspection call	7 Weeks from Date of Approved Drawing /Document.
03	Dispatch Clearances	After satisfactory inspection
04	Receipt of consignment	One week from Dispatch Clearance

3.2 Review and Monitoring

The detailed plan and progress of supply and installation of the system shall be made by the contractor and approved by BHEL. This shall be reviewed regularly and contractor shall take necessary action based up on the review and as per instruction of BHEL.

3.3 Definition of Work Completion:

The work under the scope of the contractor will be deemed to have been completed in all respect, only when all the activities, supplies and obligations under the scope of this Tender Specification are completed satisfactorily and so certified by the BHEL site in charge. The decision of BHEL shall be final and binding on the contractor.

TECHNICAL CONDITIONS OF CONTRACT (TCC)
CHAPTER IV – LIST OF STANDARDS APPLICABLE FOR 11kV/433V PACKAGE SUBSTATION

4.0 LIST OF STANDARDS APPLICABLE

S.No.	List of IS applicable	Description
1	IS: 10028: 1985 (Part-I)	Code of practice for selection of transformers
2	IS: 10028: 1981 (Part-II & III)	Code of practice for Installation and maintenance of transformers (superseding IS: 1886)
3	IS: 104: 1979: (Second Revision)	Ready mixed paint, brushing, zinc chrome, priming
4	IS: 11171: 1985	Dry type power transformers
5	IS: 1180: 1989 (Part-I,II)	Outdoor type three phase distribution transformers up to and including 100kVA 11kV
6	IS: 1248: 2003 (Part I to IX)	Electrical measuring instruments and their accessories
7	IS: 1255: 1983	Code of practice for installation and maintenance of power cables up to and including 33kV rating
8	IS: 13118: 1991	Specification for High Voltage Alternating Current Circuit Breakers
9	IS: 13234	Guide for short circuit current calculation in three phase AC systems
10	IS: 13947: 2004 (Part-V)	Low voltage switchgear and controlgear: Control circuit devices and switching elements
11	IS: 1445: 1977	Porcelain insulators for overhead lines with a nominal voltage up to and including 1000 V
12	IS: 15086: 2001 (Part-I)	Non linear resistor type gapped surge arresters for AC systems.
13	IS: 15086: 2003 (Part-III)	Artificial Pollution Testing of Surge Arresters
14	IS: 15086: 2001 (Part-V)	Surge Arresters selection and application recommendations.
15	IS: 15505: 2004	HCFC Blend- A Fire Extinguishing System
16	IS: 1554 (Part-I): 1988	PVC insulated (Heavy duty) electric cables for working voltages up to & including 1100 volts (Third Revision)
17	IS: 1554 (Part-II): 1988	PVC insulated (Heavy duty) electric cables for working voltages from 3.3kV up to & including 11kV (second Revision)
18	IS: 1866: 2000	Electrical maintenance & suervision of mineral insualting oil in equipment (Third Revision)
19	IS: 1885: 1961 (Part-I)	Fundamental Definition
20	IS: 1885: 1992 (Part-IX)	Electrotechnical Vocabulary: Electrical Relays
21	IS: 1885: 2008 (Part-X)	Electrotechnical Vocabulary Electrical power system protection
22	IS: 1885: 1966 (Part-XI)	Electrotechnical Vocabulary Electrical Measurement

23	IS: 1885: 1993 (Part-XXVIII)	Electrotechnical Vocabulary Instrutment Transformers
24	IS: 1885: 1971 (Part-XXX)	Electrotechnical Vocabulary Overhead Transmission Line and distribution of electrical energy
25	IS: 1885: 1993 (Part-XXXVIII)	Electrotechnical Vocabulary Power Transformers and Reactors
26	IS: 1885: 1993 (Part-LIV)	Electrotechnical Vocabulary Insulators
27	IS: 1885: 1993 (Part-LXXVII)	Electrotechnical Vocabulary Overhead Lines
28	IS: 1885: 1993 (Part-LXXXI)	Electrotechnical Vocabulary electrical measuring instruments
29	IS: 2026: 1977 (Part-I)	Power Transformers General
30	IS: 2026: 1977 (Part-II)	Power Transformers Temperature rise
31	IS: 2026: 1981 (Part-III)	Power transformers Insulation level and dielectric tests
32	IS: 2026: 1977 (Part-IV)	Power Transformers Terminal marking, tappings and connections.
33	IS: 2026: 1994 (Part-V)	Power Transformers/Reactor bushings minimum external clearance in air specification
34	IS: 2099: 1986	Bushings for alternating voltages above 1000 V
35	IS: 2121: 1981 (Part-I)	Conductors and earth wire accessories for overhead power lines Armour rods, binding wires and tapes for conductors
36	IS: 2121: 1981 (Part-II)	Conductors and earth wire accessories for overhead power lines Mid span joints and repair sleeves for conductors
37	IS: 2121: 1992 (Part-II)	Conductors and earth wire accessories for overhead power lines Acceessories for earth wire
38	IS: 2121: 1991 (Part-II)	Conductors and earth wire accessories for overhead power lines Non tension joints
39	IS: 2171: 1976	Portable fire extinguishers, dry powder (cartridge type)
40	IS: 2486: 1993 (Part-I)	Metal fittings of insulators for overhead power lines with nominal voltage greater than 1000V General Requirements and tests.
41	IS: 2486: 1989 (Part-II)	Insulator fittings for overhead power lines with nominal voltage greater than 1000V Dimensional requirements
42	IS: 2486: 1974 (Part-III)	Insulator fittings for overhead power lines with nominal voltage greater than 1000V Locking Devices
43	IS: 2486: 1981 (Part-IV)	Insulator fittings for overhead power lines with nominal voltage greater than 1000V Tests for Locking Devices
44	IS: 2544: 1973	Porcelain post insulators for systems with nominal voltage greater than 1000 Volts.
45	IS: 2705: 1992 (Part-I)	Current Transformers General Requirements
46	IS: 2705: 1992 (Part-II)	Current Transformers Measuring Current Trasnsformers
47	IS: 2705: 1992 (Part-III)	Current Transformers Protective Current Trasnsformers

48	IS: 2705: 1992 (Part-IV)	Current Transformers Protective Current Trasnsformers for special purpose applications.
49	IS: 3043: 1987	Code of practice for earthing
50	IS: 3156: 1992 (Part-I)	Voltage Transformers General Requirements
51	IS: 3156: 1992 (Part-II)	Voltage Transformers Measuring Voltage Transformers
52	IS: 3156: 1992 (Part-III)	Voltage Transformers Protective Voltage Transformers
53	IS: 3156: 1992 (Part-IV)	Voltage Transformers Capacitor Voltage Transformers
54	IS: 3188: 1980	Characteristics of String Insulator Units
55	IS: 3347: 1965	HV Porcelain Bushing for transformer
56	IS: 335: 1993	New Insulating Oils
57	IS: 3427: 1997	A.C. Metal Enclosed Switchgear and Controlgear for Rated Voltages Above 1 kV and Up to and Including 52 kV
58	IS: 3637: 1966	Gas operated relays
59	IS: 3639: 1966	Specification for Fittings and Accessories for Power Transformers
60	IS: 3961: 1967 (Part-I)	Recommended current ratings for cables: Part 1 Paper insulated lead sheathed cables
61	IS: 3961: 1967 (Part-II)	Recommended current ratings for cables: Part 2 PVC insulated and PVC sheathed heavy duty cables
62	IS: 3961: 1968 (Part-III)	Recommended current ratings for cables: Part 3 Rubber insulated cables
63	IS: 3961: 1968 (Part-V)	Recommended current ratings for cables: Part 5 PVC insulated light duty cables
64	IS: 398: 1996 (Part-I)	Aluminium conductors for overhead transmission purposes: Part 1 Aluminium stranded conductors
65	IS: 398: 1996 (Part-II)	Aluminium conductors for overhead transmission purposes: Part 2 Aluminium conductors, galvanized steel reinforced
66	IS: 398: 1976 (Part-III)	Aluminium conductors for overhead transmission purposes: Part 3 Aluminium conductors, aluminized steel reinforced
67	IS: 398: 1994 (Part-IV)	Aluminium conductors for overhead transmission purposes: Part 4 Aluminium alloy stranded conductors (aluminium magnesium silicon type)
68	IS: 4257: 1981 (Part-I)	Dimensions for Clamping Arrangements for Porcelain Transformer Bushings - Part 1 : For 12 kV to 52 kV Bushings
69	IS: 6262: 1971	Method of Test for Power Factor and Dielectric Constant of Electrical Insulating Liquids
70	IS: 6600: 1972	Guide for loading of oil immersed transformers
71	IS: 6792: 1992	Method for Determination of Electric Strength of Insulating Oils

72	IS: 8270: 1976: (Part-I)	Guide for preparation of diagrams, charts and tables for electrotechnology: Part 1 Definitions and classification
73	IS: 8270: 1976: (Part-II)	Guide for preparation of diagrams, charts and tables for electrotechnology: Part 2 Item designation
74	IS: 8270: 1977: (Part-III)	Guide for preparation of diagrams, charts and tables for electrotechnology: Part 3 General requirements for diagrams
75	IS: 8270: 1977: (Part-IV)	Guide for preparation of diagrams, charts and tables for electrotechnology: Part 4 Circuit diagrams
76	IS: 8270: 1976: (Part-V)	Guide for preparation of diagrams, charts and tables for electrotechnology: Part 5 Interconnection diagrams and tables
77	IS: 8270: 1983: (Part-VI)	Guide for preparation of diagrams, charts and tables for electrotechnology: Part 6 Unit wiring diagrams and tables
78	IS: 8623: 1993: (Part-I)	Specification for Low-Voltage Switchgear and Control gear Assemblies - Part 1 : Requirements for Type-Tested and Partially Type-Tested Assemblies
79	IS: 8623: 1993: (Part-II)	Specification for Low-voltage Switchgear and Control gear Assemblies - Part 2 : Particular Requirements for Busbar Trunking Systems (Busway
80	IS: 8623: 1993: (Part-III)	Specification for Low-Voltage Switchgear and Control gear Assemblies - Part 3 : Particular Requirements for Equipment Where Unskilled Persons have Access for Their Use

NOTE: This list of standards applicable is indicative in nature and cannot be taken as a comprehensive list. All the other standards which are applicable as per the statutory rules and regulations are applicable to this scope.

5.0 GENERAL REQUIREMENTS – COMMON TO ALL WORK

1.0 The intent of specification is to provide services according to the most modern and proven techniques and codes. The omission of specific reference to any method, equipment or material necessary for proper and efficient execution of this work shall not relieve the Contractor of the responsibility of providing such facilities to complete the work without any extra compensation.

2.0 The terminal points decided by BHEL shall be final and binding on the Contractor for deciding the scope of work and effecting payment for the work done.

3.0 The work covered under this specification is of highly sophisticated nature, requiring the best quality workmanship, supervision, engineering and construction management. The Contractor should ensure proper planning and successful & timely completion of the work to meet the overall project schedule. The Contractor must deploy adequate quantity of tools & plants, modern / latest construction aids etc.

4.0 All necessary certificates and licenses, permits & clearances required to carry out this work from the respective statutory/ local authorities are to be arranged by the Contractor at his cost in time to ensure smooth progress of work.

6.0 TERMS OF PAYMENT

The unit rate is further break up as below:

a) For supply: 95% of order value on pro-rata basis (per packaged substation).

b) For supervision: 05% of order value on pro-rata basis (per packaged substation).

For Supply: 95% of order value (excluding GST), on pro-rata basis, shall be released against receipt and acceptance of material at site and submission of following documents: -

a) GST Complaint Invoice (1 Original + 2 copies).
b) Inspection/ test Report duly signed by Supplier's and BHEL's representative.
c) Warrantee Certificate for Supplies.
d) Store Receipt Voucher issued by BHEL Site.

For Supervision: 5% of order value (excluding GST) on pro-rata basis shall be released on successful completion of supervision of the Package substation against submission of following document: -

a) Supervision completion report certified by BHEL site Engineer

For GST:

Applicable GST shall be released upon compliance of following documents:

a) Vendor declaring such Invoice in their GSTR-1
b) Confirmation of payment of GST thereon by vendor by submitting acknowledgement/copy of GSTR-3

Aforesaid GST payment is subject to receipt of goods and tax invoice by BHEL thereof.