

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION:D9
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan 415V SWITCHGEAR/ DISTRIBUTION BOARDS/MCC	SHEET 1 OF 16
1.0 415 V Switchgear, PMCCs and MCCs required for feeding the all the entire Plant Loads (except River water System) shall be supplied. These shall include as a minimum the following boards for 2 Units:- a) Turbine PCC b) Turbine MCC c) Boiler PCC d) Boiler MCC e) Soot blower MCC f) ESP MCC g) Mill MCCs h) TVDB i) BVDB j) Hydrogen Plant MCC k) AC & DC distribution boards l) AC & ventilation MCC m) Normal emergency switchgear n) DC Switchgears o) Emergency Switchboards (D.G) p) Cooling Tower MCCs. q) Intake Water MCCs. r) Ash handling Plant PMCC s) Ash water/Silo/Slurry MCC- As required. t) Fly Ash MCC- 3 Nos. u) Ash dyke MCC v) Coal Handling Plant MCCs- As required w) Wagon tippler MCCs- One MCC per Wagon tippler. x) Bunker Floor PMCCs- As required y) Water system switchgear. z) DM Plant MCC - aa) Chemical House MCC - bb) River water MCC - cc) Electro Chlorination Plant MCC.		
		ISSUE R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION:D9
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan 415V SWITCHGEAR/ DISTRIBUTION BOARDS/MCC	SHEET 2 OF 16
dd) Clarified water MCC ee) Effluent treatment plant MCC ff) Guard Pond MCC gg) LDO MCC hh) HFO MCC ii) Fuel oil unloading PH MCC A, B jj) Switchyard PMCC A, B. kk) Station switchyard auxiliary swbd PMCC 1 , 2 ll) Fire water PH switchgear 1A,1B. mm) Site office switchgear. nn) Compressor MCC 1A,1B oo) Air washer MCC 1A, 1B. pp) C.W Pump House MCC qq) Station ACDB 1A,1B. rr) Work Shop MCC ss) Admin building PCC tt) Service building AC and Ventilation MCC uu) ESP Control Room AC and Ventilation MCC vv) Receptacle Welding DBs. ww) Space Heater DB – As required. 1.1 415 V systems shall be 3 phase, 3-wire, solidly grounded system except for those listed in cl.no.1.2 which shall be with 4-wire system. All MCC shall derive power from power source as per Key One line diagram 5750A-738-AU-3001 attached. 1.2 Following PCC/MCC/Distribution Boards shall be of 4-wire type. Incomer and bus coupler SFU/MCCB/ACB of all 4 wire PCC/MCC/DB shall be of 4 pole type: a) Welding receptacle DBs b) Space Heater DBs c) Workshop MCC d) Admin building MCC e) Site Office switchgear f) Service building and Ventilation MCCs		
		ISSUE R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION:D9
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan 415V SWITCHGEAR/ DISTRIBUTION BOARDS/MCC	SHEET 3 OF 16
g) Station building DBs h) Switchyard DBs i) All PCCs 1.3 For codes & standards refer section D28 of this volume. 2.0 <u>FEEDER DETAILS</u> 2.1 Each of the switchgear shall be provided with two bus sections, two incomers and a bus coupler each rated for 100% of the loads connected to the switchgear. 2.2 The switchgears shall be provided with suitable number and type of outgoing feeders for the respective auxiliary loads of the system/area. Additionally following shall be provided in all Switch boards. (a) Spare feeders: 4 Nos. of 400A outgoing feeders shall be provided in station auxiliary service switchgear for Owner's use by the EPC Contractor scope. - In addition, 20% spares of each rating and type of module shall be considered with a minimum of one number. Any additional quantity required for any increase/ changes during detailed engineering stage shall also be duly considered. (b) Bus VT module – 1 per bus section. (c) Control transformer module – 1 per bus section. Where there is no bus section (only one bus) and for the N/E Switchgear bus section, 2 nos. Control Transformers are to be provided. Control transformers shall be located in Physically separate modules. Each Control transformer shall be sized for complete load of the Switchgear/MCC. i.e., Control Transformers shall be of 2 X100 % capacity with manual and auto changeover facility in case of any one Transformer supply failure. (d) 240V, 1 phase space heating. 1 per bus section. (e) Control supply (AC and DC) changeover scheme module. (f) Each bus section shall have the following feeders for Purchaser's use: 32A – 3 Nos. 63A – 2 Nos. 100A – 2 Nos. 160A – 2 Nos. (g) Essential / critical loads to receive supply from the Normal-Emergency Switchgear and 220V DCDB.		
		ISSUE R1

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PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan 415V SWITCHGEAR/ DISTRIBUTION BOARDS/MCC	SHEET 4 OF 16
3.0 <u>SHORT CIRCUIT CURRENTS</u> 3.1 The fault level on the 415V buses shall be calculated based on transformer contribution and motor contribution and shall be limited to 50kA inclusive of 10 % margin. The minimum short time current rating shall be 50 kA for 1 second. 3.2 It is the responsibility of the Vendor to co-ordinate operation of all the ACBs and MCCBs for short circuit condition so that discrimination in operation is provided. Co-ordination and relay setting is in Vendor's scope. 4.0 <u>CONTINUOUS CURRENTS</u> The continuous current rating of the bus bars, the incomers, bus couplers of the switchgear, which are fed by the transformers shall be rated at the LV side full load current of the corresponding transformers with 20% margin rounded off to the next higher standard rating. 5.0 <u>SPECIFIC REQUIREMENTS</u> 5.1 All the 415V equipments/devices like bus support insulators, CBs, CTs, PTs etc mounted inside the switchgear shall be suitable for continuous operation and satisfactory performance under the following supply conditions. (a) Variation in supply voltage $\pm 10\%$ (b) Variation in supply frequency $\pm 5\%$ (c) Combined voltage and frequency variations: 10% absolute. 5.2 All bus bar, bus-taps shall be insulated with close fitting sleeve of PVC insulation with high dielectric strength. 5.3 The switchgears shall be totally enclosed, metal clad, sheet steel fabricated, indoor, floor mounted fully draw-out modular type construction, dust and vermin proof of uniform height of not more than 2450mm, easily extendable on one side having switchgear designation indicating label's on front and rear, in single/ double front execution in totally draw out. Proper gasketting shall be provided all around the perimeter of the adjacent panels, panel and base frame, removable cover and doors. The switchboard shall be fully compartmentalized. Incomers to the switchgear shall be of cable/ Non-segregated phase busbuct. The switchgear shall be capable for the suitable termination. 5.4 Operating devices shall be incorporated only in front of the switchgear. 5.5 Switchgear shall be divided in to distinct vertical section consisting of :- (a) Completely Enclosed busbar compartment running horizontally. (b) Individual feeder modules in multi tier arrangements. (c) Enclosed vertical bus bars serving all modules in vertical section.		
		ISSUE R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION:D9
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan 415V SWITCHGEAR/ DISTRIBUTION BOARDS/MCC	SHEET 5 OF 16
(d) Vertical cable alley covering entire height and minimum 300 mm wide and shall have hinged doors. (e) A horizontal separate enclosure for all-auxiliary power and control bus as required. 5.6 All modules of identical size & type shall be fully interchangeable without any modifications. 5.7 The sheet steel to be used for the metal enclosed switchgear shall be minimum 2.5 mm thick hot rolled or 2 mm cold rolled. 5.8 The cable entry shall be bottom/top with separate gland plate for power and control cable. In case of single core cables, gland plate shall be of non magnetic material. The exact cable entry shall be finalised during detailed engineering. 5.9 All Air circuit breakers (ACBs) and Moulded case circuit breakers shall be of short circuit performance category P2 as per IS:2516 Parts I & II. 5.10 The MCCBs shall be of current limiting type. When MCCB's are used as short circuit protection devices for motor modules they shall provide type C co-ordination with associated contactor and thermal overload relay as per IS: 8544 under all operating conditions for the all currents up to the design fault current. The MCCBs on upstream and downstream shall be co-ordinated. 5.11 Test reports to prove the requirements of Type-C Co-ordination shall be furnished. 5.12 There shall be two number 220V DC control supply for each switchgear. Auto and manual changeover scheme for changeover of supply- 1 to 2 and vice versa shall be provided. Necessary voltage monitoring contactors (for remote alarm) and indication lamps shall be provided. 5.13 Minimum of one NO and one NC spare contacts of all contactors, relay devices shall be wired to terminal block. All spare contacts of all contactors relay terminals shall be wired up to the terminal block. 5.14 For CT & VT circuits disconnecting type of terminals shall be provided. 5.15 Power cable terminal arrangement and size shall be suitable to accommodate two or more number of cables based on requirements and shall facilitate easy maintenance. 5.16 Terminal arrangements shall be such that all terminals at switchgear ends, which are to be connected to remote alarms and indication at DCS, shall be separated out and shall be kept isolated from other Terminals. 240V AC, 110V AC, 24V DC, 220V DC & other voltages shall be segregated to avoid mix up of voltages. This is specifically required to avoid mixing of switchgear high voltage to C & I low voltage system.		
		ISSUE R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION:D9
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan 415V SWITCHGEAR/ DISTRIBUTION BOARDS/MCC	SHEET 6 OF 16
5.17 Meters shall be Digital type. For MCC verticals, CT pertaining to a particular module should be mounted in the respective with drawable module it self. CT should not be mounted in cable alley. 5.18 Switchgear shall be suitable for easy extension on one side. It shall be possible at a later stage to add cubicles to the switchgear by extending the bus bars. 5.19 Secondary of CTs & VTs shall be made through disconnecting type terminals with necessary shorting and earthing facilities. All the control wiring shall be through stud type terminal. 5.20 The breaker ratings indicated in the data sheets referred to the nominal rating of the breaker. However, Breakers shall be capable of carrying continuously at least 120% of circuit breaker current at an ambient temperature of 44 deg. and with breaker mounted inside the panel. If a higher rated breaker is necessary to meet this, the same shall be used. 5.21 Dummy cubicles with horizontal bus bars, power control and annunciation cable running through the panel, if necessary, to avoid beam interfering with cable openings and to facilitate easy maintenance shall be provided. 5.22 All the bolted joints in body of the switchgear shall be earthed through flexible jumpers. 5.23 All indicating and integrating instruments, protection and alarm relays , operating and indicating devices shall be visible/ accessible without opening the instrument compartment door. All the hand reset relays shall be mounted on the panel at a conventional height for operation. 5.24 All the internal wiring shall be carried out using 1100V grade, stranded copper conductor with PVC insulation and shall be flame, vermin and rodent proof. The minimum size of the copper conductor used for panel wiring shall be as follows: ➤ All circuit except CT &PTs: 1.5 sq mm per lead. ➤ CTs/PTs : 2.5 sq mm/per lead. 5.25 The minimum number of strands per conductor shall be 07. Double flexible wire shall be used for internal wiring of devices mounted on moving parts of Cu conductor of size as mentioned at a) & b) above. 5.26 Following colour coding shall be used for internal wiring:- ➤ Red, Yellow & Blue: For respective phase /PT wires. ➤ Black : for neutral wires. ➤ Green : For Earth wires ➤ Red ferruled wires for trip circuit. ➤ All other with grey coloured wires.		
		ISSUE R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION:D9
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan 415V SWITCHGEAR/ DISTRIBUTION BOARDS/MCC	SHEET 7 OF 16
5.27 The inter panel wiring shall be brought out to a separate set of terminal blocks located near the slots meant for inter panel connecting wires. 5.28 At least 20% spare spare terminations of CT, PT & others shall be provided on each panel'. and these spare terminals shall be uniformly distributed on all rows of terminal blocks. A clearance of 250 mm shall be maintained between terminal blocks and gland plate and 150 mm between two rows of terminal blocks. at least 20% 5.29 All the electrical equipment shall be fed from main MCC only and if any specific arrangement is needed, separate panel for that shall be provided in switchgear room. 5.30 All LT panels shall be mounted at least on ISMC (Indian Standard Medium Channel) or other applicable 100 channels to prevent ingress of water. 5.31 All hardware required for meeting the functional requirements stated above, whether specifically listed out in the specification or not, shall be included in the scope of supply. 5.32 Current transducers, power transducers and Voltage transducers shall be provided. 5.33 The cable terminations inside the cable alley shall be completely shrouded so that it shall be possible to work on any one of the terminations by switching OFF the corresponding feeder switch only. 5.34 All bezels, handles, screws, bolts, washers, hinges, etc. shall be of the best quality electro galvanized or passivated to withstand attach from corrosive atmosphere. 5.35 Horizontal busbar chambers shall be at the top of the board for bottom cable entry. Busbars shall be completely shrouded to prevent metal pieces falling on the busbar during maintenance. 5.36 In case of copper to aluminium connections, proper treatment shall be given to minimise the bimetallic effect. That is, all joint surfaces at aluminium to copper joints shall be silver / tin plates, alternatively Cu-Al washers (bimetallic washers) can be used.. 5.37 On- line energy monitoring system shall be provided on all drives above 80kW rating which will help in preventive maintenance. 5.38 All MCC feeders of 80kW and above rating shall have Ampere,kVA, kW transducers for communicating the data to PLC system for auxiliary consumption analysis. 5.39 Outgoing feeders of rating 200A and above upto 630A (other than motor feeders) shall have MCCBs only with Short-circuit and Earth fault protection. Feeders of rating less than 200A shall be SFU. This is not applicable for feeders feeding other MCCs and switchboards.		
		ISSUE R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION:D9
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan 415V SWITCHGEAR/ DISTRIBUTION BOARDS/MCC	SHEET 8 OF 16
5.40 Welding Distribution Boards shall be provided with the following: - It shall be with isolating transformer on the incomer with ACB with Over current and Earth fault protections. - It shall be provided with maximum 12 nos. Of outgoing feeders. - Quantity of Welding receptacles: - One (1) no. in each ESP and Boiler Platform. - One (1) no. every 50m in each floor of TG building. - Two (2) nos. each in every building in the power plant other than Admin Building. - One (1) no. for every 60M in Switchyard and Main Transformer yard. - Looping of welding receptacles not allowed. 6.0 <u>INCOMERS & BUS COUPLERS.</u> 6.1 Incoming/ Bus coupler/ Outgoing feeders of rating 200A and above up to 630A (other than motor feeders) shall have MCCBs only with Short-circuit and Earth fault protection. Feeders of rating less than 200A shall be SFU. Feeders rated above 630A shall have ACBs. 6.2 The following minimum protections shall be provided for incomers and bus coupler for switchgears. ➤ phase inverse time over current relays ➤ Earth fault relay (for incomer only) ➤ Numerical relays shall be provided for all protection. 6.3 The incomer modules & bus coupler modules of PMCC as well as important MCC's as mentioned in clause 6.5 irrespective of loads shall be equipped with fully draw out air circuit breaker protected with relays. 6.4 All incomers and outgoing feeders of various loads shall have digital energy meter for energy accounting. The energy Meters of Incomers shall be of the Tri Vector Meter type (TVM) with recording and download facility. 6.5 Important MCCs shall be controlled from remote DCS & ECP. They shall be with ACBs, closing coil, shunt trip coil and relays irrespective of the current ratings. 6.6 The incomer modules shall be interlocked with their upstream breaker such that they can be closed only when upstream breaker is closed and trip automatically when upstream breaker is tripped. 6.7 Each circuit breaker cubicle shall be complete with following minimum accessories:-		
		ISSUE R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION:D9
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan 415V SWITCHGEAR/ DISTRIBUTION BOARDS/MCC	SHEET 9 OF 16
a) One spring return Trip normal close (TNC) switch. b) Large size cluster LEDs for following condition of breaker/contactors:- (i) "ON"(Red) (ii) "OFF" (Green) (iii) Trip relay supervision (White). (iv) Spring charged (Blue) (v) DC supply supervision (Violet) (vi) Trip on fault (Amber) c) Limit switches for test and service position interlocking. d) Double pole switch for DC control supply and spring charging motor with HRC fuses or MCB will be provided (Fuse or MCB shall be provided for DC control supply which shall be decided during detailed engineering). e) Anti pumping relay. f) Sufficient terminal blocks. g) Auxiliary relays as required for contact multiplication. h) Breaker operation counter. i) Numerical Protective relays along with trip circuit supervision relay and master trip relay. j) Meters as indicated elsewhere. k) Required CTs/PTs. l) Space heaters. m) One Local/Remote Switch. n) Required number of 24 V DC DC Interposing Relays. o) 4-20 mA output Transducers for current, power and voltage. p) Other associated equipment. 6.8 All the circuit breakers shall be of fully draw out execution with "Test", "Service " & " Fully withdrawn " positions. 6.9 Double tier arrangement shall not be provided for incomers and bus coupler. In case of motor feeders, double tier arrangement may be provided but two breakers of same application motor shall not be provided in one vertical. 6.10 Breakers shall be with motor wound spring operating mechanism, 220 V DC operated Closing and tripping coils. 6.11 Closing action of the CB shall compress the opening spring ready for tripping.		
		ISSUE R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION:D9
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan 415V SWITCHGEAR/ DISTRIBUTION BOARDS/MCC	SHEET 10 OF 16
6.12 Proper mechanical indication shall be provided to locate these three positions without opening of the compartment door. 6.13 It shall be possible to bring the circuit breaker to isolated position with the help of external lever without opening the compartment door. 6.14 A stop block shall be provided on the slide rails to prevent the movement of the circuit breaker out of the compartment when it reaches the isolated position so that any accidental fall can be avoided. 6.15 No control & metering equipments should be mounted on breaker compartment door (i.e access to control & metering equipments should be available at all time without opening Breaker Compartment door). 6.16 It shall not be possible to close the Breaker if stored energy mechanism is not charged. 6.17 In case of MCCBs, it shall not be possible to close the Breaker if under-voltage relays release is not energised (if present). 6.18 Movement of the circuit breaker truck from service to test or test to isolated position OR in reverse order shall be possible only when circuit breaker is off. 6.19 It shall not be possible to withdraw the breaker when it is in closed position. 6.20 Opening of compartment door with breaker / isolating switch in Service & Intermediate and ON position and vice versa shall not be possible. 6.21 It shall not be possible to close the Breaker if closing coil is energized. 6.22 It shall not be possible to close the Breaker if OFF – Push Button is locked in off position. 6.23 It shall not be possible to close the Breaker if crank hole is open. 6.24 The Circuit Breaker shall be provided with mechanical ON/OFF, TRIP and SPRING CHARGED, DISCHARGED READY TO CLOSE AND BREAKER POSITION indication, mechanical trip push button. 6.25 The circuit breaker shall be provided with automatic safety shutters, so that before the breaker reaches 'isolated' position the main isolating contacts are completely shrouded. In the draw-out condition, it shall be possible to inspect the Breaker fixed contacts condition by lifting the shutters. 6.26 The protective relays and instruments shall be mounted in separate compartment. This compartment shall be along side and immediately next to the controlled breaker 6.27 Contact erosion indicator shall be provided on Moving contacts of Breaker for visual indication of contact life. 6.28 All the non conducting metal parts of the circuit breaker trolley shall be bonded together and shall make perfect electrical connection to earth through substantial sliding contacts, at service and test positions. Such sliding		
		ISSUE R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION:D9
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan 415V SWITCHGEAR/ DISTRIBUTION BOARDS/MCC	SHEET 11 OF 16
contacts shall be arranged to make before power plug in and interrupt after power draw out. 7.0 <u>BUS AND LINE PTs</u> Bus PT over voltage factor shall be 1.9 for 08 hours. 3 Nos. single phase PTs shall be connected up to form a 3 phase unit. Each PT cubicle shall be complete with following minimum accessories (a) PTs shall be fully draw out type with required no of cores and ratios as specified elsewhere. (b) Voltmeter with selector switch. (c) Separate Under voltage (2 nos.) and No voltage relays (2 nos.) with timers and fuse fail relays. (d) Required auxiliary relays. (e) LEDs for voltage indication. (f) Auxiliary PTs, as required. (g) DC and AC control supply and changeover switches with Short Circuit protection. 8.0 <u>MOTOR MODULES</u> 8.1 All LT motors shall be controlled as follows: a) Up to 50kW: - MPCB + Contactor (MPCB shall be with adjustable S/C and O/L protection). b) 50kW to 90kW shall have MCCB+ contactor+ bimetallic relay. c) 90Kw to 160kW shall have ACB +motor protection relay (MPR). 8.2 All motor feeder shall be complete with following minimum accessories. (a) Interlocking schemes for Space heating arrangements (space heating for motors above 30KW). (b) 3 position selector switch-Local (switchgear)/Field/Remote (DCS/PLC) (c) Test services position switches and associated contactors for interlocking. (d) Power contactors and MPCB or breaker. (e) Bi-metal relay or Motor Protection relay. (f) CTs as specified elsewhere. (g) Local indication lamp for ON, OFF & TRIP/Fault indication.		
		ISSUE R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION:D9
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan 415V SWITCHGEAR/ DISTRIBUTION BOARDS/MCC	SHEET 12 OF 16
(h) Relays as required. (i) ON & OFF PBs, for testing in Test Position. (j) 24 V DC Interposing relays to accept remote start and stop signals . 8.3 All the motors rated 30 kW and above shall be provided with a CT, ammeter and a current transducer with remote metering in DCS. Further important motor like ID/FD/PA fan, LOP motors, HP/LP bypass motor, mill feeders motor, APH motor, air conditioning motor etc shall also be provided with CT, ammeter and a current transducer with remote metering in DCS irrespective of kW. 8.4 The incomer/bus coupler, module, MPCB/MCCB feeder etc shall confirm to the attached M2 series of schematic drawings. 9.0 <u>ACTUATORS.</u> All actuators to be supplied with non integral starters. 10.0 <u>METERING.</u> 10.1 Each incomer feeder to all PMCC/PCC/MCCs shall have Voltage, Ampere, kVA, kW, transducers for communicating the data to DCS/PLC system for auxiliary consumption analysis and these parameters voltage, current, kW and kVA of each incomer also shall be available on respective ECP. 10.2 Meters shall be Digital type. All CT s/ PT s, transducers and meters (Energy accounting and audit meters) on 415 V system shall be class 1.0. Metres for motor feeders shall be with suppressed scale. 10.3 All MCC feeders (except motor feeders) of 80kW and above rating shall have Ampere, kVA, kW transducers for communicating the data to DCS/PLC system for auxiliary consumption analysis. 10.4 All the motors rated 30 kW and above shall be provided with a CT, ammeter and a current transducer with remote metering in DCS. Further important motor like ID/FD/PA fan, LOP motors, HP/LP bypass motor, mill feeders motor, APH motor, air conditioning motor etc shall also be provided with CT, ammeter and a current transducer with remote metering in DCS irrespective of kW. 10.5 The Energy accounting and audit meters as required by CEA shall be on a separate core and shall be installed at following locations to facilitate the accounting of the energy generated, transmitted, distributed and consumed in various segments of the power system and the energy loss, namely • Low voltage side of each incoming transformer feeder of low voltage (415V) buses, and This CT core and the meters shall have an accuracy of 0.2S for this purpose and PT cores shall have an accuracy class of 0.2 for this purpose.		
		ISSUE R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION:D9
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan 415V SWITCHGEAR/ DISTRIBUTION BOARDS/MCC	SHEET 13 OF 16

11.0 **ALARMS/INDICATION/SER POINTS**

11.1 **INCOMERS AND BUSCOUPLER CONTROL.**

11.1.1 Incomers/Bus couplers/Ties from/to the various Switchboards (with ACB and MCCB as incomers) listed in Clause 1.0 shall be controlled from DCS/PLC (as applicable) and ECP as explained in clause no. 2.1.1 of section D2.

11.1.2 Interconnecting cables to DCS and required interposing relays (24 V DC) are in Vendor's scope. Interposing relays are to be located in the Switchgear.

11.1.3 Each ECP shall have all the instruments as explained in clause no. 2.1.2 of section D2.

11.1.4 It shall be possible to control every breaker in the test position both from Switchgear as well as remote (DCS) for testing purpose.

11.1.5 **ALL OTHER SERVICES.**

All the motors / Valves and other equipment shall be controlled from respective process control panels/DCS to be supplied by Vendor.

Emergency stop pushbutton shall be provided near all drives except emergency drives and shall be wired directly to MCC. In case of emergency drives, emergency start PB only shall be provided.

11.1.6 The control room shall provide indication & alarms for the 415V auxiliary supply as given below. Any additional indications/alarms considered necessary during detailed engineering also shall be provided. Some of these shall be selected for sequential event recording. For each breaker and bus, grouped alarm for any abnormal conditions shall be provided in the control desk. For all breaker (ACB/MCCB) fed switchgear, status indications shall be available on CRT in form of SLD.

		MCC	DCS / PLC	ECP
STATUS INDICATION				
(a)	Incomer & Bus coupler breaker (ACB/MCCB) feeders			
	➤ Breaker ON	✓	✓	✓
	➤ Breaker OFF	✓	✓	✓
	➤ Breaker in local	✓	✓	✓
	➤ Breaker in remote	✓	✓	✓
	➤ Breaker in service	✓	✓	✓
	➤ Breaker in test	✓	✓	✓
	➤ DC supply healthy	✓	✓	✓

ISSUE
R1

SPEC. NO. TCE.5750A-H-500-001		TATA CONSULTING ENGINEERS LIMITED		VOLUME IV SECTION:D9	
PART B		RRVUNL, 2 x 660 MW, Super-Critical TPS Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan 415V SWITCHGEAR/ DISTRIBUTION BOARDS/MCC		SHEET 14 OF 16	

		MCC	DCS / PLC	ECP
	➤ Breaker spring charged	✓	✓	✓
	➤ Trip Relay supervision	✓	✓	✓
(b)	Incomer & Bus coupler breaker (SFU) feeders			
	➤ Incomer /Bus coupler ON	✓	✓	✓
(c)	Motor Feeders			
	➤ Motor ON	✓	✓	x
	➤ Motor OFF	✓	✓	x
	➤ Motor Auto trip.	✓	✓	x
	➤ Motor Local Emergency PB pressed	x	✓	x
	➤ Feeder Fault	x	✓	x
	➤ Breaker in Remote	x	✓	x
	➤ Breaker in Field	x	✓	x
	➤ Breaker in Local	✓	✓	x
	➤ Breaker in service	✓	✓	x
	➤ Breaker in test	✓	✓	x
	➤ Breaker spring charged	✓	✓	x
	➤ Trip Relay supervision	✓	✓	x
ALARM SIGNALS				
(d)	Incomer & Bus coupler breaker (ACB/MCCB) feeders			
	➤ Breaker auto tripped/L/O Relay operated	x	✓	✓
	➤ Sources paralled beyond pre-set time	x	✓	✓
	➤ Common outgoing feeder fault	x	✓	✓
	➤ Incoming 220 V DC control supply failed	x	✓	✓
(e)	Incomer & Bus coupler breaker (SFU)			

**ISSUE
R1**

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION:D9
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan 415V SWITCHGEAR/ DISTRIBUTION BOARDS/MCC	SHEET 15 OF 16

		MCC	DCS / PLC	ECP
	feeders			
	➤ Incomer/Bus coupler Fuse blown	✓	✓	✓
(f)	BUS/Line PT			
	➤ Bus under voltage	✓	✓	✓
	➤ Bus PT fuse failed	✓	✓	✓
	➤ BUS PT not in service	✓	✓	✓
(g)	Motor Feeders			
	➤ Overload alarm	x	✓	x
	➤ Feeder fault / closing permissive not available	x	✓	x
	➤ Breaker trip circuit trouble	x	✓	x
	➤ Trip through process interlock.	x	✓	x
	➤ Local push button pressed	x	✓	x
	➤ Breaker spring not charged alarm	x	✓	x

11.1.7 The current, voltage, Power measurements for each bus shall be available both on control room as indicated in this section and elsewhere in the specification. Also for specific motors where the current transducers are indicated, the measurement shall be available at the DCS.

11.1.8 Each remote controlled feeder including spare feeders shall be provided with 2nos interposing relays for start & stop.

11.1.9 The operation, indications and fault alarms for the motors of the auxiliaries shall be displayed as covered in the specification as part of C&I requirements.

12.0 **TESTS**

12.1 Switchgear shall be subjected to all routine tests as per relevant standards along with following tests:

- Mechanical operation test
- Insulation resistance and 500V DC Megger before/ after 1 minute HV test
- Electrical control, interlock and sequential operation tests

ISSUE
R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION:D9
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan 415V SWITCHGEAR/ DISTRIBUTION BOARDS/MCC	SHEET 16 OF 16
(d) Verification of wiring as per approved schematic. 12.2 Temperature rise test on each type and rating of Breaker and associated panels shall be carried out by the Vendor on breaker/Panel to be supplied for this project. 12.3 For all other type tests BIDDER shall submit valid type test reports for similar switchgear and ratings of breakers included in the offer. If these tests are not done or test results are not found satisfactory by the PURCHASER then such tests shall be carried out by Vendor without any cost implication. 12.4 Routine tests shall be carried out on all associated equipment supplied with switchgear as per relevant standards. Type test certificates of all associated equipment shall be furnished. 12.5 Valid type and routine test certificates shall be submitted by the VENDOR before despatch of the switchgear. 13.0 For technical particulars refer datasheet-A.		
		ISSUE R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION: D9
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET-A 415V MCC	SHEET 1 OF 6

Sr. No.	Description	unit	Client specification
1.0	Manufacturer's name		*
2.0	Make of major components (ACB, Contactor, MCCB , CTs, PTs)		*
3.0	Type & model number of panel		*
4.0	Applicable standard.		*
5.0	Nominal system voltage, phase & frequency	V	415 V, 3 phase, 50 Hz, 3-wire/ 4- wire
6.0	System neutral earthing considered		Effectively earthed
7.0	Maximum system voltage	V	456.5
8.0	One minute power frequency withstand voltage	KV rms	2.5
			1.5
			2.0
9.0	Short circuit withstand capability	KA rms	Min. 50 KA
	a) Short time for 1 sec b) Dynamic rating	KA peak	Min. 127.5KA
10.0	Reference ambient temperature	Deg. C	50
11.0	Continuous current rating under site reference ambient condition	A	*
12.0	Maximum temperature of Bus Bars, dropper, connectors & contacts at continuous current rating under site reference ambient temperature	Deg C	90 deg. C for non silver plated joints 105 deg. C for silver plated

REV. NO.	R0	R1	JOB NO. TCE - 5750A	CLIENT : RRVUNL
PPD. BY :	UM	SK		
CKD. BY :	MSVM	MSVM		
DATE	NOV'2009	JUN'2012		PROJECT : 2 x 660 MW, Super-Critical TPS Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION: D9
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET-A 415V MCC	SHEET 2 OF 6

			joints
13.0	Material of bus bars considered		Copper / Aluminum Alloy
14.0	Cable entry		Bottom only
15.0	Degree of protection		IP- 52 upto 1600A and IP-42 above 1600A.
16.0	Thickness of sheet steel enclosures / doors.		
	Cold Rolled		2mm
	Hot rolled		2.5mm
17.0	Shade of paints		Powder coated paint of shade RAL 7032 (Siemens Grey)
18.0	Earthing bus bar size & material considered		75 x12 mm (min) , GS
19.0	Clearance in air of live parts a) phase to phase b) phase to earth		25 mm 19 mm
20.0	Circuit breaker a) Type b) Rated operating duty c) Rated current at site reference ambient temp. A d) Rated breaking current e) Rated making current f) Short time current withstand capacity for 1	 KA rms KA peak KA	 * O-3min-CO-3min- CO * *

REV. NO.	R0	R1	JOB NO.	CLIENT : RRVUNL
PPD. BY :	UM	SK	TCE -	
CKD. BY :	MSVM	MSVM	5750A	
DATE	NOV'2009	JUN'2012		PROJECT : 2 x 660 MW, Super-Critical TPS Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION: D9
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET-A 415V MCC	SHEET 3 OF 6

	sec duration	rms	
	g) Asymmetrical breaking current		*
	(1) AC component		*
	(2) DC component	KA rms	as per IEC – 62271
	h) operating time		*
	(1) opening time		*
	(2) closing time		
	i) Closing and opening coil particulars.	Cycle s	220V DC
	j) Switching over voltage factor	Cycle s	2.2
21.0	Trip free operating mechanism type		Motor charged spring (manual trip & close facility to be provided)
22.0	Auxiliary control voltage for trip, close, annunciation and spring charging.		220 V DC (+/- 15 %)
23.0	Auxiliary control voltage for space heater, DC failure annunciation, motor winding / space heaters, lighting etc		240V AC, 1-Ph, 2 wire, 50 Hz
24.0	Breakers application		
	a) Incomer s		Yes
25.0	Details of contactors/ Switches/Fuses.		*
	• Type		
	• Rated operating duty		

REV. NO.	R0	R1	JOB NO.	CLIENT : RRVUNL
PPD. BY :	UM	SK	TCE -	
CKD. BY :	MSVM	MSVM	5750A	
DATE	NOV'2009	JUN'2012		PROJECT : 2 x 660 MW, Super-Critical TPS Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION: D9
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET-A 415V MCC	SHEET 4 OF 6

	- Rated current at site reference ambient temp. - Rated breaking current - Rated making current - Short time current withstand capacity for 1 sec duration - Asymmetrical breaking current - AC component - DC component - Operating time - opening time - closing time		
26.0	Details of CTs - Type - Ratio - Burden - Accuracy class - Knee point voltage - Magnetizing current at $V_k/2$ - Secondary resistance - Class of insulation - Short time & dynamic current rating - Applicable standard		(Cast resin, Class E or Better) **

REV. NO.	R0	R1	JOB NO.	CLIENT : RRVUNL
PPD. BY :	UM	SK	TCE -	
CKD. BY :	MSVM	MSVM	5750A	
DATE	NOV'2009	JUN'2012		PROJECT : 2 x 660 MW, Super-Critical TPS Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION: D9
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET-A 415V MCC	SHEET 5 OF 6

	No. of cores		
27.0	Details of VTs - Type - Ratio - Burden - Accuracy class - Magnetizing characteristic - Method of connection - Class of insulation - Rated voltage factor (continuous & 8 hours) - Applicable standard - No. of cores		(Cast resin Class E or Better , Overvoltage factor 1.5 continious,1.9 for 08 hours) **
28.0	Particular of meters		*
29.0	Particular of relays		*
30.0	Panels construction details		*
31.0	STARTERS		
31.1.	Type		DOL/Soft Starters
31.2.	Contactor rated duty as per IS:13947		Uninterrupted
31.3.	Utilisation category as per IS:13947		AC 3 for non reversible AC 4 for reversible

REV. NO.	R0	R1	JOB NO. TCE - 5750A	CLIENT : RRVUNL
PPD. BY :	UM	SK		
CKD. BY :	MSVM	MSVM		
DATE	NOV'2009	JUN'2012		PROJECT : 2 x 660 MW, Super-Critical TPS Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION: D9
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET-A 415V MCC	SHEET 6 OF 6

31.4.	Control scheme & bill of material enclosed	YES/ NO	Yes
	CONTROL TRANSFORMER :		
	A) Separate for each module	YES/ NO	NO
	B) Common for each switchgear section with 100% standby	YES/ NO	YES
31.5.	Single phasing preventer required	YES/ NO	Yes

NOTE :

- 1.0 '**' Information shall be filled furnished by BIDDER in contract document.
- 2.0 '***' BIDDER shall furnish these details after award of contract.

REV. NO.	R0	R1	JOB NO.	CLIENT : RRVUNL
PPD. BY :	UM	SK	TCE -	
CKD. BY :	MSVM	MSVM	5750A	
DATE	NOV'2009	JUN'2012		PROJECT : 2 x 660 MW, Super-Critical TPS Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan

SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION: D9
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET B 415V MCC	SHEET 1 OF 10
ENQUIRY/SPECIFICATION NO.:		BIDDER:

1.0	<u>SPECIFIC PARTICULARS</u>		
1.1	Switchgear designations		
1.2	Single front or double front	SF/DF	
1.3	Applicable Standard		
1.4	Fully drawout/semi drawout/Fixed	FD/SD/F	
1.5	Total dimensions of each complete switchgear L x W x D	mm $\frac{L}{W}$ $\frac{D}{D}$	
1.6.1	Width of each vertical section with cable alley	mm	
1.6.2	Width of cable alley only	mm	
1.7	Minimum clear space required a) In front b) Back	mm mm	
1.8	Max. cubicle weight with components	kg	
1.9	Have all the feeders and components specified in enclosed Drawings and Data Sheets A - 3 been provided ?		YES/NO
2.0	<u>GENERAL PARTICULARS</u>		
2.1	Sheet steel		

<u>NOTES TO BIDDER</u> 1 ITEMS WHICH DEVIATE FROM THE SPECIFICATION SHOULD BE MARKED WITHIN ASTERISK (*) AND DETAILS TO BE GIVEN IN SCHEDULE OF DEVIATIONS. 2 THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.	SIGNATURE OF BIDDER & DATE
	ISSUE R1

SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION: D9
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET B 415V MCC	SHEET 2 OF 10
ENQUIRY/SPECIFICATION NO.:		BIDDER:

	a) Cold rolled/Hot rolled b) Thickness :		
	i) Frames	mm	
	ii) Door	mm	
	iii) Rear cover	mm	
	iv) Side and top covers	mm	
	v) Panel partitions	mm	
2.2	Degree of protections provided by the enclosure (As per IS : 13947)		
2.3	Earth busbar size	Sq.mm	GI/AL/CU
2.4	BUSBAR a) Material of busbars b) Section c) Continuous current rating under site conditions d) Whether busbars have been insulated e) Type of insulation f) Temperature rise over the reference ambient	Sq.mm A °C	AL/CU PH : N: YES/NO

<u>NOTES TO BIDDER</u> 1 ITEMS WHICH DEVIATE FROM THE SPECIFICATION SHOULD BE . MARKED WITHIN ASTERISK (*) AND DETAILS TO BE GIVEN IN SCHEDULE OF DEVIATIONS. 2 THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY . SHALL BE ENCLOSED WITH EACH COPY OF THE BID.	SIGNATURE OF BIDDER & DATE ISSUE R1
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SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION: D9
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET B 415V MCC	SHEET 3 OF 10
ENQUIRY/SPECIFICATION NO.:		BIDDER:

	when carrying rated current g) Material of busbar supports h) Clearance in air : i) Between phases ii) Between phases earth i) Short time rating (One Sec.) j) Momentary rating (peak)	 mm mm kA kA	
3.0	CIRCUIT BREAKERS		
3.1	Maker's name		
3.2	Maker's type designation		
3.3	Applicable standards		
3.4	Circuit breakers type (air break and or MCCB)		
3.5	Rated voltage	V	
3.6	Rated operating duty		
3.7	Rated current	A	
3.8	Derating factor for operation under site conditions		
3.9	Rated symmetrical breaking current at rated voltage. (Indicate power factor)	kA P.F.	
3.10	Rated peak making current	kA	

<u>NOTES TO BIDDER</u> 1 ITEMS WHICH DEVIATE FROM THE SPECIFICATION SHOULD BE MARKED WITHIN ASTERISK (*) AND DETAILS TO BE GIVEN IN SCHEDULE OF DEVIATIONS. 2 THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.	SIGNATURE OF BIDDER & DATE ISSUE R1
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SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION: D9
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET B 415V MCC	SHEET 4 OF 10
ENQUIRY/SPECIFICATION NO.:		BIDDER:

3.11	Rated short time withstand rating (for 1 sec.) (For MCCB, BIDDER to indicate the time)		
3.12	Operating mechanism type		
3.13	Limits of voltage for satisfactory operation of the following devices as a % of normal voltage		
	i) Operating mechanism	%	
	ii) Closing at normal voltage	%	
	iv) Trip coil	%	
3.14	Power required for closing at normal voltage	W	
3.15	Power required for tripping at normal voltage	W	
3.16	Spring charging motor details :		
	i) Rating	kW	
	ii) Rated voltage	V, AC/DC	
	iii) Spring charging	Sec.	
3.17	Overload release provided	YES/NO	
3.18	Short circuit release settings and time delay features		
3.19	Undervoltage release setting		
3.20	Have electrical and mechanical anti-pumping features been provided	YES/NO	
3.21	Have type test certificates been enclosed ?	YES/NO	
4.0	AIR BREAK SWITCHES		
4.1	Make		
4.2	Type		

NOTES TO BIDDER 1 ITEMS WHICH DEVIATE FROM THE SPECIFICATION SHOULD BE MARKED WITHIN ASTERISK (*) AND DETAILS TO BE GIVEN IN SCHEDULE OF DEVIATIONS. 2 THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.	SIGNATURE OF BIDDER & DATE ISSUE R1
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SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION: D9
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET B 415V MCC	SHEET 5 OF 10
ENQUIRY/SPECIFICATION NO.:		BIDDER:

4.3	Rated Voltage		
4.4	Applicable standards		
4.5	Maximum prospective fault current withstand of composite unit of switch and fuse	kA (peak)	
5.0	FUSES		
5.1	Make		
5.2	Type		
5.3	Applicable standards		
5.4	Rated voltage	V	
5.5	Rated current for individual circuits to be provided as per requirements of protection coordination	YES/NO	
6.0	CONTACTORS		
6.1	Make		
6.2	Rated duty		
6.3	Rated Utilisation Category		
6.4	Applicable standards		
6.5	Rated (thermal) current provided as per specification	YES/NO	
6.6	Rated voltage of auxiliary contacts	V	
6.7	Rated voltage of coil	V	
6.8	Rated breaking capacity	Factor of rated current	
6.9	Rated making capacity	Factor of rated current	
6.10	Limits of operation		
	i) Supply voltage variation	+ %	
	ii) Supply frequency variation for closing	+ %	

NOTES TO BIDDER 1 ITEMS WHICH DEVIATE FROM THE SPECIFICATION SHOULD BE MARKED WITHIN ASTERISK (*) AND DETAILS TO BE GIVEN IN SCHEDULE OF DEVIATIONS. 2 THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.	SIGNATURE OF BIDDER & DATE
	ISSUE R1

SPEC.NO. TCE.5750A-H-500-001		TATA CONSULTING ENGINEERS LIMITED		VOLUME IV SECTION: D9	
PART B		RRVUNL, 2 x 660 MW, Super-Critical TPS Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET B 415V MCC			SHEET 6 OF 10
ENQUIRY/SPECIFICATION NO.:			BIDDER:		
	iii) Drop out voltage	%			
6.11	No of auxiliary contacts :				
	I) Normally open				
	ii) Normally closed				
7.0	SINGLE PHASING PREVENTERS				
7.1	Is it in built-in bimetal thermal overload relay	YES/NO			
8.0	CURRENT TRANSFORMERS				
8.1	Make				
8.2	Applicable standards				
8.3	All other parameters of CT as per enclosed SLD/list and Section-D	YES/NO			
9.0	VOLTAGE TRANSFORMERS				
9.1	Make				
9.2	Applicable standards				
9.3	Ratio	V/V			
9.4	Output per phase	VA			
9.5	Accuracy class				
9.6	Over voltage factor				
9.7	Class of insulation				
10.0	CONTROL TRANSFORMERS				
10.1	Make				
10.2	Type				
10.3	Applicable standards				
10.4	Ratio				
10.5	Class of insulation				
10.6	Rated output	VA			
11.0	INSTANTANEOUS OVERCURRENT RELAY				
11.1	Application (phase fault or earth fault)				
11.2	Make				
NOTES TO BIDDER			SIGNATURE OF BIDDER & DATE		
1 ITEMS WHICH DEVIATE FROM THE SPECIFICATION SHOULD BE MARKED WITHIN ASTERISK (*) AND DETAILS TO BE GIVEN IN SCHEDULE OF DEVIATIONS. 2 THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.			ISSUE R1		

SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION: D9
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET B 415V MCC	SHEET 8 OF 10
ENQUIRY/SPECIFICATION NO.:		BIDDER:

18.2	Type		
18.3	Applicable standard		
18.4	Accuracy class		
19.0	INDICATING LAMPS		
19.1	Make		
19.2	Type		
19.3	Voltage	V	
19.4	Series resistor	Ohms	
19.5	Wattage of lamp	W	
20.0	PUSH BUTTONS		
20.1	Make		
20.2	Type designation		
20.3	No of contacts:		
	i) Normally open		
	ii) Normally closed		
20.4	Contact rating	A	
21.0	SPACE HEATER		
21.1	Make		
21.2	Type		
21.3	Rated voltage	V	
21.4	Heater output for each vertical panel	W	
21.5	Thermostat at setting °C		
22.0	WIRING AND TERMINAL BLOCKS		
22.1	Voltage grade		
22.2	Insulation		
22.3	Minimum size of conductor for :		
	i) Power wiring	Sq.mm	
	ii) Control wiring	Sq.mm	
22.4	Type of terminal blocks :		

NOTES TO BIDDER 1 ITEMS WHICH DEVIATE FROM THE SPECIFICATION SHOULD BE MARKED WITHIN ASTERISK (*) AND DETAILS TO BE GIVEN IN SCHEDULE OF DEVIATIONS. 2 THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.	SIGNATURE OF BIDDER & DATE ISSUE R1
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SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION: D9
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATA SHEET B 415V MCC	SHEET 9 OF 10
ENQUIRY/SPECIFICATION NO.:		BIDDER:

	i) For withdrawable Type ii) For Fixed type		
22.5	Minimum current rating of terminal blocks	A	
22.6	Whether terminals for CT's have been provided with short circuiting facilities	YES/NO	
23.0	PUSH BUTTON STATION		
23.1	Metal Enclosure :		
	i) Die-cast aluminium/sheet metal of 2mm thickness ii) Degree of protection iii) Painting, inscription earthing terminals as specified	YES/NO	
23.2	Gland plate and cable glands provided	YES/NO	
22.3	Facility for fixing on wall/structure provided	YES/NO	
23.4	No. of Contacts : i) Normally open ii) Normally closed		
23.5	Contact rating : I) At 415 V AC ii) At 110 V AC iii) At 220 V DC	A A A	
23.6	Terminal blocks with identification nos.	YES/NO	

NOTES TO BIDDER 1 ITEMS WHICH DEVIATE FROM THE SPECIFICATION SHOULD BE MARKED WITHIN ASTERISK (*) AND DETAILS TO BE GIVEN IN SCHEDULE OF DEVIATIONS. 2 THIS DATA SHEET SHALL BE FILLED UP COMPLETELY AND A COPY SHALL BE ENCLOSED WITH EACH COPY OF THE BID.	SIGNATURE OF BIDDER & DATE
	ISSUE R1

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SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION: D9
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATASHEET-C 415V MCC	SHEET 1 OF 4

DATA TO BE FURNISHED BY THE CONTRACTOR AFTER AWARD OF CONTRACT

1.0 **OVERLOAD RELEASE**

(a) Characteristics

(b) Settings

2.0 **SINGLE PHASING PREVENTERS**

2.1 Make

2.2 Type designation

2.3 Rated voltage

3.0 **AUXILIARY RELAYS AND TIMERS**

3.1 Time delay range (for timers) Sec.

3.2 Resetting features

3.3 No. of contacts

3.3.1 Normally open/Normally closed

3.3.2 Contact rating A

4.0 **LIST OF DRAWINGS**

The VENDOR shall furnish the following drawings for each panel and switchgear.

4.1 Overall outline dimensions and general arrangement including plan, front elevation, rear & side elevations, clearances required in front and back, details of busduct connections, if any.

4.2 Switchgear layout plan including floor openings, fixing arrangements and loading details.

4.3 Schematic control diagrams to cover controls, protection, interlocks, instruments, space heaters, etc. for each type of module

ISSUE
R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION: D9
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATASHEET-C 415V MCC	SHEET 2 OF 4
4.4 4.5 4.6 4.7 (a) Detailed internal wiring diagram of each type of module, including terminal block numbers, ferrule numbers and the PURCHASER's external cable connection designations (b) Itemised bill of material for each module, listing all devices mounted and also otherwise furnished like cable glands, indicating the MANUFACTURER's type, rating, quantity & special notes, if any. Interpanel interconnection wiring diagram including terminal numbers and ferrule numbers Switch development diagrams Block Interlock Diagrams for I/C,B/C & Motor Modules of various types. ISSUE R1		

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION: D9
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATASHEET-C 415V MCC	SHEET 3 OF 4
5.7 Each type of protection relay and circuit breaker release characteristics <u>6 months</u> 5.8 Fuse characteristic curves for each type and rating of fuse <u>6 months</u> 5.9 Space heater ratings and numbers provided per cubicle and the internal distribution scheme for the same, for each switchgear <u>6 months</u> NOTES: (a) The VENDOR shall be entirely responsible for the correctness of the internal wiring diagrams mentioned against Item 5.4. (b) The VENDOR shall ensure that the characteristics of the CTs, fuses, protection relays, VTs and all other devices offered by him are such as to be suitable for the purpose for which they are intended. (c) The VENDOR shall plan his manufacturing schedule so as to allow atleast 4 weeks time for approval of the drawings after their receipt by the PURCHASER. 6.0 <u>TEST CERTIFICATES</u> 6.1 Type test certificates of all standard component parts, e.g. contactors, breakers, switches, fuses, relays, CTs, VTs, and for the standard factory built assembly shall be submitted by the VENDOR within 3 months from receipt of order. 7.0 <u>INSTRUCTION MANUALS</u> The VENDOR shall furnish specified number of copies of the instruction manual which would contain detailed instructions for all operational & maintenance requirement. The manual shall be furnished at the time of despatch of the equipment and shall include the following aspects : a) Outline dimension drawings showing relevant cross-sectional views, earthing details and constructional features. b) Rated voltages, current, duty-cycle and all other technical information which may be necessary for correct operation of the switchgear. c) Catalogue numbers of all components liable to be replaced during the life of the switchgear.		
		ISSUE R1

SPEC. NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME IV SECTION: D9
PART B	RRVUNL, 2 x 660 MW, Super-Critical TPS Stage- V, Unit # 7 & 8 at Suratgarh, Rajasthan DATASHEET-C 415V MCC	SHEET 4 OF 4
d) Storage for prolonged duration. e) Unpacking. f) Handling at site. g) Erection. h) Precommissioning tests. i) Operating procedures. j) Maintenance procedures. k) Precautions to be taken during operation and maintenance work.		
		ISSUE R1

SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME II SECTION – C 18
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan LIST OF SPARES	SHEET 55 OF 92

6.9.	Panel space heaters	2 nos.
6.10.	AC/DC switches	1 no.
6.11.	LV Fuse links	3 nos.
6.12.	Pressure Gauge & Switches	1 no.
6.13.	Transducers	1 no of each type
6.14.	Indicating Lamp	1 no of each type
6.15.	Gas filling equipment	1 no.
6.16.	Vacuum pulling equipment	1 no.
6.17.	150kg SF6 gas cylinder with gas filled	1 no.
6.18.	Contactors	2 nos. of each type
7.	415V Switchgear	
7.1.	Closing & tripping coils	4 sets of each type
7.2.	Fixed and moving contact assemblies of each breaker (4NC + 4NO)	2 sets of each type
7.3.	Spring charging motors	4 sets of each type
7.4.	Set of gasket	5 sets of each type
7.5.	Bus bar support insulators	10 nos.
7.6.	Aux. switch assembly ,limit position switches, Local/Remote selector switch, breaker control switches & other switches	5 nos. of each type
7.7.	Auxiliary Relays	5 nos. of each type
7.8.	Fuses of each rating (control)	5 nos. of each type
7.9.	Sliding Control connectors (Male & Female)	100 nos.
7.10.	Control Transformers	1 no. of each rating
7.11.	Sliding Power contacts	6 nos. of each rating

ISSUE
R1

SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME II SECTION – C 18
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan LIST OF SPARES	SHEET 56 OF 92

7.12.	Transducers	1 no. of each type
7.13.	Indicating Lamp	1 no. of each type
7.14.	Power contactor	4 nos. of each type and rating
7.15.	Push button	4 nos. of each type
7.16.	MCCB	4 nos. of each rating
7.17.	Interposing relay	10% of the quantity or min. 1 no. whichever is higher (applicable for each switchgear)
7.18.	Protection relay	1 no. of each make and type
7.19.	Breaker (complete) with trolley	1 no. of each make, type and rating
7.20.	Module	1 no. of each type and rating
7.21.	PTs	3 nos. of each rating
7.22.	CTs	3 nos. of each rating
7.23.	Auxiliary contactor	2 nos. of each rating
7.24.	Male/Female contacts	3 nos. of each type and rating
7.25.	Plug & socket assembly for control circuit	10 nos. of each type and rating
7.26.	Breaker handling trolley	2 nos. To handle each type and rating
7.27.	Power fuses	10 nos. of each type and rating
8.	Isolated Phase Bus duct (IPBD)	
8.1.	Bus support insulators	3% of each type
8.2.	Seal off bushing	1 no.
8.3.	HV fuse for PT	6 nos.
8.4.	Flexible connector for equipment connection	1 set
8.5.	Gaskets	1 set

ISSUE
R1

SPEC.NO. TCE.5750A-H-500-001	TATA CONSULTING ENGINEERS LIMITED	VOLUME II SECTION – C 18
	RRVUNL, 2 x 660 MW, Super-Critical TPS, Stage-V, Unit # 7 & 8 at Suratgarh, Rajasthan LIST OF SPARES	SHEET 67 OF 92

SL.	ITEM/DESCRIPTION	QUANTITY / UNIT (NOTE-1, 2)
3.2	Network Cards /Switches	10% for each type, size and range or minimum 2 no whichever is higher
3.3	Communication Interface Cards	10% for each type, size and range or minimum 2 no whichever is higher
3.4	All other electronic modules	10% for each type, size and range or minimum 2 no whichever is higher
3.5	Controller card (For Integrated Controller card) / Processor Module for Controller	2 nos.
3.6	I/O Cards (Each Type)	10% for each type, size and range or minimum 2 no whichever is higher
3.7	Interposing Relay	10% of total quantity
4.0	Panels, local panels, System /Marshalling cabinets	
4.1	Fuses	50 nos of each type and rating
4.2	Miniature Ckt. Breaker (MCB)	10 nos of each type and rating
4.3	Male/female parts of pre-fabricated cables	6 nos. of each type
4.4	Space Heater	10% for each type, size and range or minimum 2 no whichever is higher
4.5	Smoke Detector	10% for each type, size and range or minimum 2 no whichever is higher
4.6	Terminal Blocks	20% of total quantity.
4.7	Terminals in Terminal blocks	10 nos of each type
4.8	Cable clamps	5 nos of each type.
4.9	Blowers	1no
4.10	Cabinet Cooling Fans	4 nos. of each type,rating
5.0	Control valves and Pneumatic Block valves (for each type/model of Valve):	
5.1	Plug and steam assembly	1 no. of each type
5.2	seat ring	1 no. of each type
5.3	packing and gaskets	1 no. of each type

ISSUE
R1