2X800MW NTPC SINGRAULI STPP STAGE – III

TECHNICAL SPECIFICATION
FOR
LT SWITCHGEAR

SPECIFICATION No. PE-TS-512-506-E002
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BHARAT HEAVY ELECTRICALS LIMITED
POWER SECTOR
PROJECT ENGINEERING MANAGEMENT
NOIDA, INDIA

INDEX

PROJECT INFORMATION

SL.NO	DESCRIPTION	DETAILS
1	**METEOROLOGICAL DATA**	
1.1	MAXIMUM MEAN TEMPERATURE	45.1°C
1.2	MINIMUM MEAN TEMPERATURE	4.0°C
1.3	MAXIMUM RELATIVE HUMIDITY	83
1.4	MINIMUM RELATIVE HUMIDITY	21
1.5	AVERAGE ANNUAL RAINFALL	1199.5mm
1.6	SEISMIC ZONE (AS PER IS 1893)	II
1.7	HEIGHT ABOVE MSL	272M
2	**ELECTRICAL DATA**	
2.1	AMBIENT TEMPERATURE FOR DESIGN OF ELECTRICAL EQUIPMENT	50 Deg C
2.2	RATED FREQUENCY	50Hz
2.3	FREQUENCY VARIATION	+/- 5%
2.4	AC VOLTAGE	415V, 230V, 230V (UPS), 110V
2.5	AC VOLTAGE VARIATION	+/- 10% for 415V
2.6	DC VOLTAGE	220V, 48V, 24V
2.7	DC VOLTAGE VARIATION	+10% to -15% for 220V
2.8	FAULT LEVEL (KA/SEC)	i) 50KA for 1 sec for 415V system
		ii) 20KA for 1 sec for 220V DC
		iii) 20KA for 1 sec for 48V DC

SCOPE			
SCOPE OF THIS PACKAGE COVERS THE FOLLOWING:			
SL.NO	**PARAMETERS**	**REQUIREMENT**	**REMARKS**
1	SUPPLY INCLUDING DESIGN, ENGINEERING, MANUFACTURING OF	YES	
a)	MAIN SUPPLY	YES	
b)	COMMISSIONING SPARES	YES	
2	PAINTING	YES	
3	INSPECTION & TESTING	YES	
4	PACKING	YES	
5	TRANSPORTATION & DELIVERY TO SITE	YES	
6	ERECTION & COMMISSIONING	YES	COMMISSIONING of Numerical Relay, Ethernet Switch, IMCC, Y-Link, Wireless Temp. Monitoring System & HMI only
7	SUPERVISION OF ERECTION & COMMISSIONING	NO	
8	MANDATORY SPARES	YES	
9	O & M SERVICE	NO	
10	O & M SPARES	NO	

GENERAL TECHNICAL REQUIREMENT	
1.0	It is not the intent to specify herein all the details of design and manufacturing. Bidder shall ensure that the offered equipment confirms in all respects to high standards of design, engineering and workmanship.
2.0	Bidder shall also ensure that the offered equipment shall comply with all applicable statutory and regulatory requirements.
3.0	In the event of any conflict between the requirements of two clauses of this specification, documents or requirements of different codes and standards specified, the more stringent requirement as per the interpretation of the owner shall apply.
4.0	Drawing/document submission shall be through web based Document Management System(DMS) of BHEL. Bidder would be provided access to the DMS for drawing/document submission. Bidder to ensure internet connectivity of min speed of 2Mbps at their end.
5.0	Drawings/ documents submitted by bidder at any stage shall be complete in all respects. Any incomplete drawing submitted shall be treated as non- submission with delays attributable to bidder. For any clarification/ discussion required to complete the drawings, the bidder shall depute his personnel to BHEL / Customer's Office as per the requirement for across the table submission/ finalizations of drawings.
6.0	Latest codes and standards shall be complied with.
7.0	Successful Bidder shall submit attached Quality Plan on compliance route for BHEL/ End customer's approval during contract stage.
8.0	Inspection / testing shall be witnessed as per the quality plan apart from review of various test certificates/ Inspection records etc. There shall be no techno-commercial implication to BHEL on account of Quality plan approval.
9.0	Successful bidder shall furnish their sub-vendor list as annexure to quality plan which shall be subject to BHEL / Customer approval without any techno-commercial implication to BHEL.
10.0	In case, the bidder is sourcing the item/any component from outside India, the third party inspection shall be arranged by bidder at their cost and shall be deemed to be considered by the bidder in their offer.
11.0	Nameplates shall be manufactured from stainless steel or aluminium with a matte or satin finish, and engraved with black lettering or Anodized Aluminium name plates of black background with laser engraving of a minimum 6 mm height or as per equipment standard whichever is higher. Anodized Aluminium name plates with black background with laser engraving.
12.0	Equipment must be safe, reliable and easy to maintain at all operating condition.
13.0	**SWITCHBOARDS**
13.1	All switchboards shall be of double front, draw out, complete closed-door operation, metal enclosed, indoor, floor-mounted, free-standing type of bolted design. Entire bus bar system shall be insulated with PVC sleeves (UL 224). Cable terminations located in cable alley shall be designed to meet the Form IVb (as per IEC 60439) for safety purpose. All switchboards shall be divided into distinct vertical sections (panels), each comprising of the following compartments:
a)	**BUSBAR COMPARTMENT -** A completely enclosed bus bar compartment shall be provided for the horizontal and vertical bus bars. Bolted covers shall be provided for access to horizontal and vertical busbars and all joints for repair and maintenance, which shall be feasible without disturbing any feeder compartment. Auxiliary and power bus bars shall be in separate compartments. *All moving and fixed contacts of each draw-out modules must be of rating more than 150%+ of MCCB/MPCB mounted inside the module. Each phase of vertical busbars shall be separated by phase barrier and same shall be sleeved (UL-224).* Two separate sets of vertical busbars shall be provided in each panel of double front MCCs / DBs. Interleaving arrangement for busbars shall be adopted for switchboards with a rating of more than 1600A.
b)	**SWITCHGEAR / FEEDER COMPARTMENT -** All equipment associated with an incomer or outgoing feeder shall be housed in a separate compartment of the vertical section. Two-tier breaker arrangement in a vertical section shall be offered for outgoing breaker feeders of rating up to 1600A. Fixed part of vertical busbar and moving part of draw-out modules for power connection shall be of Silver/Tinned plated Copper only. No live parts shall be accessible with equipment drawn out. The Module compartment door shall have external padlocking facility with MCC frame/fixed structure. The MCC module will have a hole with a grommet on side plate of the module truck for taking Profibus DP connector with 2 nos. armoured profibus DP cables from Cable alley to IMC's profibus DP port for making daisy chain connection of IMCs. Alternatively, good quality Secondary Isolating Contacts (SICs) can be offered for Profibus DP communication port connection & isolation between moving & fixed parts of MCC. A separate compartment shall be provided for relays and other control devices associated with a circuit breaker. For breaker controlled motor feeders, an aux. relay shall be provided for taking Local push button station (EPB) "normally open (NO)" contact input from field and provide potential free output to DDCMIS to avoid probable mixing of switchgear control voltage with DDCMIS 24V DC voltage. This aux. relay shall have 2NO+2NC contacts. Canopy shall be provided over EPB.
13.2	Wherever two breaker compartments are provided in the same vertical section, form 4B separation and separate vertical busbar chamber shall be provided. For Incomer panel suitable interlock shall be provided to prevent opening of rear cover, in case incoming supply is ON/Line is live and for Bus-coupler panel suitable interlock shall be provided to prevent opening of rear cover, in case either of the bus-section is in charged condition.
13.3	For modules of size more than 300 mm, symmetric guides not less than 4 nos shall be provided for smooth removal or insertion of module. All identical module chassis of same size shall be fully interchangeable without having to carry out any modifications.

GENERAL TECHNICAL REQUIREMENT	
13.4	Suitable interlock to be provided between incomer and bus coupler for non-breaker boards including DCDBs for prevention of opening of Incomer when the bus coupler is open and vice-versa.
13.5	All 415V air circuit breaker switchgear panels shall be of single-front type. All 415V Circuit breaker modules and other MCC modules shall be fully draw out type (Except module in ACDB, DCDB *& Solenoid Valve DBs*). All draw-out modules & Circuit Braker modules shall be provided with “Closed door operation” feature wherein movement of the module from “Isolated” position to “Test” position and to “Service” position & vice-versa and power ON / OFF operation of the module shall be possible only with the module door closed condition. All phases/neutral and control contact shall be intact while in service position. Degree of protection of the panel shall be maintained in “ Service”, “Test” and “Isolated” positions. Module door shall open only when module is in “Isolated” position and “Power off” condition. Interlock shall be provided to prevent the change of module state from “Isolated” to “Test” position and to “Service” position or vice- versa, if Main Switch/MCCB/MPCB of the module is kept in ON condition. All the modules shall be of standard width only and no half width, quarter width etc sized modules shall be acceptable. It shall be possible to pad lock the module door irrespective of state of module i.e. “Service”, “Test” or “Isolated”. Module Operated Automatic safety shutter shall be provided to cover all the live power terminals, in case the module is taken out from the panel. Two (2) nos of Dummy modules of each size to fill in module being taken out for maintenance purpose shall be provided in each switchgear room, in case module door is part of module. These Dummy Modules shall be fitted in switchboard as vacant modules having no cut out on back side and cable alley side. In case door is hinged to the panel, 2 nos of blanking plates of each size need to be provided. Minimum 10mm of gap shall be ensured between busbar and moving power contact tips while module is in “Test” position to ensure user safety (Refer Annexure-3 for calculating number and type of dummy modules to be supplied).
13.6	Interlock mechanism shall be provided with the voltage monitoring such that, it should not be possible to open the rear door of incomer and bus coupler modules when the incoming power source is in live condition. In case of any bypass/overriding of this interlock, appropriate hooter at local and alarm to DCS shall be provided.
13.7	Circuit-breaker cubicles shall be provided with safety shutters operated automatically by the movement of the circuit breaker carriage, to cover the stationary isolated contacts when the breaker is withdrawn.
13.8	The compartment door of fixed type modules shall be interlocked to prevent opening while the MCCB/MPCB is in “ON” condition.
13.9	The Bidder shall provide adopter panel/ dummy panel required to meet various configuration / arrangement of busbars.
13.10	Cable alley door should be hinged at minimum 3 position. Panel space heater and plug & socket (As per Module PNL SP HTR mentioned in Module wise BOM) to be provided in cable alley of each vertical.
13.11	All power and control cable inside the modules shall be neatly dressed.
13.12	Control and communication cables inside the modules shall be separate and should be terminated at separate terminal blocks.
13.13	Power contactors/ Isolators should be securely mounted inside panel to prevent its vibration during operation.
13.14	All components mounted in switchborad shall be accessible and shall not obstruct access to wiring, terminals or components. Maintenance and inspection shall be possible in any individual unit without affecting other units.
13.15	Negative Bus of DCDB between two bus section should be shorted to avoid double voltage formation.
13.16	Each cubicle shall be provided with suitable base channels for direct bolting to the foundation at site. All necessary galvanized bolts, nuts, washers etc. shall be supplied by the Supplier for installation of Cubicle at site.
13.17	Wireless temperature monitoring system to be provided and same shall be integrated to DDCMIS/ separate HMI. Temperature sensors shall be installed in all relevant joints, contact joints etc. as per the standard OEM Practice, however Position of such sensors shall be decided at the time of detailed engineering. This shall be provided for the following switchgears: Station Service Switchgear, Boiler PMCC, Turbine PMCC & Unit Emergency Switchgear. Bidder to consider complete monitoring system with transmitter, receiver and its connection upto Unitised HMI for LT Switchgear.
13.18	Width of Dummy panels may vary from 300mm to 600mm which shall be informed during detailed engineering.
13.19	Contactors shall be of 250% of motor FLC for fan and compressor application and 200% of motor FLC for other application.
13.20	Bottom most operable handle should be at least 300mm above FFL. Shrouding of at least 3mm thickness to be provided below the hanging portion of vertical busbars.
14.0	**PROTOTYPE PANELS**
	In order to establish the compliance with the requirements of this technical specification, prototype panels shall be made and offered for the BHEL/End Customer inspection and approval before the start of bulk manufacturing of panels for this project. The exact configuration of such prototype panels shall be finalized during detailed engineering. The switchgear shall be modified complying the observation marked during Prototype inspection (if any).

GENERAL TECHNICAL REQUIREMENT	
15.0	**INTELLIGENT MOTOR CONTROLLER (IMC)**
15.1	Profibus DP based IMC is envisaged which is to be interfaced to the fieldbus based DDCMIS on Profibus DP protocol. The complete monitoring and control along with detailed diagnostics of IMC shall be provided by the bidder. For interface with DDCMIS, IMC modules in a Profibus DP segment shall be connected to Y link with single cable in daisy chain fashion using PG/PG connectors. All the Profibus DP cables (the looping cables from the Y-links to the IMC modules) are in the scope of bidder. The Profibus cables shall be neatly dressed & connected on MCC Modules in MCC/SWGR rooms. The total no. of IMC modules in one Profibus DP segment and their response time shall be governed by Process requirement and other relevant clauses. The same shall be finalized during detailed engineering and submitted to the Employer for prior approval before implementation. Necessary support along with required software and hardware accessories shall be provided by the bidder to BHEL while integration of IMCs with DDCMIS. The connection/looping/ interface of IMC with DDCMIS shall be as per Compliance Drawings_ Annexure-2 (Typical IMC Network Architecture).
15.2	All requisite hardware & software for seamless integration and interface of Profibus DP based IMC modules with fieldbus based DDCMIS system, even if not explicitly indicated in the Technical Specifications are to be supplied and engineered.
15.3	The IMC shall be able to perform its functions without fail inside MCC modules which are kept in non-AC normal ventilated Switchgear rooms of the power plant.
15.4	Electronic modules of IMCs and other associated electronic modules shall be G3 / GX compliant with Conformal protective coating in line with ISA S71.1/ Class 3C3 (3C4) in line with IEC 60721-3-3 for protection against air pollution and harsh environments. The conformal coating version shall be a standard product from the manufacturer's factory. The hardware that is being conformal coated locally shall not be acceptable.
15.5	Intelligent Motor Controller (IMC) shall provide protection, metering, control, monitoring and historical logging for 1ϕ and 3ϕ AC induction motors using integral current transformers (CTs) or external CTs and line-line voltages (415V). The IMC should conform to IEC-60947-4-1 and 60947-8 for overload protections.
15.6	All active electronic components / modules like OLMs / Y-links etc. required for the interface of Profibus based IMCs with DDCMIS system to be installed in the CER / MCC /RIO room, shall be powered by redundant 24V DC feeders. Redundant feeder shall be provided by BHEL at Y-Link.
15.7	The loss / power supply failure of any IMC shall not disrupt the network including the last IMC module in the segment. To meet this functional requirement any additional component / power supply shall be provided by the bidder.
15.8	Voltage measurement input of IMC shall be capable of taking 415V directly from line & no voltage transformer (VT) should be required.
15.9	The IMC shall be pre-programmed with basic software based on all type of feeders in bidder's scope. The fine tuning/ limit values shall be done at the time of commissioning of the PMCC/ MCC panels.
15.10	The IMC shall have following protection functions, control functions and other operation & diagnostic features but not limited to these:

GENERAL TECHNICAL REQUIREMENT				
	a) PROTECTION FUNCTIONS i) Overload (I^2t) Protection with site selectable Trip class 5 to 30 ii) Current imbalance iii) No. of starts/hr limitation iv) Stall Protection during start v) Load Jam protection during running	**b) CONTROL FUNCTIONS** i) Close / Trip Command ii) Reversing starter	**c) The IMC will have standard function control blocks for various functions:** i) Watch dog facility ii) Ready to start iii) External wiring iv) Emergency stop v) External check-back signal vi) DP fault vii) Test 1 with shut-down viii) Test 2 without shut-down ix) Reset	**d) OPERATING AND DIAGNOSTICS DATA** The IMC shall continuously monitor and provide the following data for display (local / remote)- a) For DK2/DN1/HTR module: i) 3-Phase currents ii) Motor ON / OFF status iii) Motor Fault / Switchgear Disturbance iv) Overload trip status v) Overload alarm status vi) Operating hours vii) Number of switching operations viii) Number of overload trips ix) At least last 5 trip data with time stamping in non-volatile memory of IMC in FIFO sequence b) For DK21 module: In addition to the above for DK2 module, following measurement data shall also be provided. x) 3 Phase Voltages xi) 3 Phase Power xii) 3 phase Energy
15.11	Supplier shall provide complete list of data items available for cyclic and acyclic data communication on Profibus DP for DDCMIS interface and diagnostics.			
15.12	**Configuration / programming:** i) IMC shall be programmable from IMC's HMI, PC (laptop) and DDCMIS. ii) IMC shall be configurable to operate as an overload relay iii) Digital outputs shall be potential free and independent, each output shall be connectable to different field voltages iv) All licensed software required for configuration / programming / parameterization / fault diagnostics of IMCs along with software licenses shall be supplied as a part of the package. v) All interface files like DTM & GSD files shall be provided for interfacing IMCs with DDCMIS.			
15.13	**User Interface:** i) Local HMI shall be provided with each IMC. The HMI shall be mounted on front of the MCC module for easy access to the operator to view measurement parameters & fault/trip status. ii) HMI shall have the capability of uploading / downloading parameters to IMC. iii) The address & other communication parameters shall be configurable from HMI. iv) HMI shall be internally powered by IMC and no additional power supply shall be required. Simple cables with RJ45 connectors or RS232 connector or USB cable shall be sufficient for connection to IMC. IMC shall have dedicated port for connection to IMC's HMI/PC(laptop). v) HMI shall have the simple text display in English. vi) HMI shall have operate / reset buttons. vii) HMI shall display the operating data, status, faults, counters & warnings information.			
15.14	The total no. of IMC modules in one Profibus DP segment and their response time shall be governed by Process requirement. The same shall be finalized during detailed engineering and submitted to the customer for prior approval before implementation.			
15.15	Profibus cable shall be routed in a separate pre-fitted closed PVC tray inside MCC panels. The tray shall be located in such way that interference due to 220V DC/110V AC/240V AC available in Switchgear/MCC panels can be minimized on Profibus cables.			
15.16	Supplier to ensure training of Customer's representatives by IMC OEM regarding Familiarisation of IMCC and its Interface with DCS. Further, IMC OEM shall also give training at End Customer's site regarding Operation & Maintenance of IMCC and its interface with DCS.			
15.17	Bidder to provide one no. of each type of IMC module along with Y-Link to BHEL on returnable basis & coordinate with BHEL for conducting FAT for IMC as per customer satisfaction.			
16.0	**NUMERICAL RELAY**			
16.1	**PROVEN TRACK RECORD FOR NUMERICAL RELAYS & NETWORKING**			

GENERAL TECHNICAL REQUIREMENT					
	a) Bidder/ Sub Vendor should have manufactured, supplied and successfully configured at least one hundred (100) numbers of Numerical Relays with IEC 61850 used for application in Feeder Protections/Transformer Protections/Motor protections. These relays should have been in successful operation for at least two (2) years. **And** b) Bidder/ Sub Vendor should have manufactured/ integrated and successfully done Site Acceptance Test (SAT) for a network on IEC 61850 with at least one hundred (100) numbers of Communicable Numerical Relays.				
16.2	**SWITCHGEAR NUMERICAL RELAY NETWORKING**				
	The typical configuration of such a proposed system is as per the enclosed Compliance Drawings_Annexure-1 (Typical Switchgear Relay Network Architecture). The numerical relay network shall include relays on all LV switchgears being supplied under this package. Each ring network shall consist of switchgear level Ethernet switches connected through Fibre Optic cable and subsequently connected to Network Level Ethernet Switches (L3 Level) placed in main plant control equipment room (CER). Port requirement in Network Level ethernet switch (L3 Level) for DDCMIS interface shall be furnished by BHEL/Customer during detail engineering.				
16.3	**SYSTEM PERFORMANCE REQUIREMENTS**				
a)	**Latency:** The system shall be so designed and implemented as to provide data transfer speeds prescribed by IEC 61850-5.				
b)	**Reliability:** All components shall be designed and configured to make the system highly reliable. Failure of any component shall be immediately announced and wherever possible, the system shall be made self-healing.				
c)	**Diagnostic tools:** The system shall have necessary diagnostic tools to continuously monitor the system performance and provide feedback to the operator / engineer. Necessary software tools to track changes in the system shall be provided.				
16.4	**GENERAL REQUIREMENTS**				
a)	Numerical Relays shall have appropriate setting ranges, accuracy, resetting ratio, transient overreach and other characteristics to provide required sensitivity for the intended application.				
b)	All numerical relays shall be capable of satisfactory continuous operation between 80-120% of the rated voltage.				
c)	Threshold voltage for binary inputs shall be suitably selected to ensure avoidance of mal operation due to stray voltages and preferably shall be more than 70% of the rated control supply voltage.				
d)	All IEDs shall have freely programmable optically isolated binary inputs (BI) and potential free binary output (BO) contacts, the quantity of which shall be adequate to realize the associated interlocks / feedbacks. At least 2 binary inputs (BI) & 2 binary outputs (BO) shall be kept as Spares for End Customer's future use. The required no of IO's can be achieved through external I/O device of same make complying the requirement.				
e)	Failure of a control supply and de-energization of a relay shall not initiate any circuit breaker/ vacuum contactor operation.				
f)	Disturbance Record waveforms, event records & alarms shall be stored in Non-volatile memory and failure of control supply shall not result in deletion of any of these data.				
g)	The supplier shall be responsible for providing adequate and co-ordinated scheme of protection in his equipment. The protective devices shall be selectively co-ordinated and range and settings so selected to have a good down stream discrimination as well as quickest possible circuit isolation in case of fault.				
h)	All the numerical relays shall have communications on three ports, one local front port communication to laptop and two rear port on IEC 61850 to communicate with the DDCMIS through LAN.				
i)	All Numerical relays shall have features for electrical measurements including voltage, current, power (active & reactive), frequency, power-factor and energy parameters. All numerical relays shall have provision of both current (CT) and voltage (VT) inputs. Relays shall be suitable for both residually connected neutral CT input as well as CBCT input. All CT terminals on the relays shall be of fixed type suitable for connection of ring-type lugs to avoid any hazard due to loose connection leading to CT open-circuit. In no circumstances Plug In type connectors shall be used for CT / VT connections. Relays shall be suitable for CT secondary current of 1A.				
	DAET (LT Incomer)	5CT	3-Ph, 1 REF, 1 Spare		
	DAE (Buscoupler, Tie)	4CT	3-Ph, 1 Spare		
	DM (ACB Controlled Motor)	4CT	3Ph, 1 Spare		
j)	Relays used in incomers, ties and bus couplers shall have provision of two sets of voltage inputs (3 Nos for bus voltage & 1 No. for line voltage) for the purpose of synchronization.				
k)	All numerical relays shall have key pad / keys to allow relay setting from relay front. Pre-programmed or programmable key for Master trip (86) reset shall be provided on the relay front.				
l)	Relays shall have suitable output contact for circuit breaker failure protection (CBFP). Relays shall have self diagnostic feature with continuous self check for power failure, program routines, memory and main CPU failures and a separate output contact for indication of any failure.				
m)	Relays shall have at least two sets or groups of two different sets of adaptable settings. Relays shall have multiple IEC / ANSI / user-programmable characteristics. Design of the relay must be immune to any kind of electromagnetic interference. All cards/ hardware of numerical relays shall be suitable for operation in Harsh environmental conditions with respect to high temperature, humidity & dust. Relays of each type / model shall be supplied with same Firmware / Software version for the complete package.				
n)	Supplier to prepare & submit Relay Network Scheme and Mimic document for Relay Network architecture for helping DDCMIS supplier (i.e. BHEL) to create the dynamic/static mimic in DDCMIS for Network monitoring.				

GENERAL TECHNICAL REQUIREMENT	
o)	The IP address for the Numerical Relays & SNTP address shall be furnished by customer during detailed engineering. The required .ICD / .CID files of the Numerical relays configured with unique IP address, SNTP address & unique logic device name under LV Switchgears for integration with DDCMIS shall be provided by supplier along with necessary engineering support as and when required during detailed engineering.
p)	The integration of Switchgear Relay Network with Switchgear DDCMIS (supplied by customer) shall be finalized in consultation with the Switchgear DDCMIS supplier i.e. BHEL EDN Bangalore and the same shall be tested as a part of Major Design Feature testing with a prototype system of the offered Switchgear relay Network system, at the works of the DDCMIS supplier i.e. EDN Bangalore or any other place approved by customer.
q)	During the Factory Acceptance Test (FAT) of the DDCMIS, Relay & Ethernet Switch supplier will arrange a prototype ring with at least three ethernet switches at switchgear level (L2) with one numerical relay of each type and L3 Switches network, at the works of the DDCMIS supplier along with the relay configuration engineer and necessary engineering support. Exact test setup shall be finalized during detailed engineering.
r)	Numerical relays are to be configured with two datasets. One dataset for Analog data & the other dataset for Binary data. Analog dataset shall be assigned for two no's of un buffered Report Control Block and Binary dataset shall be assigned for two no's of Buffered Report Control Block.
s)	Numerical relay configuration for all relays being supplied under the package shall be carried out in line with the approved schematics and shall be submitted for approval. Setting calculations and relay settings configured in relay software for all relays shall be submitted for approval. Approved relay configuration / settings files shall be loaded in all the relays prior to dispatch to site.
t)	Relay shall be immune to capacitance effect due to long length of connected control cables. Any external hardware, if required for avoiding mal operation of the relay due to cable capacitance shall be included as a standard feature.
16.5	**PROTECTION & CONTROL FEATURES**
a)	Control of breakers shall be carried out from DDCMIS through hardwired control commands in the form of 24V DC signal. All close and trip commands from DDCMIS shall be hardwired through separate coupling relays to BI of numerical relays in form of 220 V DC signal.
b)	Trip circuit supervision shall be provided for all feeders to monitor the circuit breaker / contactor trip circuit both in pre-trip and post-trip conditions.
c)	Schematics requiring auxiliary relays / timers for protection function shall be a part of numerical relay. The number of auxiliary relay and timer functions shall be as required for the application. Timer functions shall be configurable for on & off delays as per requirement.
d)	The numerical relay shall be able to provide supervisory functions such as trip circuit monitoring, circuit breaker status monitoring, VT and CT supervision.
e)	The numerical processor shall be capable of measuring and storing values of a wide range of quantities, all events, faults and disturbance recordings with a time stamping using the internal real time clock. Battery backup for real time clock in the event of power supply failure shall be provided.
f)	At least 200 time tagged events / records shall be stored with time stamping. Details of at least 5 previous faults including the type of protection operated, operating time, all currents & voltages and time of fault.
g)	Diagnostics Automatic testing, power on diagnostics with continuous monitoring to ensure high degree of reliability shall be provided. The results of the self reset functions shall be stored in battery back memory. Test features such as examination of input quantities, status of digital inputs and relay outputs shall be shall available on the user interface.
h)	20 Signals (both Analog & Digital) from each relay shall be communicated to DDCMIS on IEC 61850 protocol. Supplier to furnish mapping details of each relay for all signals. Mapping document (IO list) shall be furnished by customer during detail engineering.
i)	Sequence of events shall have 1ms resolution at device level.
j)	Measurement accuracy shall be 2 % for rated RMS Current and voltage.
k)	It shall be possible to carryout open / close operation of breakers from a laptop by interfacing from the relay front port during initial commissioning.
l)	All motor feeders(>30KW) shall have 4-20 mA analog output (current signal) for use in control logics in DDCMIS or for information in DDCMIS.
m)	GOOSE Controls shall be configured in the Numerical Relays for following functions. The response time of GOOSE interlocks shall be 10 ms. (GOOSE Performance Class P1, Message Type 1A) - (a) Inter tripping (b) Reverse Blocking including Hard wiring (c) Earthing Interlocks
17.0	**ETHERNET SWTICHES AND ETHERNET SWITCH BOX**

GENERAL TECHNICAL REQUIREMENT	
17.1	Ethernet switches shall be 'substation hardened',19" rack mounted and shall comply with IEC-61850 for communications and environment requirements. The Ethernet switches shall be of Layer 2 & managed type with four (4) Nos of Fibre Optic ports fully populated with SFP modules and Sixteen(16) / Eight(8) Copper ports to achieve the LAN configuration indicated in the drawing. These switches shall be mounted inside the switchgear panels and shall be suitable for accepting dual redundant power supplies. The FO ports shall be Single mode 1000Mbps ports. Copper ports shall be 10/100Mbps ports. The switch shall support RSTP/MSTP. The Ethernet Switch shall have feature of MAC binding per port and IEEE 801.1X radius Authentication for Port Security. Switch shall have feature to monitor the Port status over Modbus/SNMP Protocol & Port Configuration through Web Interface. Power supply arrangement for all the ethernet switches shall be in Supplier's scope.
17.2	Necessary software for configuration and real-time network monitoring shall be provided along with the Ethernet switches. Stabilized network ring architecture should be established in all aspects considering network redundancy as per project requirement. Suitable software for Network monitoring shall be integrated with the HMI (Switchgear EWS) to provide complete network status.
17.3	Cat5e/Cat6 Ethernet cable / FO cable shall be used for connecting the Numerical Relays to Ethernet switches in all Switchgears. If FO cable are used then numerical relays & Ethernet switches shall also have suitable FO ports. Further, additional FO patch cords of maximum length (quantity – 10% of total quantity of IEDs) shall be supplied to facilitate maintenance. Optical Fibre Cable termination equipment such as LIU, patch cord, etc. for the seamless network shall be provided by bidder. Minimum FO ports quantity on Ethernet switch shall be as per clause 17.1 above.
17.4	The Fibre Optic cable shall be armoured, Single-mode, graded index OMI (ISO/IEC 11801) of Diameter 125µm core / cladding with max attenuation of 1.52 dB/km at 1310nm wavelength & 1.0 dB/km at 1550nm wavelength. The cable should be suitable for operation at 1310/1550nm. The outer Sheath / Jacket of the FO Cable shall be Fire retardant.
17.5	The numerical relays & Ethernet switches being installed at switchboard shall be suitable for auxiliary power supply 220V DC with tolerance of 80% to 120 % of rated voltage & shall be finalized during detailed engineering. Ethernet switches shall have provision to receive dual redundant power supplies.
17.6	IEC 61850 Ethernet switches in Switchgear panels – Sufficient quantity of Ethernet switches as per requirement for all boards under bidder's scope. At least 2 ports per switch shall be kept as spare ports.
17.7	All the ethernet switch (at L2 & L3 level) shall be rack mounted. The racks shall be supplied by supplier.
17.8	Ethernet Switch Box shall consist of the following: (a) Two nos. Ethernet switches (layer-3) at network level for Ring formation and taking data from Numerical relay network (IEC-61850) and providing to DDCMIS(IEC-61850). (b) At least 2 Nos (1 working + 1 standby) ventilation fans with monitoring. (c) Arrangement for receiving and distributing auxiliary power supply to various equipment/ circuits along with monitoring devices for incoming power supply. (d) 1 LED light +1 Power Socket with Switch. (e) Any other equipment/ device necessary for completeness of the system.
18.0	**PROTECTION CO-ORDINATION**
	Each motor/heater feeder shall consist of MPCB/MCCB (with S/C release only), Power contactor & intelligent motor controller (IMC) to ensure Type-2 Co-ordination.
19.0	**HMI (SWITCHGEAR ENGINEERING WORK STATION) AND LAPTOP**
19.1	All the HMI PCs being offered in the system shall be industrial grade PC and as per the latest available configurations as on the date of bid opening. The minimum storage capacity shall be 1 TB, minimum RAM shall be 16GB and processor shall be I7/ equivalent or higher. Screen size shall be minimum 24 inches. Operating system of the HMI shall be 64-bit Windows Professional/ Enterprise version and necessary application software such as relays configuration & setting software, Disturbance record analysis software, Relays IEC 61850 configuration software, Ethernet Switches configuration software, Anti-virus software, etc shall be installed in the HMI. All HMI shall be provided with other required accessories like Keyboard, mouse etc.
19.2	Switchgear Engineering Work Station will be provided with Laser printer & connected to the relay network through Network level switches for online configuration/setting change of relays & ethernet switches. Automatic downloading and saving of the disturbance records & event files from relays through automatic DR download software tools provided by the relay vendors shall also happen in this HMI.
19.3	Licensed software for automatic downloading & saving of Disturbance records and Event records from Numerical relay to Switchgear Engineering works stations (EWS) shall also be provided & installed in HMI (Switchgear EWS).
19.4	Laptops shall have same hardware configuration and software as for HMI PC except screen size which shall be 14 inches.
19.5	Laptops shall be supplied complete with following accessories: • carrying case, • 240VAC adaptor, • Communication cord with port converter (if required) for relay communication.
19.6	HMI console (furniture i.e. Table with drawer & chair) shall be provided for each HMI. The console shall have space for keeping an additional PC.
20.0	**SYSTEM SOFTWARE REQUIREMENTS**

GENERAL TECHNICAL REQUIREMENT	
	The bidder shall provide all licensed software packages required by the system for meeting the intent, functional and parametric and performance requirements of the specification. All licenses (except anti-virus which shall be valid for 3 years from the date of takeover by the end customer) shall be valid for the continuous service life of the plant.
21.0	**SYSTEM SECURITY**
21.1	Security features shall be provided for Identification and authentication control at each level for safeguarding against unauthorized access. The bidder shall provide software locks / passwords to the Employer's engineers at site for all operating and application software at all levels.
21.2	Security Audit for Switchgear Relay Network shall be done as defined in Security Policies/Procedures and Security Audits mentioned below by BHEL. Suitable actions based on the findings of the security audit shall be carried out by the relay/ Ethernet switch/ LT switchgear supplier.
22.0	**SECURITY POLICIES/PROCEDURES AND SECURITY AUDITS**
22.1	In order to enforce network security in the Switchgear Relay network integrated to the Switchgear DDCMIS, security policies and procedures are to be followed by the bidder. For checking compliance to the above security policies & procedures, periodic security audit by a certified auditor (as per CERT-IN panel or CERT of country of origin of DDCMIS supplier (BHEL)) will be arranged during ATST, at the time of trial operation and every year during AMS period. However only during ATST, the security audit for Switchgear Relay network integrated to the Switchgear DDCMIS shall be done on prototype ring during Station LAN FAT. At the time of trial operation and every year during AMS period, the security audit for Switchgear Relay network shall be carried out on the actual installation at site. This shall include vulnerability assessment of the workstations/ servers and penetration testing of the Station LAN through the firewall from a node outside the network. It may be noted that following policies/procedures are only the operation guidelines and advisory steps to ensure maximum data security. The following security policies shall be followed. Details of the same shall be provided during detailed engg. 1. Information Security Policy a) Information Security Team Policy b) Firewall Policy c) Information Identification and Classification Policy d) Security Policy Review Policy e) Information Labelling and Handling Policy f) System Planning and Acceptance Policy g) Capacity Management Policy h) Media Handling Policy i) Information Security Awareness Policy j) Third Party Access Policy k) Change Control Policy l) Anti Virus Policy m) System Access Policy n) Monitoring Policy o) Incident Handling Policy p) Information Backup and Restoration Policy q) Network Access Policy r) User Access Management Policy All the above is in the scope of BHEL and included in the specification for system clarity only. However, based on the findings of the security audit, any material (i.e. cards/ modules/ peripherals/ cables/ components etc.) required for the above which is part of supply of vendor will be part of AMC. The security policies/procedures envisages formation of an Information Security team which shall comprise of Supplier's personnel deputed at site during tenure of the contract. All the responsibilities of information security team have to be discharged by supplier's team during tenure of the contract.
23.0	**TIME SYNCHRONIZATION**
	RTC of Numerical relays, Ethernet Switches, HMI, etc shall be time synchronized with plant clock of upstream system on SNTP or IRIG-B (to be decided during detailed engineering).
24.0	**CABLE TERMINATION**
24.1	Cable termination compartment and arrangement for power cables shall be suitable for heavy duty, 1.1 kV grade, stranded Aluminium conductor, PVC/ XLPE insulated, armored / unarmoured and PVC sheathed cables. All necessary cable terminating accessories such as Lugs, Glands, supporting clamps and brackets, hardware etc. for cables shall be provided by the supplier to suit the final cable sizes.

GENERAL TECHNICAL REQUIREMENT	
24.2	Cable shall be terminated using double compression type cable glands. Testing requirements of Cable glands shall conform to BS:6121 and gland shall be of robust construction capable of clamping cable and cable armour (for armoured cables) firmly without injury to insulation. Cable glands shall be made of heavy duty brass machine finished and nickel chrome plated. Thickness of plating shall not be less than 10 micron. All washers and hardware shall also be made of brass with nickel chrome plating. Rubber components shall be of neoprene or better synthetic material and of tested quality. Cable glands & heavy duty lugs of BHEL approved make for external power & control cable connection and termination at supplier supplied equipment's end shall be in the scope of supplier. Further grounding bolts for connection to earth flat shall be in the scope of supplier.
24.3	It shall be preferred to follow a standardization of Terminal Numbers across all LV Modules for ease of Interconnection and maintenance as per Compliance Drawings_Annexure-4 (Scheme).
24.4	Terminal Points of Supply:
a)	Cable/Busduct termination compartment of PCC/PMCC/MCC
b)	Termination at multi-way terminal board for control cables.
c)	Scope and terminal points for interface between Numerical Relays and DDCMIS shall be as per Compliance Drawings_ Annexure-1 (Typical Switchgear Relay Network Architecture). All necessary hardware and software required to ensure the successful installation, testing, and commissioning of the supplier's supplied system will be the responsibility of the supplier. The supplier is required to provide the necessary support to establish seamless communication on IEC 61850 between the DDCMIS and network level (L3) ethernet switch as and when required.
d)	Scope and terminal points for interface between IMC and DDCMIS shall be as per Compliance Drawings_ Annexure-2 (Typical IMC Network Architecture). All necessary hardware and software required to ensure the successful installation, testing, and commissioning of the supplier's supplied system will be the responsibility of the supplier. The supplier is required to provide the necessary support to establish seamless communication between the DDCMIS and the Y-Link as and when required.
25.0	**DERATING OF EQUIPMENTS**
	The supplier shall ensure that the equipment offered will carry the required load current at site ambient conditions specified and perform the operating duties without exceeding the permissible temperature as per Indian Standards / Specification. Continuous current rating at 50°C ambient in no case shall be less than 90% of the normal rating specified. The supplier shall indicate clearly the derating factors if any employed for each component and furnish the basis for arriving at these derating factors duly considering the specified current ratings and ambient temperature of 50°C.
26.0	**RELAY TEST EQUIPMENT**
26.1	The required relay test equipment shall comprise the following: (a) One 3 phase (4 Voltage and 6 current sources) dynamic portable relay test system for allowing dynamic and steady state testing. (b) Any other auxiliary items required for comprehensive protection testing all types of the protection relays supplied under this contract.
26.2	It shall have the capability to replay the Disturbance / Fault records acquired by the numerical relays in IEEE / COMTRADE format or EMTP simulations, to facilitate dynamic testing of all the numerical relays supplied under this contract. The required software for steady state/dynamic testing of all the numerical protection relays along with a laptop dedicated for the testing shall also be supplied. The relay test set shall be suitable for IEC 61850 compliance testing with required no. of RJ45, FO and USB Ports. The test set shall have min 8 nos. (GI) binary inputs and 4 nos. (GI) binary outputs. The associated software for automated relay testing and IEC61850 GOOSE/GSSE Configuration shall also be supplied.
27.0	**SPARE MODULE REQUIREMENT**
	a) Spares (MCCB Modules less than 100A and MPCB Modules): All Switchgears, Motor Control Centers (MCCs) & AC/DC distribution boards, etc. shall have at least twenty per cent (20%) or minimum two (whichever is higher) fully equipped MCCB/ MPCB modules of each rating as spares which shall be uniformly distributed over different vertical sections. **b) Spares (MCCB modules—100A and higher—Starter/DAE-OG/DM Modules):** In addition, all Switchgears, MCCs and AC distribution boards shall have as spares at least twenty per cent (20%) of starter modules/MCCB/ DAE-OG/DM modules or at least one module (whichever is higher) of each rating range of the selection table, equipped for the rating of the largest auxiliary fed from that range. However, the same is already considered in the Board wise BOM (Annexure-A.1 part of technical data Part-A).
28.0	**TRAINING**
	The Supplier shall arrange for training on system design, engineering, operation and maintenance of Numerical relays & Numerical relay Network system at the principal's facility and at site as follows:
28.1	**Training at principals works (Relay Manufacturer) in the following areas:**
a)	Basics of Feeder, Transformer and Motor Protection for IEC 61850 Numerical relay and detail discussion on functions available in the relays.
b)	Relay configurations and hands on practice of preparation of logic & settings, .CID files through relay software tools and relay GOOSE Logics.

GENERAL TECHNICAL REQUIREMENT	
c)	Interfacing / communication of relay with software: uploading / downloading of logic.
d)	Secondary injection testing of provided function blocks and guidelines for relay settings. DR downloading and analysis for Fault diagnostics.
e)	Common problems faced and trouble shooting.
	The Scope shall include providing training in the areas stated above for five (5) No Executives from Engineering, Site Erection and O & M for a duration of five (5) days. The cost of training including boarding & lodging and local transportation shall be in the Supplier's scope.
28.2	Training Workshop at Site:
a)	Workshop Training at site shall aim for familiarization of Site Engineers for commissioning and day to day O&M of Numerical Relays and Numerical Relay Network and trouble shooting.
b)	**The scope shall include Two No's of Numerical Relay and Numerical Relay Network workshops and Training for a batch of 20 Engineers at Project Site. One such Workshop shall be organized before the commissioning of First LV Switchboard and the Second workshop shall be conducted before Unit Commissioning.** **Customer shall provide the required Infrastructure such as Training Conference room, Projection systems etc.**
29.0	**RESPONSIBILITY OF THE ASSOCIATE/COLLABORATOR (APPLICABLE IF LT SWITHCHGEAR IS SUPPLIED THROUGH PRE QUALIFICATION REQUIREMENT: ROUTE-2):**
	The Associate/Collaborator (as applicable) for sourcing of LT Air Circuit Breaker shall be fully responsible and accountable for the item supplied and its compliance to the specification requirements. The Associate/Collaborator (with respect to his manufactured and supplied LT Air Circuit Breaker) shall: i) Participate in the Inspection of the LT Switchgears at Switchgear Supplier's Works, if required by End Customer. ii) Participate in Technical Co-ordination Meetings (TCMs) from time to time during detailed engineering, if required. iii) Participate in Site Testing and Commissioning of LT Switchgears, if required. iv) Participate/address/resolve the issues raised during Contract Execution Period.
30.0	Painting shade on exterior shall be RAL 9002 for complete panel except RAL 5012 for extreme ends and RAL 9002 for Mounting Plate & Trolley. Paint finish coat shall be minimum 50 microns (minimum total DFT shall be 100 microns). However, in case electrostatic process of painting is offered, minimum paint thickness of 50 microns shall be acceptable for finish coat.
31.0	Four (4) Nos. lifting lugs shall be provided for each shipping section, two (2) nos. on either end of the section. For each shipping section, the bus conductor shall be supported at minimum two positions.
32.0	All hardwares used for the panel manufacturing shall be zinc passivated with the Salt Spray life of minimum 120hrs.

	TECHNICAL SPECIFICATION LT SWITCHGEAR 2X800MW NTPC SINGRAULI STPP STAGE – III	PE-TS-512-506-E002
		Issue No: 01
		Rev. No. 00
		17.01.2026

TECHNICAL DATA PART - A

SL.NO	DESCRIPTION	UOM	DETAIL
1.0	**DESIGN CODES & STANDARDS**		
1.1	Low-Voltage Switchgear and Controlgear Assemblies General Rules		IEC: 61439
1.2	Colours for ready-mixed paints and enamels.		IS: 5
1.3	PVC insulated cables for working voltages up to and including 1100V		IS: 694
1.4	AC static watthour meters		IS: 13010
1.5	Electrical Indicating instruments		IS: 1248
1.6	Air-Break Switches, air break disconnectors, air break disconnector and fuse combination units for voltages not exceeding 1000V AC or 1200 V DC.		IS/IEC: 60947
1.7	Danger Notice Plates		IS: 2551
1.8	Hot dip galvanising		IS: 2629
1.9	Current Transformers		IS: 2705
1.10	Code of practice for earthing		IS: 3043
1.11	Instrument transformers		IS: 16227
1.12	Wrought Aluminium and Aluminium alloys for electrical purposes		IS: 5082
1.13	Code of practice of phosphating of iron and steel		IS: 6005
1.14	Static Relays		IS: 8686
1.15	Specification of control transformers for switchgear and Control gear for voltage not exceeding 1000V AC		IS - 12021
1.16	Electrical Relays		IEC: 60255
1.17	Communication networks and systems in substations		IEC: 61850
1.18	Guide for uniform system of marking and identification of conductors and apparatus terminals		IS: 11353
1.19	Cold Rolled Low Carbon Steel Sheets and Strips		IS :513
1.20	Cable glands		BS:6121
1.21	Compression lugs and Connectors		DIN 46239
2.0	**DESIGN /SYSTEM PARAMETERS**		
2.1	Max. System Voltage for continuous operations Max. System Frequency for continuous operations		415 Volt (+/- 10%) 50Hz (+5/- 5%), Combined (10% absolute sum)
2.2	One minute power frequency withstand voltage		
a)	Main circuit	KV	2.5 rms.
b)	Aux. Circuit	KV	2.0 rms.
2.3	Internal arc classification		50 KA for 0.5 Sec
2.4	Draw out type modules		Complete Closed Door Operation
2.5	Cable alley compartment		Form-IVB as per IEC-61439
2.6	**Busbars & connections**		
2.6.1	Fault level		
a)	ACB		50 KA r.m.s for 1 sec.
b)	MCCB		50 KA r.m.s for MCCB clearing time
2.6.2	Dynamic Rating for ACB & MCCB	KA	105 kA (peak)
2.6.3	Temperature rise above ambient temperature (50 Deg C)		
a)	Busbar (when carrying 90% of the rated current)		
i.	Silver plated joints	Deg C	55
ii.	Non-silver plated joints	Deg C	40
b)	Accessible parts/external enclosures	Deg C	20
c)	Manual operating means		
i	For Metallic	Deg C	10
ii	For Insulating material	Deg C	15
2.6.4	PVC sleeving for horizontal busbar		Insulated (UL224) CE/UL (CERTIFIED)
2.6.5	Colour coding for conductor & terminals		Applicable as per IS 11353
2.6.6	Busbar clearances in air (minimum)		
a)	Phase-phase	mm	25mm (Insulation Sleeves / Barriers shall be provided for clearance less than 25 mm)
b)	Phase-earth	mm	25mm (Insulation Sleeves / Barriers shall be provided for clearance less than 25 mm)
c)	Incomer Rear Door and Busbar	mm	400mm
2.7	Secondary wiring		FRLS Copper Wire
2.7.1	Colour code of wires		
a)	CT Circuit		R,Y,B,Black
b)	Space Heater Circuit		Black
c)	PT Circuit		R,Y,B
d)	AC Control Circuit		Black
e)	DC Control Circuit		Grey
f)	Door Earthing		Green
2.7.2	Sizes of wires (minimum)		
a)	CT leads	Sqmm	2.5
b)	Other wires	Sqmm	1.5
2.8	Auxiliary buses provision		
a)	AC control bus	V	110V AC (With Neutral solidly earthed)
b)	DC control bus	V	220V DC
c)	AC space heater bus	V	240V AC (with Neutral solidly earthed)

TECHNICAL DATA PART - A

d)	Controls, indications & alarms		To be provided
2.9	**Switchgear main assemblies**		
2.9.1	**Air circuit breakers**		
a)	Rated Voltage, Frequency, No of Poles		415 Volts, 50 Hz, 3 (three) Poles
b)	Symmetrical (rms) interrupting capacity at rated voltage	KA	50kA
c)	Momentary making current	KA	105kA (peak)
d)	Short Circuit Breaking Current - AC Component		50 KA(RMS) for 1 Sec
e)	Short Circuit Breaking Current - DC Component		As per IS/IEC 60947
f)	Operating mechanism		Air break spring charged stored energy type
g)	Auxiliary voltage		
i	Spring charging motor	V	220 DC
ii	Closing coil	V	220 DC
iii	Shunt trip coil	V	220 DC
h)	Operating duty		O-3 min-CO-3 min-CO
i)	Auxiliary contacts		Minimum 10 NO + 10 NC
			(4NO+4NC for DDCMIS interface and 6NO+6NC Auxiliary Contact-directly operated from breaker operated Mechanism)
j)	Anti-pumping feature		Both Mechanical & Electrical
2.9.2	**Moulded case circuit breakers (MCCB) & Motor protection circuit breakers (MPCB)**		Thermal Magnetic based with in built front adjustable releases
a)	Type		Thermal Magnetic based with in built front adjustable releases
b)	For Motors Below 30kW		MPCB to be provided
c)	For Motors From 30kW and below 90kW		MCCB to be provided
d)	Rated voltage	V	415V AC
e)	Rated Insulation level	V	690V AC
f)	Rated short circuit breaking capacity	KA	50kA
g)	Rated making capacity	KA	105kA
h)	Utilization category		A of IS / IEC 60947
i)	Type of releases required		
i	Overload		Refer Modulewise BoM (Annexure-A.2)
ii	Under voltage		No
iii	Short circuit		Yes
iv	Shunt trip		No
j)	Auxiliary contacts		
	Numbers (Minimum)		1 NO + 1 NC
2.10	**Switchgear components**		
2.10.1	**Intelligent motor controller (IMC/IMCC)**		Applicable (For drives less than 90KW)
a)	Power supply voltage & frequency		110 V & 50 Hz (For basic and expansion module (if applicable) both)
b)	Degree of protection		IP20 for IMC and IP54 for HMI
c)	Current sensing module		For motors & heaters both below 90 KW
d)	Voltage sensing module		For motors & heaters both from 30 KW & below 90 KW
e)	Resetting		Manual on panel facia
f)	Digital input & output		6 Digital Inputs & 3 programmable potential free Digital Outputs (inbuilt with basic module or with add-on expansion modules)
g)	Binary input interrogation voltage		110V AC, 50 Hz
h)	Binary output		Rated for 6A, 110V AC
i)	Protocol		Profibus DP
j)	Profibus connector		One PG/PG port connector for each IMC, fast-connect type
k)	Over Load protection		As per IEC 60947-4-1 & 60947-8
l)	LED indications on IMC		Required for: i) Controller healthy ii) Controller fault iii) Controller power supply healthy
2.10.2	**Power Contactors**		Air break electro magnetic type
a)	Coil voltage (nominal)	V	(i) 110V AC (-15% to +10%) (Drop out voltage-less than 70%, Guaranteed Drop out at 20% of rated voltage) (ii) 220V DC (-15% to +10%)
b)	No. of poles for contactor		Three
c)	Utilization category		
i)	AC Reversible motor		AC4 of IS/IEC 60947
ii)	AC Non-reversible motor		AC3 of IS/IEC 60947
iii)	DC contactor		DC3
iv)	Aux contact		1 NO + 1 NC (Minimum)
2.10.3	**Auxiliary Contactors**		
a)	Coil voltage (nominal)	V	110 AC / 230AC / 220 DC
b)	No. of poles for contactor		Three
c)	Permissible supply voltage variation w.r.t. Nominal coil voltage	%	85 – 110
d)	Aux Relay contact		2 NO + 2 NC (Minimum)
2.10.4	**High rupturing capacity (HRC) fuses**		
a)	Voltage Class	V	650V
b)	Rupturing Capacity		
i)	AC	KA	80kA rms for AC Circuit
ii)	DC	KA	20kA for DC Circuit
2.10.5	**Instruments, meters & transducers**		
a)	Indicating instruments		
i)	Accuracy class		2.0

	TECHNICAL DATA PART - A		
ii)	One min. power frequency withstand test voltage	kV	2.0 (RMS)
b)	Current Transducers		
i	Input	A	0-1A
ii	Output	mA	4 - 20mA
iii	Number of outputs	Nos.	2nos. (decoupled)
iv	Minimum Overcurrent reach for motor current ammeters		6 x CT sec. current of 1A for a minimum period of 30seconds
v	Accuracy Class		1.0
c)	Voltage Transducers		
i	Input		(i) 500V / 50 Hz (for AC) (ii) 250V (for DC)
ii	Output	mA	4-20mA
iii	Number of outputs	Nos.	2nos. (decoupled)
iv	Accuracy Class		1.0
2.10.6	**Relays**		
a)	Type		Numerical Relay
b)	Coil rating		
i)	Current coil	A	1
ii)	Coil Voltage	V	220V DC
c)	Aux. Voltage	V	220V DC with variation of 80% to 120%
d)	One minute power frequency withstand voltage (rms)	kV	2kV
e)	Measurement Accuracy for rated RMS Current and voltage	%	2
f)	Power frequency withstand test voltage	kV	2.5kV for 1 seconds
2.10.7	**Current transformers**		
a)	Type		Cast Resin Bar Primary / Nylon Casing (Insulation Class E or Better)
b)	Voltage class and frequency		650V, 50 Hz
c)	Secondary rating	A	1A
d)	Accuracy class (metering) & Burden		Class 1.0, 5VA (Minimum)/ Class 0.2, 5VA (Minimum) (Refer Annexure-A.2_Modulewise BOM for details)
e)	Accuracy class (protection) & Burden		5P20, 5VA or better, PS Class for REF
f)	Instrument security factor for metering CT		5
g)	Short time withstand capability (RMS)		
i	Associated with circuit breaker protected feeders	KA	50 KA for 1 Sec
ii	Associated with MCCB protected feeders	KA	Prospective current of 50 KA for the MCCB clearing time
h)	Dynamic withstand capability (peak)		
i	Associated with circuit breaker protected feeders	KA	105kA (peak)
ii	Associated with MCCB protected feeders	KA	Prospective current of 105kA (peak) as Limited by MCCB
2.10.8	**Voltage transformers**		
a)	Type		Cast Resin, Insulation class Class E or better
b)	System earthing		EFFECTIVE
c)	Voltage Ratio		
i	Line PT		415V/110V
ii	Bus PT		415/√3V/110/√3 V
d)	Accuracy class		Cl. 0.5 / Cl. 0.2 (Refer Annexure-A.2_Modulewise BOM for details)
e)	Method of Construction		V-V
f)	Rated Voltage factor		1.1 continuous, 1.5 for 30 sec.
g)	One minute power frequency withstand voltage (rms)	KV	2.5kV
2.10.9	**Control transformers (for contactor operation)**		
a)	Type		Dry / Cast Resin, Insulation Class B or better
b)	Voltage Ratio		415V/110 V with taps +/- 5% in steps of 2.5%
c)	One minute power frequency withstand voltage (rms)	KV	2.5kV
d)	Rating		1.5 X Adequate for application (VA)
2.10.10	**Miniature circuit breaker**		
a)	Rated Voltage		415V/240V/110V AC/220V DC
b)	Current breaking Capacity	KA	10kA
c)	Characteristic Curve		C or above
2.10.11	**Control and selector switch**		
a)	Application		As per Annexure-A.2_Modulewise BOM
b)	Type		
i)	Control switch		Pistol Grip & Spring return
ii)	Selector switch		Stay Put
2.10.13	**Indication Lamp**		LED type (Refer Annexure-A.2_Modulewise BOM for details)
2.10.14	**Panel Space heaters**		
a)	Voltage	V	240V AC
b)	Thermostat required		Yes
2.10.15	**General purpose timers**		
a)	Type		Electronic
b)	No. of contacts		As per requirements
2.10.16	**Terminal block**		
a)	Rating		
i	voltage grade	V	650V
ii	current	A	10A
b)	Material of construction		6.6 polyamide as per UL 94
c)	Type		Screw less, push in technology (IEC 60947-7-1 and UL certified)
d)	Spare TB		20%
e)	CT Terminals		(i) With shorting and disconnecting facility

TECHNICAL DATA PART - A

			(ii) Stud type terminals
			(iii) Suitable for ring type lugs
2.11	DC MCCB Box		
a)	Construction		(i) Metal Enclosed Fixed Type CRCA: 2mm structure & 1.6mm enclosure Or (ii) Poly Carbonate (a) Halogen Free, flame Retardant (UL-94,V0) (b) Thickness: 4mm (iii) UL224 sleeved Busbars
b)	Incomer		63A DP MCCB
c)	Busbars		100 A fully insulated (PVC sleeved, UL224) busbars
d)	Outgoing		8 nos. 16A outgoing DP MCCB feeders
e)	Other Components		1 no. Auxiliary Contactor for supply monitoring & 1 no. Led Indicating lamp (Blue color)
f)	Paint Shade		RAL 9002
2.12	AC MCCB Box		
a)	Construction		(i) Metal Enclosed Fixed Type CRCA: 2mm structure & 1.6mm enclosure Or (ii) Poly Carbonate (a) Halogen Free, flame Retardant (UL-94,V0) (b) Thickness: 4mm (iii) UL224 sleeved Busbars
b)	Incomer		63A TPN MCCB
c)	Busbars		100 A, 3-phase, 4-wire, fully insulated (PVC sleeved,UL224) busbars
d)	Outgoing		9 nos. 16 A DP MCCB and 3 nos. 16 A TPN MCCB
e)	Other Components		3 nos. Led Indicating lamps (R,Y,B) for incoming supply monitoring
f)	Paint Shade		RAL 9002
3.0	**CONSTRUCTION FEATURES**		
3.1	General		
3.1.1	Operational fronts		Both Single & Double Front (Refer Annexure-A.1_Boardwise BOM for details)
3.1.2	Type of Module operation		PCC/PMCC/MCC - Drawout type ACDB/DCDB/SOLENOID VALVE DB's - Fixed Type
3.1.3	Enclosure		
a)	Material		Sheet steel
b)	Type		CRCA
c)	Sheet metal thickness (minimum)		
i	Non-load bearing - covers, doors, partition etc.	mm	1.6
ii	Load bearing - structures & frame etc.	mm	2
iii	Gland plates		3mm for CRCA/HR, 4mm for Non-Magnetic –Single Core Cable Entry
3.1.4	Glands		Double compression, Heavy duty nickel chrome plated brass machine finished. Thickness of plating not less than 10 micron. All washers and hardware shall also be made of brass with nickel chrome plating Rubber components shall be of neoprene or better synthetic material and of tested quality.
3.1.5	Lugs/ ferrules		Heavy duty solderless crimping type (copper lugs/ ferrules for copper cables, aluminium lugs/ ferrules for aluminium cables and Bimetallic washers or bimetallic type lugs shall be used for bimetallic connections) as per the DIN 46239
3.1.6	Degree of protection of switchboards with modules in service and all doors closed		
a)	Without louvers (<1600 A)		IP-52
b)	With louvers (= > 1600 A)		IP-42 (Gasketing arrangement shall be as per type tested design for IP 5X)
c)	Outdoor panels with stainless steel enclosure (SWITCHYARD OIL FILTERATION BOARD, U#8 TRF AREA OUTDOOR SWGR, U#9 TRF AREA OUTDOOR SWGR etc.)		IP 55 (mounted on 500mm pedestal)
3.1.7	Facility for functional testing of withdrawable		
a)	Incomer & Bus Coupler units		Yes
b)	Outgoing contactor starters		Yes
3.1.8	Gasket		Steel Reinforced EPDM /PU Foam / Neoprene gaskets
3.1.9	Panel Height	mm	2450 (max.)
3.2	**Busbars & connections**		
3.2.1	Busbar material		
a)	Horizontal & Jumper connection		High Conductivity Aluminium Alloy/Copper
b)	Vertical		Copper
c)	Earth BusBar		
i.	For all switchboards except ACBD and DCDB		GS (65 mm X 8 mm)
ii.	For ACDB and DCDB		GS (50 mm x 6 mm)
iii.	Electronic earthing for IMC		Separate Copper Earth bus (25mm x 3mm)
d)	Hardware for busbars		High Tensile steels (Bolts/Nuts/Spring Washer)
e)	Type of cover for busbar compartment		Bolted Type

TECHNICAL DATA PART - A

f)	Additional Requirement		(i) Separate compartments for Auxiliary and Power Busbars (ii) Two separate sets of vertical busbars in each panel of double front MCC / DB (iii) Interleaving arrangement for busbar for switchboards of rating >1600 Amps
3.3	Cabling and terminations		
a)	Cable entry		Bottom
b)	Incoming connections from transformer/DG for PCC/PMCC 1600A and above		Busduct
c)	Incoming connections from transformer for PCC/PMCC below 1600A		Cable
4.0	**INSPECTION/ TESTING**		
4.1	The following type test certificates of LT Switchgear and MCC panels with 10 years validity from 22.12.2023 shall be submitted.		
a)	Circuit breaker of each rating i) Test sequence 1 ii) Combined test sequence (With Circuit breakers mounted inside the Switchgear panel)		
b)	Complete design verification of Switchgear/MCC Panels as per IEC 61439 Part- 1, Annexure-D		
c)	Internal arc test for Personnel and Assembly Protection as per IEC/TR 61641. Test shall be conducted for breaker compartment, busbar chamber, incoming side of smallest sized module, outgoing terminals of module in cable alley.		
d)	MCC modules of any three ratings, as selected by the Employer, for class - II protection Co-ordination as per IS 13947-4-1 / IEC 60947-4-1.		
4.2	For the following equipment the vendor shall submit the reports of all the type tests		
a)	NUMERICAL RELAYS		
b)	MCCB		
c)	Intelligent Motor Controller (IMC) for Electromagnetic Compatibility (EMC) & other requirements as per applicable standards.		
4.3	Type test reports conducted within last 10 years from 22.12.2023 for the following tests on the model of the Numerical relays & Ethernet switches being offered shall be submitted for customer's review. Type Tests of Ethernet Switches shall have been conducted at NABL accredited Lab.		

4.4	**TEST ITEMS**	**Standard**
a)	Dimensions of structure and visual inspection	IEC 60297-3-101
b)	Functional requirements:	Relevant IEC 60255-100 series
	– Steady-state simulation	
	– Dynamic simulation	
c)	Product safety requirements (including the dielectric tests and thermal short time rating)	IEC 60255-27
d)	EMC requirements:	IEC 60255-26
	– Emission	
	– Immunity	
e)	Energizing quantities:	
	– Burden	N/A
	– Change of auxiliary energizing quantity	IEC 60255-11
f)	Contact performance	N/A
g)	Communication requirements	Relevant IEC protocol standards
h)	Climatic environmental requirements:	IEC 60068-2-14, IEC 60068-2-1, IEC 60068-2-2, IEC 60068-2-78, IEC 60068-2-30, IEC 60255-27
	– Cold	
	– Dry heat	
	– Change of temperature	
	– Damp heat	
i)	Mechanical requirements: – Shock	IEC 60255-21-1, IEC 60255-21-2, IEC 60255-21-3
	– Vibration	
	– Bump	
	– Seismic	
j)	Enclosure protection	IEC 60529, IEC 60255-27

4.5	In absence of type tests reports or in case reports are not found to be meeting the specification/standards requirements, supplier shall conduct all such type tests without any commercial/delivery implication to BHEL according to the relevant standards and reports shall be submitted to the customer for approval.
4.6	The tests shall be carried out as per Quality Plan.

TECHNICAL DATA PART - A

ANNEXURE-A.1

BOARDWISE BOM

Type of Connection : TOP/SIDE BUSDUCT ENTRY

DOUBLE FRONT D/O TYPE

FLOOR MOUNTED

Name of the Board (PMCC) →			0DA	0DB	8DA	8DB	9DA	9DB
RATING	**UNIT**	**MODULE TYPE**	**QTY.**	**QTY.**	**QTY.**	**QTY.**	**QTY.**	**QTY.**
4000	A	DAET(I/C)	2	2	2	2	2	2
4000	A	DAET(B/C)	1	1	1	1	1	1
3000	A	DAET(I/C)	0	0	0	0	0	0
3000	A	DAET(B/C)	0	0	0	0	0	0
630	A	DAE(O/G)	5	5	3	3	3	3
800	A	DAE(O/G)	3	3	0	0	0	0
1000	A	DAE(O/G)	5	5	0	0	0	0
1250	A	DAE(O/G)	2	2	0	0	0	0
1600	A	DAE(O/G)	0	0	0	0	0	0
2500	A	DAE(TIE)	0	0	0	0	0	0
3000	A	DAE(TIE)	1	1	0	4	0	4
16	A	E3 (O/G)	0	0	0	4	0	4
32	A	E3 (O/G)	4	4	4	7	4	7
63	A	E3 (O/G)	5	5	7	3	7	3
125	A	E3 (O/G)	5	5	11	8	11	8
160	A	E3 (O/G)	4	4	0	9	0	9
200	A	E3 (O/G)	3	3	9	2	9	2
250	A	E3 (O/G)	3	3	3	5	3	5
400	A	E3 (O/G)	6	6	4	3	4	3
0.0 – 5.5	KW	DK2 / PK2 / AK2	0	0	45	16	45	16
5.6 – 7.0	KW	DK2 / PK2 / AK2	0	0	4	0	4	0

TECHNICAL DATA PART - A

ANNEXURE-A.1

BOARDWISE BOM

Type of Connection : TOP/SIDE BUSDUCT ENTRY

DOUBLE FRONT D/O TYPE

FLOOR MOUNTED

Name of the Board (PMCC) →			0DA	0DB	8DA	8DB	9DA	9DB
RATING	**UNIT**	**MODULE TYPE**	**QTY.**	**QTY.**	**QTY.**	**QTY.**	**QTY.**	**QTY.**
7.1 – 13.0	KW	DK2 / PK2 / AK2	0	0	26	7	26	7
13.1 – 24.0	KW	DK2 / PK2 / AK2	5	4	10	18	10	18
24.1 – 29.9	KW	DK2 / PK2 / AK2	0	0	0	0	0	0
30.0 – 37.0	KW	DK21 / PK21 / AK21	0	0	0	0	0	0
37.1 – 55.0	KW	DK21 / PK21 / AK21	4	3	5	2	5	2
55.1 – 80.0	KW	DK21 / PK21 / AK21	0	0	0	3	0	3
80.1 – 89.9	KW	DK21 / PK21 / AK21	0	0	0	0	0	0
90 – 200.0	KW	DM / PM	9	9	6	6	6	6
Up to 32A		E1	0	0	0	0	0	0
Up to 16A		EA3	0	0	7	4	7	4
32	A	EA3	0	0	12	0	12	0
63	A	EA3	0	0	0	0	0	0
125	A	EA3	0	0	0	0	0	0
32	A	ET3	0	0	6	6	6	6
400	A	ES3	4	4	2	2	2	2
		G1 (BUS PT)	2	2	2	2	2	2
		CS (Control Supply)	2	2	2	2	2	2
		WTS1 (Wireless Temp. Sensor Module 1)	36	36	27	63	27	63
		WTS2 (Wireless Temp. Sensor Module 2)	180	180	75	75	75	75

TECHNICAL DATA PART - A

ANNEXURE-A.1

BOARDWISE BOM

Type of Connection : TOP/SIDE BUSDUCT ENTRY

DOUBLE FRONT D/O TYPE

FLOOR MOUNTED

Name of the Board (PMCC) ⟶			0DA	0DB	8DA	8DB	9DA	9DB
RATING	**UNIT**	**MODULE TYPE**	**QTY.**	**QTY.**	**QTY.**	**QTY.**	**QTY.**	**QTY.**
		Dummy Panel	2	2	2	2	2	2
		Y-link	2	1	14	7	14	7
		Ethernet Switch	2	2	1	2	1	2

Note: The quantity mentioned above includes the requirement for engineering contractual spares.

TECHNICAL DATA PART - A

ANNEXURE-A.1

BOARDWISE BOM

Type of Connection : TOP/SIDE BUSDUCT ENTRY EXCEPT 0DC WITH CABLE ENTRY

DOUBLE FRONT D/O TYPE

FLOOR MOUNTED

Name of the Board (PMCC) →			0DE	0DF	0DM	0DD	0DH	0DN	0DC
RATING	**UNIT**	**MODULE TYPE**	**QTY.**	**QTY.**	**QTY.**	**QTY.**	**QTY.**	**QTY.**	**QTY.**
4000	A	DAET(I/C)	4	0	0	0	0	0	0
4000	A	DAET(B/C)	0	0	0	0	0	0	0
3000	A	DAET(I/C)	0	0	2	0	0	0	0
3000	A	DAET(B/C)	0	0	1	0	0	0	0
2500	A	DAET(I/C)	0	2	0	2	2	2	0
2500	A	DAET(B/C)	0	1	0	1	1	1	0
1600	A	DAET(I/C)	0	0	0	0	0	0	0
1600	A	DAET(B/C)	0	0	0	0	0	0	0
1000	A	DAET(I/C)	0	0	0	0	0	0	2
1000	A	DAET(B/C)	0	0	0	0	0	0	1
630	A	DAE(O/G)	3	0	0	0	0	0	0
800	A	DAE(O/G)	0	0	0	0	0	0	0
1000	A	DAE(O/G)	3	0	0	3	0	0	0
1600	A	DAE(O/G)	0	0	0	0	0	0	0
16	A	E3 (O/G)	33	16	22	10	48	52	75
32	A	E3 (O/G)	8	18	6	5	6	0	8
63	A	E3 (O/G)	4	18	17	6	3	4	8
100	A	E3 (O/G)	5	3	5	2	3	3	3
125	A	E3 (O/G)	3	3	3	6	3	3	3
160	A	E3 (O/G)	8	2	3	0	0	0	0
200	A	E3 (O/G)	5	2	3	3	2	0	0
250	A	E3 (O/G)	3	3	3	2	2	0	0

TECHNICAL DATA PART - A

ANNEXURE-A.1

BOARDWISE BOM

Type of Connection : TOP/SIDE BUSDUCT ENTRY EXCEPT 0DC WITH CABLE ENTRY

DOUBLE FRONT D/O TYPE

FLOOR MOUNTED

Name of the Board (PMCC) →			0DE	0DF	0DM	0DD	0DH	0DN	0DC
RATING	**UNIT**	**MODULE TYPE**	**QTY.**	**QTY.**	**QTY.**	**QTY.**	**QTY.**	**QTY.**	**QTY.**
400	A	E3 (O/G)	3	3	5	2	0	0	0
0.0 – 5.5	KW	DK2 / PK2 / AK2	33	0	0	2	46	10	78
5.6 – 7.0	KW	DK2 / PK2 / AK2	0	0	0	0	0	0	0
7.1 – 13.0	KW	DK2 / PK2 / AK2	6	0	0	5	10	5	18
13.1 – 24.0	KW	DK2 / PK2 / AK2	9	0	4	4	2	2	4
24.1 – 29.9	KW	DK2 / PK2 / AK2	0	0	0	0	0	0	0
30.0 – 37.0	KW	DK21 / PK21 / AK21	8	0	2	0	3	0	3
37.1 – 55.0	KW	DK21 / PK21 / AK21	4	0	0	6	0	0	0
55.1 – 80.0	KW	DK21 / PK21 / AK21	8	0	4	4	0	0	3
80.1 – 89.9	KW	DK21 / PK21 / AK21	0	0	0	0	0	0	0
90 – 200.0	KW	DM / PM	6	0	9	0	5	6	0
Up to 32A		E1	6	4	4	4	21	17	24
32	A	EA3	4	2	3	3	0	3	2
63	A	EA3	4	2	0	0	0	0	2
125	A	EA3	3	0	0	0	0	0	0
32	A	ET3	4	4	4	4	4	4	4
250	A	ES3	2	2	2	2	2	2	2
		G1 (BUS PT)	2	2	2	2	2	2	2
		CS (Control Supply)	2	2	2	2	2	2	2
		Dummy Panel	4	2	2	2	2	2	2
		Y-link	10	1	2	3	8	3	14
		Ethernet Switch	1	1	1	1	1	1	1

Note: The quantity mentioned above includes the requirement for engineering contractual spares.

TECHNICAL DATA PART - A

ANNEXURE-A.1

BOARDWISE BOM

Type of Connection : TOP/SIDE BUSDUCT ENTRY

DOUBLE FRONT D/O TYPE

FLOOR MOUNTED

Name of the Board (ESP PMCC) ⟶			8DC	8DD	8DE	8DF	8DH	8DJ	9DC	9DD	9DE	9DF	9DH	9DJ
RATING	**UNIT**	**MODULE TYPE**	**QTY.**	**QTY.**	**QTY.**	**QTY.**	**QTY.**	**QTY.**	**QTY.**	**QTY.**	**QTY.**	**QTY.**	**QTY.**	**QTY.**
3000	A	DAET(I/C)	1	1	1	1	1	1	1	1	1	1	1	1
3000	A	DAE(TIE)	1	1	1	1	1	1	1	1	1	1	1	1
630	A	DAE(O/G)	0	0	0	0	0	0	0	0	0	0	0	0
800	A	DAE(O/G)	0	0	0	0	0	0	0	0	0	0	0	0
1000	A	DAE(O/G)	0	0	0	0	0	0	0	0	0	0	0	0
1600	A	DAE(O/G)	0	0	0	0	0	0	0	0	0	0	0	0
32	A	E3 (O/G)	2	2	2	2	2	2	2	2	2	2	2	2
400	A	E3 (O/G)	1	1	1	1	1	1	1	1	1	1	1	1
400	A	E2 (O/G)	24	24	24	24	24	24	24	24	24	24	24	24
6	A	ALI	6	6	6	6	6	6	6	6	6	6	6	6
6	A	WLT (3D)	6	6	6	6	6	6	6	6	6	6	6	6
6	A	ARECA	2	2	2	2	2	2	2	2	2	2	2	2
6	A	MM	2	2	2	2	2	2	2	2	2	2	2	2
0.37	KW	RM1	26	26	26	26	26	26	26	26	26	26	26	26
0.37	KW	RM2	25	25	25	25	25	25	25	25	25	25	25	25
17	KW	HH (HOPPER HEATER)	24	24	24	24	24	24	24	24	24	24	24	24
40	KW	HI	4	4	4	4	4	4	4	4	4	4	4	4
10	KW	HS	4	4	4	4	4	4	4	4	4	4	4	4
2X1.1	KW	DDM	8	8	8	8	8	8	8	8	8	8	8	8
Up to 32A		E1	2	2	2	2	2	2	2	2	2	2	2	2
250	A	ES3	1	1	1	1	1	1	1	1	1	1	1	1
32	A	ET3	6	6	6	6	6	6	6	6	6	6	6	6
		G1 (BUS PT)	1	1	1	1	1	1	1	1	1	1	1	1
		CS (Control Supply)	1	1	1	1	1	1	1	1	1	1	1	1
		Dummy Panel	2	2	2	2	2	2	2	2	2	2	2	2
		Y-link	6	6	6	6	6	6	6	6	6	6	6	6
		Ethernet Switch	1	1	1	1	1	1	1	1	1	1	1	1

Note: The quantity mentioned above includes the requirement for engineering contractual spares.

TECHNICAL SPECIFICATION
LT SWITCHGEAR
2X800MW NTPC SINGRAULI STPP STAGE – III

TECHNICAL DATA PART - A

ANNEXURE-A.1

BOARDWISE BOM

Type of Connection : TOP/SIDE BUSDUCT ENTRY

DOUBLE FRONT D/O TYPE

FLOOR MOUNTED

Name of the Board (ESP Standby PMCC) ⟶			8DL	8DM	9DL	9DM
RATING	**UNIT**	**MODULE TYPE**	**QTY.**	**QTY.**	**QTY.**	**QTY.**
4000	A	DAET(I/C)	1	1	1	1
4000	A	DAE(B/C)	0	0	0	0
630	A	DAE(O/G)	1	1	1	1
800	A	DAE(O/G)	0	0	0	0
1000	A	DAE(O/G)	0	0	0	0
3000	A	DAE(TIE)	1	1	1	1
4000	A	DAE(TIE)	1	1	1	1
16	A	E3 (O/G)	0	0	0	0
32	A	E3 (O/G)	0	0	0	0
63	A	E3 (O/G)	0	0	0	0
125	A	E3 (O/G)	5	7	5	7
160	A	E3 (O/G)	0	0	0	0
250	A	E3 (O/G)	2	2	2	2
400	A	E3 (O/G)	2	0	2	0
0.0 – 5.5	KW	DK2 / PK2 / AK2	0	0	0	0
5.6 – 7.0	KW	DK2 / PK2 / AK2	0	0	0	0
7.1 – 13.0	KW	DK2 / PK2 / AK2	3	3	3	3
13.1 – 24.0	KW	DK2 / PK2 / AK2	3	0	3	0
24.1 – 29.9	KW	DK2 / PK2 / AK2	0	0	0	0
30.0 – 37.0	KW	DK21 / PK21 / AK21	0	0	0	0
37.1 – 55.0	KW	DK21 / PK21 / AK21	0	0	0	0
55.1 – 80.0	KW	DK21 / PK21 / AK21	0	0	0	0

TECHNICAL DATA PART - A

ANNEXURE-A.1

BOARDWISE BOM

Type of Connection : TOP/SIDE BUSDUCT ENTRY

DOUBLE FRONT D/O TYPE

FLOOR MOUNTED

Name of the Board (ESP Standby PMCC) ⟶			8DL	8DM	9DL	9DM
RATING	**UNIT**	**MODULE TYPE**	**QTY.**	**QTY.**	**QTY.**	**QTY.**
80.1 – 89.9	KW	DK21 / PK21 / AK21	0	0	0	0
90 – 200.0	KW	DM / PM	0	0	0	0
Up to 32A		E1	0	0	0	0
		G1 (BUS PT)	1	1	1	1
		CS (Control Supply)	1	1	1	1
		Dummy Panel	2	2	2	2
		Y-link	1	1	1	1
		Ethernet Switch	1	1	1	1

Note: The quantity mentioned above includes the requirement for engineering contractual spares.

TECHNICAL DATA PART - A

ANNEXURE-A.1

BOARDWISE BOM

Type of Connection : TOP/SIDE BUSDUCT ENTRY

DOUBLE FRONT D/O TYPE

FLOOR MOUNTED

Name of the Board →			0DR AT CHP MCC-1 NEAR TP-19	0DS AT CHP MCC-2 NEAR TP-24	0DU CRUSHER HOUSE MCC in AHP MCC-2 NEAR TP-21
RATING	**UNIT**	**MODULE TYPE**	**QTY.**	**QTY.**	**QTY.**
4000	A	DAET(I/C)	2	2	2
4000	A	DAET(B/C)	1	1	1
3000	A	DAET(I/C)	0	0	0
3000	A	DAET(B/C)	0	0	0
2500	A	DAET(I/C)	0	0	0
2500	A	DAET(B/C)	0	0	0
1000	A	DAE(O/G)	0	0	0
16	A	E3 (O/G)	6	8	8
32	A	E3 (O/G)	28	17	15
63	A	E3 (O/G)	24	16	28
125	A	E3 (O/G)	20	29	38
160	A	E3 (O/G)	5	5	3
250	A	E3 (O/G)	16	9	11
400	A	E3 (O/G)	0	0	0
0.0 – 5.5	KW	DK2 / PK2 / AK2	6	10	23
5.6 – 7.0	KW	DK2 / PK2 / AK2	0	0	0
7.1 – 13.0	KW	DK2 / PK2 / AK2	11	0	0

TECHNICAL DATA PART - A

ANNEXURE-A.1

BOARDWISE BOM

Type of Connection : TOP/SIDE BUSDUCT ENTRY

DOUBLE FRONT D/O TYPE

FLOOR MOUNTED

Name of the Board →			0DR AT CHP MCC-1 NEAR TP-19	0DS AT CHP MCC-2 NEAR TP-24	0DU CRUSHER HOUSE MCC in AHP MCC-2 NEAR TP-21
RATING	**UNIT**	**MODULE TYPE**	**QTY.**	**QTY.**	**QTY.**
13.1 – 24.0	KW	DK2 / PK2 / AK2	20	11	8
24.1 – 29.9	KW	DK2 / PK2 / AK2	0	0	0
30.0 – 37.0	KW	DK21 / PK21 / AK21	12	2	4
37.1 – 55.0	KW	DK21 / PK21 / AK21	3	3	5
55.1 – 80.0	KW	DK21 / PK21 / AK21	0	2	3
80.1 – 89.9	KW	DK21 / PK21 / AK21	0	0	0
90 – 200	KW	DM / PM	3	2	0
0.0 – 5.5	KW	DN1 / PN1 / AN1	0	0	0
7.1 – 13.0	KW	DN1 / PN1 / AN1	0	0	0
13.1 – 24.0	KW	DN1 / PN1 / AN1	0	3	0
30.0 – 37.0	KW	DN1 / PN1 / AN1	0	0	0
Upto 32	A	E1	7	11	10
32	A	EA3	4	3	3
32	A	ET3	4	4	4
63	A	ES3	2	2	2
		G1 (BUS PT)	4	2	2
		CS (Control Supply)	4	2	2
		Dummy Panel	4	2	2

	TECHNICAL SPECIFICATION **LT SWITCHGEAR** **2X800MW NTPC SINGRAULI STPP STAGE – III**	**PE-TS-512-506-E002** **Issue No: 01** **Rev. No. 00** **Date : 17.01.2026**

TECHNICAL DATA PART - A

ANNEXURE-A.1

BOARDWISE BOM

Type of Connection : TOP/SIDE BUSDUCT ENTRY

DOUBLE FRONT D/O TYPE

FLOOR MOUNTED

Name of the Board →			**0DR AT CHP MCC-1 NEAR TP-19**	**0DS AT CHP MCC-2 NEAR TP-24**	**0DU CRUSHER HOUSE MCC in AHP MCC-2 NEAR TP-21**
RATING	**UNIT**	**MODULE TYPE**	**QTY.**	**QTY.**	**QTY.**
		Y-link	8	5	6
		Ethernet Switch	2	1	1

Note: The quantity mentioned above includes the requirement for engineering contractual spares.

TECHNICAL DATA PART - A

ANNEXURE-A.1

BOARDWISE BOM

Type of Connection : CABLE ENTRY

DOUBLE FRONT D/O TYPE

FLOOR MOUNTED

Name of the Board →			**SWITCHYARD SWITCHBOARD 0DJ**
RATING	**UNIT**	**MODULE TYPE**	**QTY.**
1000	A	DAE(I/C)	2
1000	A	DAE(B/C)	1
16	A	E3 (O/G)	0
32	A	E3 (O/G)	10
63	A	E3 (O/G)	16
125	A	E3 (O/G)	0
160	A	E3 (O/G)	4
250	A	E3 (O/G)	8
400	A	E3 (O/G)	6
0.0 – 5.5	KW	DK2 / PK2 / AK2	0
5.6 – 7.0	KW	DK2 / PK2 / AK2	0
7.1 – 13.0	KW	DK2 / PK2 / AK2	0
13.1 – 24.0	KW	DK2 / PK2 / AK2	0
24.1 – 29.9	KW	DK2 / PK2 / AK2	0
30.0 – 37.0	KW	DK21 / PK21 / AK21	0
37.1 – 55.0	KW	DK21 / PK21 / AK21	0
55.1 – 80.0	KW	DK21 / PK21 / AK21	0
80.1 – 89.9	KW	DK21 / PK21 / AK21	0
90 – 200.0	KW	DM / PM	0
Up to 32A		E1	22
250	A	ES3	2
		G1 (BUS PT)	2
		CS (Control Supply)	2
		Dummy Panel	2

Note: The quantity mentioned above includes the requirement for engineering contractual spares.

TECHNICAL DATA PART - A

ANNEXURE-A.1

BOARDWISE BOM

Type of Connection : CABLE ENTRY
DOUBLE FRONT D/O TYPE
FLOOR MOUNTED

Name of the Board (MCC) →			0DI	0DK	8HD	9HD	AC PDB SWYD	VENT PDB SWYD
RATING	UNIT	MODULE TYPE	QTY.	QTY.	QTY.	QTY.	QTY.	QTY.
250	A	E3 (I/C)	0	0	0	0	2	2
250	A	CC (I/C)	0	0	0	0	0	0
250	A	E3 (B/C)	0	0	0	0	0	0
400	A	E3 (I/C)	2	2	2	2	0	0
400	A	CC (I/C)	0	0	0	0	0	0
400	A	E3 (B/C)	1	1	1	1	0	0
16	A	E3 (O/G)	12	22	7	7	0	0
32	A	E3 (O/G)	18	6	33	33	7	0
63	A	E3 (O/G)	6	5	9	9	3	0
100	A	E3 (O/G)	3	3	4	4	0	0
125	A	E3 (O/G)	2	3	3	3	0	0
160	A	E3 (O/G)	0	3	0	0	0	0
250	A	E3 (O/G)	0	0	0	0	0	0
400	A	E3 (O/G)	0	0	0	0	0	0
0.0 – 5.5	KW	DK2 / PK2 / AK2	29	5	0	0	0	0
5.6 – 7.0	KW	DK2 / PK2 / AK2	0	0	0	0	0	0
7.1 – 13.0	KW	DK2 / PK2 / AK2	4	4	8	8	0	0
13.1 – 24.0	KW	DK2 / PK2 / AK2	8	4	4	4	0	0
24.1 – 29.9	KW	DK2 / PK2 / AK2	0	0	0	0	0	0
30.0 – 37.0	KW	DK21 / PK21 / AK21	0	0	0	0	0	4
37.1 – 55.0	KW	DK21 / PK21 / AK21	0	0	0	0	0	0
55.1 – 80.0	KW	DK21 / PK21 / AK21	0	0	0	0	3	0
80.1 – 89.9	KW	DK21 / PK21 / AK21	0	0	0	0	0	0
90 – 200.0	KW	DM / PM	0	0	0	0	0	0
Up to 32A		E1	4	2	6	6	4	5
Up to 16A		EA3	0	0	0	0	0	0
32	A	EA3	4	4	0	0	0	0
63	A	EA3	0	0	0	0	0	0

TECHNICAL DATA PART - A

ANNEXURE-A.1

BOARDWISE BOM

Type of Connection : CABLE ENTRY
DOUBLE FRONT D/O TYPE
FLOOR MOUNTED

Name of the Board (MCC) →			0DI	0DK	8HD	9HD	AC PDB SWYD	VENT PDB SWYD
RATING	**UNIT**	**MODULE TYPE**	**QTY.**	**QTY.**	**QTY.**	**QTY.**	**QTY.**	**QTY.**
200	A	EA3	0	0	0	0	3	0
32	A	ET3	0	4	0	0	0	0
		VM (BUS PT)	2	2	2	2	2	2
		CS (Control Supply)	2	2	2	2	2	2
		Dummy Panel	2	2	0	0	2	2
		Y-link	6	3	2	2	1	1
		Ethernet Switch	0	0	0	0	0	0
		Alarm module	0	0	0	0	1	1

Note: The quantity mentioned above includes the requirement for engineering contractual spares.

TECHNICAL DATA PART - A

ANNEXURE-A.1

BOARDWISE BOM

Type of Connection : CABLE ENTRY

DOUBLE FRONT D/O TYPE

FLOOR MOUNTED

Name of the Board (MCC) →			0SA	0SB	0QA	0QB	0WA	0WB	0WC	8TB	9TB
RATING	**UNIT**	**MODULE TYPE**	**QTY.**	**QTY.**	**QTY.**	**QTY.**	**QTY.**	**QTY.**	**QTY.**	**QTY.**	**QTY.**
630	A	DAE(I/C)	0	0	2	2	2	0	0	2	2
630	A	DAE(B/C)	0	0	1	1	1	0	0	1	1
800	A	DAE(I/C)	2	2	0	0	0	0	0	0	0
800	A	DAE(B/C)	1	1	0	0	0	0	0	0	0
1000	A	DAE(I/C)	0	0	0	0	0	2	2	0	0
1000	A	DAE(B/C)	0	0	0	0	0	1	1	0	0
630	A	DAE(O/G)	0	0	0	0	0	0	0	0	0
16	A	E3 (O/G)	27	24	28	29	38	29	104	7	11
32	A	E3 (O/G)	3	3	6	6	0	10	7	4	4
63	A	E3 (O/G)	5	5	17	17	24	12	7	4	4
125	A	E3 (O/G)	0	0	4	4	3	3	3	3	3
160	A	E3 (O/G)	0	0	3	3	0	0	0	0	0
250	A	E3 (O/G)	0	0	0	0	0	3	0	3	0
400	A	E3 (O/G)	0	0	0	0	0	0	0	0	0
0.0 – 5.5	KW	DK2 / PK2 / AK2	6	6	17	17	32	15	50	26	3
5.6 – 7.0	KW	DK2 / PK2 / AK2	0	0	0	0	0	0	0	0	0

TECHNICAL DATA PART - A

ANNEXURE-A.1

BOARDWISE BOM

Type of Connection : CABLE ENTRY

DOUBLE FRONT D/O TYPE

FLOOR MOUNTED

Name of the Board (MCC) →			0SA	0SB	0QA	0QB	0WA	0WB	0WC	8TB	9TB
RATING	**UNIT**	**MODULE TYPE**	**QTY.**	**QTY.**	**QTY.**	**QTY.**	**QTY.**	**QTY.**	**QTY.**	**QTY.**	**QTY.**
7.1 – 13.0	KW	DK2 / PK2 / AK2	0	0	3	3	0	4	12	4	0
13.1 – 24.0	KW	DK2 / PK2 / AK2	7	7	6	6	8	0	4	16	11
24.1 – 29.9	KW	DK2 / PK2 / AK2	0	0	0	0	0	0	0	0	0
30.0 – 37.0	KW	DK21 / PK21 / AK21	6	6	0	0	3	0	9	2	2
37.1 – 55.0	KW	DK21 / PK21 / AK21	0	0	0	0	0	0	0	0	0
55.1 – 80.0	KW	DK21 / PK21 / AK21	0	0	0	0	0	0	0	0	0
80.1 – 89.9	KW	DK21 / PK21 / AK21	0	0	0	0	0	0	0	0	0
90 – 200.0	KW	DM / PM	0	0	0	0	0	0	0	0	0
Up to 32A		E1	0	0	0	0	9	6	17	10	8
125		EA3	0	0	0	0	0	0	0	0	0
		VM (BUS PT)	2	2	2	2	2	2	2	1	1
		CS (Control Supply)	2	2	2	2	2	2	2	2	2
		Dummy Panel	2	2	2	2	2	2	2	2	2
		Y-link	3	3	4	4	6	3	10	6	2
		Ethernet Switch	1	1	1	1	1	1	1	1	1

Note: The quantity mentioned above includes the requirement for engineering contractual spares.

TECHNICAL DATA PART - A

ANNEXURE-A.1

BOARDWISE BOM

Type of Connection : CABLE ENTRY

DOUBLE FRONT D/O TYPE

FLOOR MOUNTED

Name of the Board (MCC) →			8TA	9TA	0TA		
RATING	**UNIT**	**MODULE TYPE**	**QTY.**	**QTY.**	**QTY.**		
1250	A	DAE(I/C)	0	0	2		
1250	A	DAE(B/C)	0	0	1		
1000	A	DAE(I/C)	2	2	0		
1000	A	DAE(B/C)	1	1	0		
16	A	E3 (O/G)	53	53	3		
32	A	E3 (O/G)	6	6	0		
63	A	E3 (O/G)	0	0	0		
125	A	E3 (O/G)	0	0	10		
160	A	E3 (O/G)	0	0	0		
250	A	E3 (O/G)	0	0	3		
400	A	E3 (O/G)	0	0	0		
0.0 – 5.5	KW	DK2 / PK2 / AK2	8	8	11		
5.6 – 7.0	KW	DK2 / PK2 / AK2	0	0	0		
7.1 – 13.0	KW	DK2 / PK2 / AK2	0	0	10		
13.1 – 24.0	KW	DK2 / PK2 / AK2	8	8	40		

TECHNICAL DATA PART - A

ANNEXURE-A.1

BOARDWISE BOM

Type of Connection : CABLE ENTRY

DOUBLE FRONT D/O TYPE

FLOOR MOUNTED

Name of the Board (MCC) →			8TA	9TA	0TA		
RATING	**UNIT**	**MODULE TYPE**	**QTY.**	**QTY.**	**QTY.**		
24.1 – 29.9	KW	DK2 / PK2 / AK2	0	0	0		
30.0 – 37.0	KW	DK21 / PK21 / AK21	8	8	5		
37.1 – 55.0	KW	DK21 / PK21 / AK21	0	0	5		
55.1 – 80.0	KW	DK21 / PK21 / AK21	0	0	0		
80.1 – 89.9	KW	DK21 / PK21 / AK21	0	0	0		
90 – 200.0	KW	DM / PM	0	0	0		
Up to 32A		E1	27	27	29		
32	A	EA3	0	0	3		
32	A	ET3	0	0	3		

		VM (BUS PT)	2	2	2		
		CS (Control Supply)	2	2	2		
		Dummy Panel	2	2	2		
		Y-link	3	3	10		
		Ethernet Switch	1	1	1		
		Alarm module					

Note: The quantity mentioned above includes the requirement for engineering contractual spares.

TECHNICAL DATA PART - A

ANNEXURE-A.1

BOARDWISE BOM

Type of Connection : CABLE ENTRY

DOUBLE FRONT D/O TYPE

FLOOR MOUNTED

Name of the Board (MCC) ⟶			SOOT BLOWER-UNIT 8	SOOT BLOWER-UNIT 9
RATING	**UNIT**	**MODULE TYPE**	**QTY.**	**QTY.**
63	A	CC (I/C)	2	2
0.0 – 5.5	KW	WB	248	248
0.0 – 5.5	KW	LR	75	75
0.0 – 5.5	KW	AH	6	6
		JAMMING RELAY MODULE	2	2
		VM (BUS PT)	1	1
		CS (Control Supply)	2	2
		Dummy Panel	4	4
		Y-link	0	0
		Ethernet Switch	0	0

Note: The quantity mentioned above includes the requirement for engineering contractual spares.

TECHNICAL DATA PART - A

ANNEXURE-A.1

BOARDWISE BOM

Type of Connection : CABLE ENTRY

DOUBLE FRONT FIXED TYPE

FLOOR MOUNTED

Name of the Board (ACDB) →			8HA	8KA	9HA	9KA	8HB	8QA	9HB	9QA	0WE	TRF AREA OUTDOOR SWGR # 8	TRF AREA OUTDOOR SWGR # 9
RATING	**UNIT**	**MODULE TYPE**	**QTY.**	**QTY.**	**QTY.**	**QTY.**	**QTY.**	**QTY.**	**QTY.**	**QTY.**	**QTY.**	**QTY.**	**QTY.**
630	A	DAE(I/C)	0	0	0	0	2	2	2	2	0	0	0
630	A	DAE(B/C)	0	0	0	0	1	1	1	1	0	0	0
400	A	CC (I/C)	0	0	0	0	0	0	0	0	2	1	1
400	A	E3 (B/C)	0	0	0	0	0	0	0	0	1	0	0
250	A	CC (I/C)	2	2	2	2	0	0	0	0	0	0	0
250	A	E3 (B/C)	0	0	0	0	0	0	0	0	0	0	0
16	A	E3 (O/G)	161	240	161	240	26	35	26	35	78	0	0
32	A	E3 (O/G)	11	84	11	84	10	4	10	4	3	0	0
63	A	E3 (O/G)	17	12	17	12	12	8	12	8	0	0	0
125	A	E3 (O/G)	4	0	4	0	3	2	3	2	4	0	0
160	A	E3 (O/G)	0	0	0	0	0	0	0	0	0	0	0
250	A	E3 (O/G)	0	0	0	0	0	0	0	0	0	0	0
400	A	E3 (O/G)	0	0	0	0	0	0	0	0	0	2	2
Up to 32A	A	E1	0	3	0	3	27	34	27	34	0	0	0
125A	A	E1	0	0	0	0	0	0	0	0	0	0	0
		VM (BUS PT)	1	1	1	1	2	2	2	2	2	1	1
		CS (Control Supply)	0	0	0	0	0	0	0	0	0	0	0
		Dummy Panel	2	2	2	2	2	2	2	2	2	0	0

Note: The quantity mentioned above includes the requirement for engineering contractual spares.

TECHNICAL DATA PART - A

ANNEXURE-A.1

BOARDWISE BOM

Type of Connection : SANDWICH BUSDUCT

DOUBLE FRONT D/O TYPE

FLOOR MOUNTED

Name of the Board (EMERGENCY MCC) →			8DG	9DG
RATING	**UNIT**	**MODULE TYPE**	**QTY.**	**QTY.**
3000	A	DG(I/C)	2	2
3000	A	DAE(B/C)	1	1
3000	A	DAE(TIE)	2	2
630	A	DAE(O/G)	0	0
800	A	DAE(O/G)	0	0
1000	A	DAE(O/G)	2	2
1250	A	DAE(O/G)	0	0
1600	A	DAE(O/G)	0	0
2500	A	DAE(O/G)	0	0
3000	A	DAE(O/G)	0	0
16	A	E3-TP (O/G)	9	9
32	A	E3-TP (O/G)	18	18
63	A	E3-TP (O/G)	7	7
100	A	E3-TP (O/G)	4	4
125	A	E3-TP (O/G)	14	14
160	A	E3-TP (O/G)	3	3
250	A	E3-TP (O/G)	6	6
400	A	E3-TP (O/G)	5	5
0.0 – 5.5	KW	DK2E	14	14
5.6 – 7.0	KW	DK2E	3	3
7.1 – 13.0	KW	DK2E	6	6
13.1 – 24.0	KW	DK2E	5	5
24.1 – 29.9	KW	DK2E	26	26
30.0 – 37.0	KW	DK21E	0	0
37.1 – 55.0	KW	DK21E	15	15
55.1 – 80.0	KW	DK21E	6	6
80.1 – 89.9	KW	DK21E	0	0
90 – 200.0	KW	DM / PM	4	4
Up to 32A		E1	3	3
		G2 (BUS PT)	2	2
		CS (Control Supply)	2	2
		WTS1 (Wireless Temp. Sensor Module 1)	45	45
		WTS2 (Wireless Temp. Sensor Module 2)	45	45
		Dummy Panel	2	2
		Y-link	10	10
		Ethernet Switch	1	1

Note: The quantity mentioned above includes the requirement for engineering contractual spares.

TECHNICAL DATA PART - A

ANNEXURE-A.1

BOARDWISE BOM

Type of Connection : CABLE ENTRY
DOUBLE FRONT FIXED TYPE
FLOOR MOUNTED

→

Name of the Board (DCDB)			8FA	9FA	0FA	
RATING	**UNIT**	**MODULE TYPE**	**QTY.**	**QTY.**	**QTY.**	
125	A	DB	0	0	2	
125	A	DC	0	0	2	
125	A	CH	0	0	2	
125	A	HD	0	0	1	
1600	A	DB	2	2	0	
1600	A	DC	2	2	0	
1600	A	CH	2	2	0	
1600	A	HD	1	1	0	
UP TO 32A	A	MCCB TYPE (X)	108	108	30	
63	A	MCCB TYPE (X)	20	20	10	
100	A	MCCB TYPE (X)	4	4	0	
125	A	MCCB TYPE (X)	3	3	2	
250	A	MCCB TYPE (X)	3	3	0	
400	A	MCCB TYPE (X)	3	3	0	
600	A	MCCB TYPE (X)	3	3	0	
		S (BUS PT)	2	2	2	
		CS (Control Supply)	0	0	0	
		Dummy Panel	2	2	2	

Note: The quantity mentioned above includes the requirement for engineering contractual spares.

TECHNICAL DATA PART - A

ANNEXURE-A.1

BOARDWISE BOM

Type of Connection : CABLE ENTRY
DOUBLE FRONT FIXED TYPE
FLOOR MOUNTED

Name of the Board (DCDB) →			CHP MCC-2 DCDB	CHP MCC-3 DCDB
RATING	**UNIT**	**MODULE TYPE**	**QTY.**	**QTY.**
125	A	DB	2	2
125	A	DC	0	0
125	A	CH	2	2
125	A	HD	0	0
1600	A	DB	0	0
1600	A	DC	0	0
1600	A	CH	0	0
1600	A	HD	0	0
UP TO 32A	A	MCCB TYPE (X)	22	20
63	A	MCCB TYPE (X)	10	8
100	A	MCCB TYPE (X)	0	0
125	A	MCCB TYPE (X)	0	0
250	A	MCCB TYPE (X)	0	0
400	A	MCCB TYPE (X)	0	0
600	A	MCCB TYPE (X)	0	0
		S (BUS PT)	2	2
		CS (Control Supply)		
		Dummy Panel	2	2

Note: The quantity mentioned above includes the requirement for engineering contractual spares.

TECHNICAL DATA PART - A

ANNEXURE-A.1

BOARDWISE BOM

Type of Connection : CABLE ENTRY

DOUBLE FRONT FIXED TYPE

FLOOR MOUNTED

Name of the Board →			SWITCHYARD EPDB	SWITCHYARD OIL FILTERATION
RATING	**UNIT**	**MODULE TYPE**	**QTY.**	**QTY.**
630	A	DAE(I/C)	0	0
630	A	DAE(B/C)	0	0
400	A	CC (I/C)	0	1
400	A	E3 (B/C)	0	0
250	A	CC (I/C)	4	0
250	A	E3 (B/C)	0	0
16	A	E3 (O/G)	0	0
32	A	E3 (O/G)	0	0
63	A	E3 (O/G)	5	0
125	A	E3 (O/G)	0	0
160	A	E3 (O/G)	4	0
250	A	E3 (O/G)	0	0
400	A	E3 (O/G)	0	2
Up to 32A		E1	0	0
		VM (BUS PT)	2	1
		CS (Control Supply)	0	0
		Dummy Panel	2	2

Note: The quantity mentioned above includes the requirement for engineering contractual spares.

TECHNICAL DATA PART - A
ANNEXURE-A.1
BOARDWISE BOM

Type of Connection : CABLE ENTRY

DOUBLE FRONT FIXED TYPE

FLOOR MOUNTED

Name of the Board (SWITCHYARD DCDB) ⟶			220V SWYD DCDB	48V SWYD DCDB
RATING	**UNIT**	**MODULE TYPE**	**QTY.**	**QTY.**
125	A	DB	2	2
125	A	DC	2	2
125	A	CH	2	2
125	A	HD	1	1
125	A	Discharge Feeder	2	4
UP TO 32A	A	MCCB TYPE (X)	20	22
63	A	MCCB TYPE (X)	46	0
100	A	MCCB TYPE (X)	0	0
125	A	MCCB TYPE (X)	2	8
250	A	MCCB TYPE (X)	0	0
400	A	MCCB TYPE (X)	0	0
600	A	MCCB TYPE (X)	0	0
		S (BUS PT)	2	2
		CS (Control Supply)	0	0
		Dummy Panel	2	2

Note: The quantity mentioned above includes the requirement for engineering contractual spares.

TECHNICAL DATA PART - A

ANNEXURE-A.2

MODULE WISE BOM

S. No.	Module Type	Item Description	Qty.	Remarks
1	DAET (I/C)	**PMCC INCOMER BREAKER OF RATING 1000A & ABOVE**		
		ACB 3P, ELECTRICALLY OPERATED D/O TYPE, WITHOUT RELEASES, CONTROL SUPPLY VOLTAGE 220V DC, MIN. 10NO+10NC (6NO+6NC AUX. CONTACT DIRECTLY OPERATED FROM BKR. OPERATED MECHANISM). SPRING CHARGE LIMIT SWITCH WITH MIN. 2NO+2NC CONTACTS	1	
		CONTROL MCB SP 6A	10	
		NEUTRAL LINK	2	
		INDICATING LAMP	5	
		CURRENT TRANSFORMER, 5VA or better, CL-5P20, INSL CL-E OR BETTER, SECONDARY CURRENT: 1A	3	
		CURRENT TRANSFORMER (PROTECTION) WITH VDR, 5VA or better, CL-PS, INSL CL-E OR BETTER, SECONDARY CURRENT: 1A	3	
		POTENTIAL TRANSFORMER - 415/110V, 50 VA CL-0.5, INSL CL-E OR BETTER	1	
		CT SHORTING TERMINAL - STUD TYPE	As required	
		CONTROL TERMINALS (FIXED)	As required	
		POWER TERMINALS	As required	
		220 V DC DP MCB 10A	2	
		2 POLE BREAKER CONTROL SWITCH (TNC), 16A, 220VDC	1	
		2 POLE, 2 POSI., LOCAL/ REMOTE SWITCH	1	
		INTERPOSING/ COUPLING RELAY WITH BUILT IN LED, TEST KNOB & FREEWHEELING DIODE	2	
		AUX. CONTACTOR, 2NO+2NC, CV. 220 V DC	2	
		NUMERICAL RELAY WITH COMMUNICATION FACILITY (ONE LOCAL FRONT PORT FOR COMMUNICATION WITH LAPTOP & TWO RJ REAR PORT AS PER IEC-61850 FOR COMMUNICATION WITH DDCMIS) FOR FOLLOWING FUNCTIONS: • PHASE OVER CURRENT PROTECTION (50/51) • EARTH FAULT PROTECTION (50N/51N) • STAND BY EARTH FAULT PROTECTION (51NS) • RESTRICTED EARTH FAULT PROTECTION (64R) • BUS NO VOLT • FAULT LOCKOUT FUNCTION (86) • UNDER VOLTAGE WITH TIMER (27M) • SYNCHRONISING CHECK FUNCTION (25) • CIRCUIT BREAKER FAILURE (50BF) • RELAY SELF SUPERVISION • CIRCUIT BREAKER CONDITION MONITORING • TRIP CIRCUIT SUPERVISION (95) • CURRENT TRANFORMER SUPERVISION • VOLTAGE TRANFORMER SUPERVISION • BREAKER CONTROL with I/L • DISTURBANCE RECORDING • FAULT RECORDING • EVENT RECORDING • MEASUREMENT FUNCTIONS (3I, Io, 3U, Uo, Hz, P, Q, E, PF) • NO. OF DI/DO SHALL BE AS PER SCHEME REQUIREMENT • ALL THE BINARY INPUTS SHALL BE CAPABLE OF TAKING THE 220V DC, HOWEVER THE THERSHOLD VALUE FOR BINARY INPUTS SHALL BE MORE THAN 70% OF RATED CONTROL SUPPLY VOLTAGE • CT INPUT 5 NOs. (3-Ph, 1 for REF and 1 SPARE) WITH CT SECONDARY CURRENT OF 1A • PT INPUT 4 NOs. (3 NOS FOR BUS VOLTAGE & 1 NO FOR LINE VOLTAGE)	1	
2	DAE (I/C)	**MCC INCOMER BREAKER OF RATING 630A & ABOVE**		
		ACB 3P, ELECTRICALLY OPERATED D/O TYPE, WITHOUT RELEASES, CONTROL SUPPLY VOLTAGE 220V DC, MIN. 10NO+10NC (6NO+6NC AUX. CONTACT DIRECTLY OPERATED FROM BKR. OPERATED MECHANISM). SPRING CHARGE LIMIT SWITCH WITH MIN. 2NO+2NC CONTACTS	1	
		CONTROL MCB SP 6A	6	
		NEUTRAL LINK	2	
		INDICATING LAMP	5	
		CURRENT TRANSFORMER, 5VA or better, CL-5P20, INSL CL-E OR BETTER, SECONDARY CURRENT: 1A	3	
		POTENTIAL TRANSFORMER - 415/110V, 50 VA CL-0.5, INSL CL-E OR BETTER	1	
		CT SHORTING TERMINAL - STUD TYPE	As required	
		CONTROL TERMINALS (FIXED)	As required	
		POWER TERMINALS	As required	
		220 V DC DP MCB 10A	4	
		2 POLE BREAKER CONTROL SWITCH (TNC), 16A, 220VDC	1	
		2 POLE, 2 POSI., LOCAL/ REMOTE SWITCH	1	
		LIMIT SWITCH	2	
		INTERPOSING/ COUPLING RELAY WITH BUILT IN LED, TEST KNOB & FREEWHEELING DIODE	2	
		AUX. CONTACTOR, 2NO+2NC, CV. 220 V DC	2	

TECHNICAL DATA PART - A

ANNEXURE-A.2

MODULE WISE BOM

		NUMERICAL RELAY WITH COMMUNICATION FACILITY (ONE LOCAL FRONT PORT FOR COMMUNICATION WITH LAPTOP & TWO RJ REAR PORT AS PER IEC-61850 FOR COMMUNICATION WITH DDCMIS) FOR FOLLOWING FUNCTIONS: • PHASE OVER CURRENT PROTECTION (50/51) • EARTH FAULT PROTECTION (50N/51N) • STAND BY EARTH FAULT PROTECTION (51NS) • RESTRICTED EARTH FAULT PROTECTION (64R) • BUS NO VOLT • FAULT LOCKOUT FUNCTION (86) • UNDER VOLTAGE WITH TIMER (27M) • SYNCHRONISING CHECK FUNCTION (25) • CIRCUIT BREAKER FAILURE (50BF) • RELAY SELF SUPERVISION • CIRCUIT BREAKER CONDITION MONITORING • TRIP CIRCUIT SUPERVISION (95) • CURRENT TRANFORMER SUPERVISION • VOLTAGE TRANFORMER SUPERVISION • BREAKER CONTROL with I/L • DISTURBANCE RECORDING • FAULT RECORDING • EVENT RECORDING • MEASUREMENT FUNCTIONS (3I, Io, 3U, Uo, Hz, P, Q, E, PF) • NO. OF DI/DO SHALL BE AS PER SCHEME REQUIREMENT • ALL THE BINARY INPUTS SHALL BE CAPABLE OF TAKING THE 220V DC, HOWEVER THE THERSHOLD VALUE FOR BINARY INPUTS SHALL BE MORE THAN 70% OF RATED CONTROL SUPPLY VOLTAGE • CT INPUT 5 NOs. (3-Ph, 1 for REF and 1 SPARE) WITH CT SECONDARY CURRENT OF 1A • PT INPUT 4 NOs. (3 NOS FOR BUS VOLTAGE & 1 NO FOR LINE VOLTAGE)	1	
3	**DAET/DAE (B/C)**	**PMCC/ MCC BUSCOUPLER BREAKER OF RATING 630A & ABOVE**		
		ACB 3P, ELECTRICALLY OPERATED D/O TYPE, WITHOUT RELEASES, CONTROL SUPPLY VOLTAGE 220V DC, MIN. 10NO+10NC (6NO+6NC AUX. CONTACT DIRECTLY OPERATED FROM BKR. OPERATED MECHANISM). SPRING CHARGE LIMIT SWITCH WITH MIN. 2NO+2NC CONTACTS	1	
		CONTROL MCB SP 6A	10	
		NEUTRAL LINK	1	
		INDICATING LAMP	2	
		CURRENT TRANSFORMER (PROTECTION) WITH VDR, 5VA or better, **CL-5P20**, INSL CL-E OR BETTER, SECONDARY CURRENT: 1A	3	
		CT SHORTING TERMINAL - STUD TYPE	As required	
		CONTROL TERMINALS (FIXED)	As required	
		POWER TERMINALS	As required	
		220 V DC DP MCB 10A	2	
		2 POLE BREAKER CONTROL SWITCH (TNC), 16A, 220VDC	1	
		2 POLE, 2 POSI., LOCAL/ REMOTE SWITCH	1	
		LIMIT SWITCH	2	
		INTERPOSING/ COUPLING RELAY WITH BUILT IN LED, TEST KNOB & FREEWHEELING DIODE	2	
		AUX. CONTACTOR, 2NO+2NC, CV. 220 V DC	2	
		NUMERICAL RELAY WITH COMMUNICATION FACILITY (ONE LOCAL FRONT PORT FOR COMMUNICATION WITH LAPTOP & TWO RJ REAR PORT AS PER IEC-61850 FOR COMMUNICATION WITH DDCMIS) FOR FOLLOWING FUNCTIONS: • PHASE OVER CURRENT PROTECTION (50/51) • EARTH FAULT PROTECTION (50N/51N) • BUS NO VOLT • FAULT LOCKOUT FUNCTION (86) • UNDER VOLTAGE WITH TIMER (27M) • SYNCHRONISING CHECK FUNCTION (25) • CIRCUIT BREAKER FAILURE (50BF) • RELAY SELF SUPERVISION • CIRCUIT BREAKER CONDITION MONITORING • TRIP CIRCUIT SUPERVISION (95) • CURRENT TRANFORMER SUPERVISION • VOLTAGE TRANFORMER SUPERVISION • BREAKER CONTROL FUNCTION • DISTURBANCE RECORDING • FAULT RECORDING • EVENT RECORDING • MEASUREMENT FUNCTIONS (3I, Io, 3U, Uo, Hz, P, Q, E, PF) • NO. OF DI/DO SHALL BE AS PER SCHEME REQUIREMENT • ALL THE BINARY INPUTS SHALL BE CAPABLE OF TAKING THE 220V DC, HOWEVER THE THERSHOLD VALUE FOR BINARY INPUTS SHALL BE MORE THAN 70% OF RATED CONTROL SUPPLY VOLTAGE • PT INPUT 4 NOs.	1	
4	**DG (I/C)**	**EMERGENCY BOARD INCOMER BREAKER FROM DG OF RATING 630A & ABOVE**		
		ACB TP, ELECTRICALLY OPERATED D/O TYPE, WITHOUT RELEASES, CONTROL SUPPLY VOLTAGE 220V DC, MIN. 10NO+10NC (6NO+6NC AUX. CONTACT DIRECTLY OPERATED FROM BKR. OPERATED MECHANISM). SPRING CHARGE LIMIT SWITCH WITH MIN. 2NO+2NC CONTACTS	1	
		CONTROL MCB SP 6A	10	
		NEUTRAL LINK	2	
		INDICATING LAMP	5	
		CURRENT TRANSFORMER (METERING), 5VA (Min.), CL-1, INSL CL-E OR BETTER, SECONDARY CURRENT: 1A	1	
		CURRENT TRANSFORMER, 5VA or better, CL-5P20, INSL CL-E OR BETTER, SECONDARY CURRENT: 1A	3	
		CURRENT TRANSFORMER (PROTECTION) WITH VDR, 5VA or better, CL-PS, INSL CL-E OR BETTER, SECONDARY CURRENT: 1A	3	
		POTENTIAL TRANSFORMER - 415/110V, 50 VA CL-0.5, INSL CL-E OR BETTER	1	
		CT SHORTING TERMINAL - STUD TYPE	As required	
		CONTROL TERMINALS (FIXED)	As required	

TECHNICAL DATA PART - A

ANNEXURE-A.2

MODULE WISE BOM

		POWER TERMINALS	As required	
		220 V DC DP MCB 6A	4	
		2 POLE BREAKER CONTROL SWITCH (TNC), 16A, 220VDC	1	
		2 POLE, 2 POSI., LOCAL/ REMOTE SWITCH	1	
		LIMIT SWITCH	2	
		INTERPOSING/ COUPLING RELAY WITH BUILT IN LED, TEST KNOB & FREEWHEELING DIODE	2	
		AUX. CONTACTOR, 2NO+2NC, CV. 220 V DC	2	
		NUMERICAL RELAY WITH COMMUNICATION FACILITY (ONE LOCAL FRONT PORT FOR COMMUNICATION WITH LAPTOP & TWO RJ REAR PORT AS PER IEC-61850 FOR COMMUNICATION WITH DDCMIS) FOR FOLLOWING FUNCTIONS: • PHASE OVER CURRENT PROTECTION (50/51) • EARTH FAULT PROTECTION (50N/51N) • RESTRICTED EARTH FAULT PROTECTION (64R) • BUS NO VOLT • FAULT LOCKOUT FUNCTION (86) • UNDER VOLTAGE WITH TIMER (27M) • SYNCHRONISING CHECK FUNCTION (25) • CIRCUIT BREAKER FAILURE (50BF) • DIFFERENTIAL PROTECTION (87) (HIGH IMPEDANCE) • REVERSE POWER PROTECTION • DG NEUTRAL DISPLACEMENT (59) • DG MONITORING • RELAY SELF SUPERVISION • CIRCUIT BREAKER CONDITION MONITORING • TRIP CIRCUIT SUPERVISION (95) • CURRENT TRANFORMER SUPERVISION • VOLTAGE TRANFORMER SUPERVISION • BREAKER CONTROL FUNCTION • DISTURBANCE RECORDING • FAULT RECORDING • EVENT RECORDING • MEASUREMENT FUNCTIONS (3I, Io, 3U, Uo, Hz, P, Q, E, PF) • NO. OF DI/DO SHALL BE AS PER SCHEME REQUIREMENT • ALL THE BINARY INPUTS SHALL BE CAPABLE OF TAKING THE 220V DC, HOWEVER THE THERSHOLD VALUE FOR BINARY INPUTS SHALL BE MORE THAN 70% OF RATED CONTROL SUPPLY VOLTAGE • CT INPUT 4 NOs. (3 FOR CURRENT PROTECTION, 1 SPARE), SECONDARY CURRENT: 1A • PT INPUT 4 NOs.	1	
5	**DAE(O/G) / DAE-TIE**	**OUTGOING/ TIE BREAKER FEEDER OF RATING 630A & ABOVE**		
		ACB 3P, ELECTRICALLY OPERATED D/O TYPE, WITHOUT RELEASES, CONTROL SUPPLY VOLTAGE 220V DC, MIN. 10NO+10NC (6NO+6NC AUX. CONTACT DIRECTLY OPERATED FROM BKR. OPERATED MECHANISM). SPRING CHARGE LIMIT SWITCH WITH MIN. 2NO+2NC CONTACTS	1	
		CONTROL MCB SP 6A	4	
		NEUTRAL LINK	1	
		INDICATING LAMP	2	
		CURRENT TRANSFORMER, 5VA or better, CL-5P20, INSL CL-E OR BETTER, SECONDARY CURRENT: 1A	3	
		CT SHORTING TERMINAL - STUD TYPE	As required	
		CONTROL TERMINALS (FIXED)	As required	
		POWER TERMINALS	As required	
		220 V DC DP MCB 10A	2	
		2 POLE BREAKER CONTROL SWITCH (TNC), 16A, 220VDC	1	
		2 POLE, 2 POSI., LOCAL/ REMOTE SWITCH	1	
		LIMIT SWITCH	2	
		AUX. CONTACTOR, 2NO+2NC, CV. 220 V DC	2	
		INTERPOSING/ COUPLING RELAY WITH BUILT IN LED, TEST KNOB & FREEWHEELING DIODE	2	
		NUMERICAL RELAY WITH COMMUNICATION FACILITY (ONE LOCAL FRONT PORT FOR COMMUNICATION WITH LAPTOP & TWO RJ REAR PORT AS PER IEC-61850 FOR COMMUNICATION WITH DDCMIS) FOR FOLLOWING FUNCTIONS: • PHASE OVER CURRENT PROTECTION (50/51) • EARTH FAULT PROTECTION (50N/51N) • BUS NO VOLT • FAULT LOCKOUT FUNCTION (86) • UNDER VOLTAGE WITH TIMER (27M) • SYNCHRONISING CHECK FUNCTION (25) (Applicable for DAE-TIE only) • CIRCUIT BREAKER FAILURE (50BF) • RELAY SELF SUPERVISION • CIRCUIT BREAKER CONDITION MONITORING • TRIP CIRCUIT SUPERVISION (95) • CURRENT TRANFORMER SUPERVISION • VOLTAGE TRANFORMER SUPERVISION • BREAKER CONTROL FUNCTION • DISTURBANCE RECORDING • FAULT RECORDING • EVENT RECORDING • MEASUREMENT FUNCTIONS (3I, Io, 3U, Uo, Hz, P, Q, E, PF) • NO. OF DI/DO SHALL BE AS PER SCHEME REQUIREMENT • ALL THE BINARY INPUTS SHALL BE CAPABLE OF TAKING THE 220V DC, HOWEVER THE THERSHOLD VALUE FOR BINARY INPUTS SHALL BE MORE THAN 70% OF RATED CONTROL SUPPLY VOLTAGE • CT INPUT 5 NOs. (3-Ph, 1 for REF and 1 SPARE) WITH CT SECONDARY CURRENT OF 1A • PT INPUT 4 NOs. (3 NOS FOR BUS VOLTAGE & 1 NO FOR LINE VOLTAGE)	1	
6	**DM/PM/AM**	**BREAKER CONTROLLED MOTOR FEEDER RATED 90KW & ABOVE (CONTROLLED FROM DDCMIS/PLC/ATRS)**		

TECHNICAL DATA PART - A

ANNEXURE-A.2

MODULE WISE BOM

		ACB TP, ELECTRICALLY OPERATED D/O TYPE, WITHOUT RELEASES, CONTROL SUPPLY VOLTAGE 220V DC, MIN. 10NO+10NC (6NO+6NC AUX. CONTACT DIRECTLY OPERATED FROM BKR. OPERATED MECHANISM). SPRING CHARGE LIMIT SWITCH WITH MIN. 2NO+2NC CONTACTS	1	
		CONTROL MCB	5	
		NEUTRAL LINK	1	
		INDICATING LAMP	3	
		CURRENT TRANSFORMER (METERING), 5VA (Min.), CL-1, INSL CL-E OR BETTER, SECONDARY CURRENT: 1A	1	
		CURRENT TRANSFORMER, 5VA or better, CL-5P20, INSL CL-E OR BETTER, SECONDARY CURRENT: 1A	3	
		CURRENT TRANSDUCER (DC), 4-20 mA, DUAL O/P	1	
		DIGITAL AMMETER	1	
		CT SHORTING TERMINAL - STUD TYPE	As required	
		CONTROL TERMINALS (FIXED)	As required	
		POWER TERMINALS	As required	
		SP ON/ OFF SWITCH FOR MOTOR SPACE HEATER OF BREAKER MOTOR FDR, 10A, 240V AC	1	
		220 V DC DP MCB 6A	4	
		2 POLE BREAKER CONTROL SWITCH (TNC), 16A, 220VDC	1	
		2 POLE, 2 POSI., LOCAL/ REMOTE SWITCH	1	
		LIMIT SWITCH	2	
		AUXILIARY CONTACTOR 2NO+2NC WITH ADD-ON BLOCK 1NO+1NC, COIL VOLTAGE:- 220V DC	1	
		INTERPOSING/ COUPLING RELAY WITH BUILT IN LED, TEST KNOB & FREEWHEELING DIODE	2	
		NUMERICAL RELAY WITH COMMUNICATION FACILITY (ONE LOCAL FRONT PORT FOR COMMUNICATION WITH LAPTOP & TWO RJ REAR PORT AS PER IEC-61850 FOR COMMUNICATION WITH DDCMIS) FOR FOLLOWING FUNCTIONS: • PHASE OVER CURRENT PROTECTION (50/51) • EARTH FAULT PROTECTION (50N/51N) • STALLING/ LOCKED ROTOR PROTECTION (50L/R) • THERMAL OVERLAOD PROTECTION (49) • NEGATIVE PHASE SEQUENCE PROTECTION (46) • BUS NO VOLT • REPETATIVE START PROTECTION (66) • FAULT LOCKOUT FUNCTION (86) • UNDER VOLTAGE WITH TIMER (27M) • MOTOR DIFFERENTIAL PROTECTION (87M) • CIRCUIT BREAKER FAILURE (50BF) • PHASE REVERSAL PROTECTION (46R) • MOTOR START MONITORING & RESTART INHIBIT FEATURE • VT FUSE-FAIL PROTECTION (60) • CURRENT UNBALANCE PROTECTION • RELAY SELF SUPERVISION • CIRCUIT BREAKER CONDITION MONITORING • TRIP CIRCUIT SUPERVISION (95) • CURRENT TRANFORMER SUPERVISION • VOLTAGE TRANFORMER SUPERVISION • BREAKER CONTROL FUNCTION • DISTURBANCE RECORDING • FAULT RECORDING • EVENT RECORDING • MEASUREMENT FUNCTIONS (3I, Io, 3U, Uo, Hz, P, Q, E, PF, H, 27U) • NO. OF DI/DO SHALL BE AS PER SCHEME REQUIREMENT • ALL THE BINARY INPUTS SHALL BE CAPABLE OF TAKING THE 220V DC, HOWEVER THE THERSHOLD VALUE FOR BINARY INPUTS SHALL BE MORE THAN 70% OF RATED CONTROL SUPPLY VOLTAGE • CT INPUT 5 NOs. (3-Ph, 1 for REF and 1 SPARE) WITH CT SECONDARY CURRENT OF 1A • PT INPUT 4 NOs. (3 NOS FOR BUS VOLTAGE & 1 NO FOR LINE VOLTAGE)	1	
7	**G1**	**BUS PT MODULE FOR PCC/ PMCC**		
		TRIPLE POLE MCCB	1	
		4 POLE MCB	1	
		NEUTRAL LINK	2	
		POTENTIAL TRANSFORMER - 415/√3 / 110/√3, 50 VA CL-0.5, INSL CL-E OR BETTER	3	
		CONTROL TERMINALS (FIXED)	As required	
8	**G2**	**BUS PT MODULE FOR EMERGENCY MCC**		
		TRIPLE POLE MCCB	1	
		4 POLE MCB	1	
		NEUTRAL LINK	2	
		POTENTIAL TRANSFORMER - 415/√3 / 110/√3, 50 VA CL-0.5, INSL CL-E OR BETTER	3	
		CONTROL TERMINALS (FIXED)	As required	
9	**VM**	**BUS PT MODULE FOR MCC/ ACDB**		
		MCCB WITH 1NO+1NC AUX. CONTACT	3	
		CONTROL DP MCB	1	
		AUX. CONTACTOR, 2NO+2NC, CV. 415 V AC	1	
		AC VOLTMETER (0-500V)	1	
		VOLTMETER SELECTOR SWITCH	1	
		VOLTAGE TRANSDUCER (AC), 4-20 mA, DUAL O/P	1	
		CONTROL TERMINALS (FIXED)	As required	
10	**CS**	**EACH CONTROL SUPPLY MODULE**		
		MCCB	2	
		CONTROL MCB	4	
		NEUTRAL LINK	6	
		AUX. CONTACTOR, 2NO+2NC, CV. 110 V AC (AS AC MONITORING RELAY)	4	
		CONTROL TRANSFORMER, DRY TYPE, CAST RESIN, 415/110V, INS. CL-B OR BETTER	2	
		2 POLE, 2 POSI., SELECTOR SWITCH FOR CONTROL TRF., 110V AC	2	
		CONTROL TERMINALS (FIXED)	As required	

TECHNICAL DATA PART - A

ANNEXURE-A.2

MODULE WISE BOM

11	**DB**	**220V/ 48V DC INCOMER OF DCDB FROM BATTERY**		
		DC AMMETER WITH SHUNT AND CENTER ZERO	1	
		CONTROL TERMINALS (FIXED)	As required	
12	**DC**	**220V/ 48V DC BUS COUPLER (NORMALLY CLOSED)**		
		250V DC ISOLATING SWITCH WITH 2NO+2NC AUXILIARY CONTACTS	1	
		CONTROL TERMINALS (FIXED)	As required	
13	**CH**	**220V/ 48V DC INCOMER OF DCDB FROM CHARGER**		
		MCCB -A TP, 1C/O AUX. CONTACT & EXTENDED ROTARY HANDLE	1	
		CONTROL TERMINALS (FIXED)	As required	
14	**HD**	**220V/ 48V DC BUS COUPLER (NORMALLY OPEN)**		
		TP, 250V DC ISOLATING SWITCH WITH 2NO+2NC AUXILIARY CONTACTS	1	
		LINK/ ISOLATION (FOR SWITCHYARD)	1	
		CONTROL TERMINALS (FIXED)	As required	
	NOTE: MODULE TYPE HD SHALL HAVE KEY INTERLOCK WITH MODULE TYPE DC ON BOTH SECTION IN SUCH A WAY THAT WHEN SWITCH 'HD' IS IN OPEN CONDITION THE KEY SHALL BE TRAPPED. ON CLOSING MODULE 'HD' THE KEY SHALL BE RELEASED. MODULE TYPE DC CAN ONLY BE OPENED ON INSERTING THE ABOVE KEY IN ANY ONE OF THE SECTION.			
15	**S**	**220V/ 48V DCDB BUS MODULE FOR METERING & PROTECTION**		
		250V DC MCCB	1	
		UNDERVOLTAGE RELAY (INSTANTANEOUS WITH SETTING OF 80% OF 220VDC. THE RESETTING OF RELAY SHOULD NOT BE MORE THAN 1.05)	1	
		OVERVOLTAGE RELAY (INSTANTANEOUS WHICH SHALL OPERATE AT 110% OF 220V DC. THE RESETTING SHOULD NOT BE LESS THAN .95)	1	
		EARTHFAULT RELAY (CAEM21 OR EQV.)	1	
		INDICATING LAMP	3	
		CONTROL MCB	2	
		NEUTRAL LINK	1	
		DC VOLTMETER (0-300V)	1	
		VOLTMETER SELECTOR SWITCH	1	
		VOLTAGE TRANSDUCER (DC), 4-20mA, DUAL O/P	1	
		AUX. CONTACTOR, 2NO+2NC, CV. 220/48 V DC	2	
		PUSH BUTTON - SPRING RETURN WITH 1NO+1NC AUX. CONTACT	2	
		CONTROL TERMINALS (FIXED)	As required	
16	**MCCB TYPE (X)**	**220V/ 48V DC OUTGOING FEEDER**		
		250V DC DP MCCB	1	
		POWER TERMINALS	As required	
17	**CC (I/C)**	**MCC/ ACDB INCOMER WITH CONTACTOR (FOR ONE OUT OF TWO LOGIC) OF RATING UP TO 400A**		
		TP MCCB ADJ. O/L, S/C & E/F RELEASE	1	
		EXTENDED ROTARY HANDLE	1	
		AUXILIARY CONTACT FOR MCCB 1C/O	1	
		TP POWER CONTACTOR(AC) COIL VOLTAGE 110V AC	1	
		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	1	
		CONTROL MCB 6A, 10KA	7	
		INDICATING LAMP	3	
		AUX. CONTACTOR, 2NO+2NC, CV. 110 V AC	2	
		CONTROL TERMINALS (DRAWOUT)	As required	
18	**E3 (I/C)**	**MCC/ ACDB INCOMER OF RATING UP TO 400A**		
		TP MCCB ADJ. O/L & S/C RELEASE	1	
		EXTENDED ROTARY HANDLE	1	
		NEUTRAL LINK EQUIVALENT TO MCCB RATING	1	
		AUXILIARY CONTACT FOR MCCB 1C/O	1	
		CONTROL MCB 6A, 10KA	1	
		NEUTRAL LINK-16A	1	
		INDICATING LAMP	3	
		CONTROL TERMINALS (DRAWOUT)	As required	
		NEUTRAL CT	1	
		CT SHORTING TERMINAL - STUD TYPE	As required	
19	**E3 (B/C)**	**MCC/ ACDB BUSCOUPLER OF RATING UP TO 400A**		
		TP MCCB ADJ. O/L & S/C RELEASE	1	
		EXTENDED ROTARY HANDLE	1	
		NEUTRAL LINK EQUIVALENT TO MCCB RATING	1	
		AUXILIARY CONTACT FOR MCCB 1C/O	1	
		CONTROL MCB 6A, 10KA	1	
		NEUTRAL LINK-16A	1	
		INDICATING LAMP	3	
		CONTROL TERMINALS (DRAWOUT)	As required	
		NEUTRAL CT	1	
		CT SHORTING TERMINAL - STUD TYPE	As required	
		POWER TERMINALS	As required	
20(A)	**E3 (O/G)**	**TPN AC OUTGOING MCCB OPERATED FEEDER FOR RATING UP TO 400A**		
		TP MCCB ADJ. **S/C & O/L** RELEASE	1	
		EXTENDED ROTARY HANDLE	1	
		NEUTRAL LINK EQUIVALENT TO MCCB RATING	1	
		AUXILIARY CONTACT FOR MCCB 1C/O	1	

TECHNICAL DATA PART - A

ANNEXURE-A.2

MODULE WISE BOM

20(B)	**E3-TP (O/G)**	**TP AC OUTGOING MCCB OPERATED FEEDER FOR RATING UP TO 400A (FOR 3PHASE, 3WIRE SYSTEM)**		
		TP MCCB ADJ. **S/C & O/L** RELEASE	1	
		EXTENDED ROTARY HANDLE	1	
		AUXILIARY CONTACT FOR MCCB 1C/O	1	
21	**E2**	**2 PHASE AC OUTGOING MCCB OPERATED FEEDER**		
		DP MCCB ADJ. S/C **& O/L** RELEASE	1	
		EXTENDED ROTARY HANDLE	1	
		AUXILIARY CONTACT FOR MCCB 1C/O	1	
22	**E1**	**SINGLE PHASE AC OUTGOING MCCB OPERATED FEEDER**		
		DP MCCB ADJ. S/C **& O/L** RELEASE	1	
		EXTENDED ROTARY HANDLE	1	
		NEUTRAL LINK EQUIVALENT TO MCCB RATING	1	
		AUXILIARY CONTACT FOR MCCB 1C/O	1	
23	**ES3**	**TPN AC OUTGOING FOR SOLAR, MCCB OPERATED FEEDER FOR RATING UP TO 400A**		
		FP MCCB ADJ. S/C **& O/L** RELEASE	1	
		EXTENDED ROTARY HANDLE	1	
		NEUTRAL LINK EQUIVALENT TO MCCB RATING	1	
		AUXILIARY CONTACT FOR MCCB 1C/O	1	
		CURRENT TRANSFORMER (METERING), 10VA, CL-0.5, INSL CL-E OR BETTER	3	
		CT SHORTING TERMINAL - STUD TYPE	As required	
		CONTROL TERMINALS (DRAWOUT)	As required	
		POTENTIAL TRANSFORMER - 415/√3 / 110/√3, 25 VA CL-0.5, INSL CL-E OR BETTER	3	
		CONTROL 4P MCB 6A, 10KA	2	
		CONTROL MCB 6A, 10KA	1	
		NEUTRAL LINK-16A	1	
		MULTIFUNCTION DIGITAL ENERGY METER WITH RS485 PORT (0.5 ACC. CLASS)	1	
24	**DK2/PK2/AK2**	**UNIDIRECTIONAL MOTOR FEEDER BELOW 30KW (CONTROLLED FROM DDCMIS/PLC/ATRS)**		
		TP MPCB ADJ. S/C RELEASE	1	
		EXTENDED ROTARY HANDLE	1	
		AUXILIARY CONTACT FOR MPCB 1C/O	1	
		TP POWER CONTACTOR(AC) COIL VOLTAGE 110V AC	1	
		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	1	
		INTELLIGENT MOTOR CONTROLLER (IMC) WITH CURRENT SENSING MODULE AND CT (IN-BUILT/ EXTERNAL) SHALL HAVE FOLLOWING FUNCTIONS: **a) PROTECTION FUNCTIONS** i) Overload (I2t) Protection with site selectable Trip class 5 to 30 ii) Current imbalance iii) No. of starts/hr limitation iv) Stall Protection during start v) Load Jam protection during running **b) CONTROL FUNCTIONS** i) Close / Trip Command ii) Reversing starter **c) STANDARD CONTROL BLOCKS FOR VARIOUS FUNCTIONS** i) Watch dog facility ii) Ready to start iii) External wiring iv) Emergency stop v) External check-back signal vi) DP fault vii) Test 1 with shut-down viii) Test 2 without shut-down ix) Reset **d) OPERATING AND DIAGNOSTICS DATA** The IMC shall continuously monitor and provide the following data for display (local/ remote) i) 3-Phase currents ii) Motor ON / OFF status iii) Motor Fault / Switchgear Disturbance iv) Overload trip status v) Overload alarm status vi) Operating hours vii) Number of switching operations viii) Number of overload trips ix) At least last 5 trip data with time stamping in non-volatile memory of IMC in FIFO sequence **e) LED INDICATIONS** i) Controller healthy ii) Controller fault iii) Controller power supply healthy.	1	
		CONTROL MCB 6A, 10KA	1	
		NEUTRAL LINK-16A	1	
		AUX. CONTACTOR, 2NO+2NC, CV. 110 V AC	2	
		INDICATING LAMP	3	
		CONTROL TERMINALS (DRAWOUT)	As required	
		INTERPOSING/ COUPLING RELAY WITH BUILT IN LED, TEST KNOB & FREEWHEELING DIODE	2	
25	**DK21/PK21/ AK21**	**UNIDIRECTIONAL MOTOR FEEDER RATED 30KW & BELOW 90KW (CONTROLLED FROM DDCMIS/PLC/ATRS)**		
		TP MCCB ADJ. S/C RELEASE	1	
		EXTENDED ROTARY HANDLE	1	

TECHNICAL DATA PART - A

ANNEXURE-A.2

MODULE WISE BOM

		AUXILIARY CONTACT FOR MCCB 1C/O	1	
		TP POWER CONTACTOR(AC) COIL VOLTAGE 110V AC	1	
		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	1	
		INTELLIGENT MOTOR CONTROLLER (IMC) WITH CURRENT & VOLTAGE SENSING MODULE AND BOTH CT & VT (IN-BUILT/ EXTERNAL) SHALL HAVE FOLLOWING FUNCTIONS: **a) PROTECTION FUNCTIONS** i) Overload (I2t) Protection with site selectable Trip class 5 to 30 ii) Current imbalance iii) No. of starts/hr limitation iv) Stall Protection during start v) Load Jam protection during running **b) CONTROL FUNCTIONS** i) Close / Trip Command ii) Reversing starter **c) STANDARD CONTROL BLOCKS FOR VARIOUS FUNCTIONS** i) Watch dog facility ii) Ready to start iii) External wiring iv) Emergency stop v) External check-back signal vi) DP fault vii) Test 1 with shut-down viii) Test 2 without shut-down ix) Reset **d) OPERATING AND DIAGNOSTICS DATA** The IMC shall continuously monitor and provide the following data for display (local /remote) i) 3-Phase currents ii) Motor ON / OFF status iii) Motor Fault / Switchgear Disturbance iv) Overload trip status v) Overload alarm status vi) Operating hours vii) Number of switching operations viii) Number of overload trips ix) At least last 5 trip data with time stamping in non-volatile memory of IMC in FIFO sequence x) 3 Phase Voltages xi) 3 Phase Power xii) 3 phase Energy **e) LED INDICATIONS** i) Controller healthy ii) Controller fault iii) Controller power supply healthy.	1	
		CONTROL MCB 6A, 10KA	2	
		NEUTRAL LINK-16A	2	
		AUX. CONTACTOR, 2NO+2NC, CV. 110 V AC	2	
		CURRENT TRANSFORMER , 5VA, CL-1, INSL CL-E OR BETTER	1	
		CT SHORTING TERMINAL - STUD TYPE	As required	
		CURRENT TRANSDUCER (DC), 4-20 mA, DUAL O/P	1	
		INDICATING LAMP	3	
		CONTROL TERMINALS (DRAWOUT)	As required	
		INTERPOSING/ COUPLING RELAY WITH BUILT IN LED, TEST KNOB & FREEWHEELING DIODE	2	
		SP ON/ OFF SWITCH FOR MOTOR SPACE HEATER OF MOTOR FDR, 10A, 240V AC	1	
26	**DK2E/PK2E/AK2E**	**UNIDIRECTIONAL MOTOR FEEDER (REACCELERATION) BELOW 30KW (CONTROLLED FROM DDCMIS/PLC/ATRS)**		
		TP MPCB ADJ. S/C RELEASE	1	
		EXTENDED ROTARY HANDLE	1	
		AUXILIARY CONTACT FOR MPCB 1C/O	1	
		TP POWER CONTACTOR(AC) COIL VOLTAGE 110V AC	1	
		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	1	

TECHNICAL DATA PART - A

ANNEXURE-A.2

MODULE WISE BOM

		INTELLIGENT MOTOR CONTROLLER (IMC) WITH CURRENT SENSING MODULE AND CT (IN-BUILT/ EXTERNAL) SHALL HAVE FOLLOWING FUNCTIONS: **a) PROTECTION FUNCTIONS** i) Overload (I2t) Protection with site selectable Trip class 5 to 30 ii) Current imbalance iii) No. of starts/hr limitation iv) Stall Protection during start v) Load Jam protection during running **b) CONTROL FUNCTIONS** i) Close / Trip Command ii) Reversing starter **c) STANDARD CONTROL BLOCKS FOR VARIOUS FUNCTIONS** i) Watch dog facility ii) Ready to start iii) External wiring iv) Emergency stop v) External check-back signal vi) DP fault vii) Test 1 with shut-down viii) Test 2 without shut-down ix) Reset **d) OPERATING AND DIAGNOSTICS DATA** The IMC shall continuously monitor and provide the following data for display (local/ remote) i) 3-Phase currents ii) Motor ON / OFF status iii) Motor Fault / Switchgear Disturbance iv) Overload trip status v) Overload alarm status vi) Operating hours vii) Number of switching operations viii) Number of overload trips ix) At least last 5 trip data with time stamping in non-volatile memory of IMC in FIFO sequence **e) LED INDICATIONS** i) Controller healthy ii) Controller fault iii) Controller power supply healthy.	1	
		CONTROL MCB 6A, 10KA	1	
		NEUTRAL LINK-16A	1	
		AUX. CONTACTOR, 2NO+2NC, CV. 110 V AC	2	
		INDICATING LAMP	3	
		CONTROL TERMINALS (DRAWOUT)	As required	
		INTERPOSING/ COUPLING RELAY WITH BUILT IN LED, TEST KNOB & FREEWHEELING DIODE	2	
		POWER OFF DELAY TIMER	1	
27	**DK21E/PK21E/ AK21E**	**UNIDIRECTIONAL MOTOR FEEDER (REACCELERATION) RATED 30KW & BELOW 90KW (CONTROLLED FROM DDCMIS/PLC/ATRS)**		
		TP MCCB ADJ. S/C RELEASE	1	
		EXTENDED ROTARY HANDLE	1	
		AUXILIARY CONTACT FOR MCCB 1C/O	1	
		TP POWER CONTACTOR(AC) COIL VOLTAGE 110V AC	1	
		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	1	
		INTELLIGENT MOTOR CONTROLLER (IMC) WITH CURRENT & VOLTAGE SENSING MODULE AND BOTH CT & VT (IN-BUILT/ EXTERNAL) SHALL HAVE FOLLOWING FUNCTIONS: **a) PROTECTION FUNCTIONS** i) Overload (I2t) Protection with site selectable Trip class 5 to 30 ii) Current imbalance iii) No. of starts/hr limitation iv) Stall Protection during start v) Load Jam protection during running **b) CONTROL FUNCTIONS** i) Close / Trip Command ii) Reversing starter **c) STANDARD CONTROL BLOCKS FOR VARIOUS FUNCTIONS** i) Watch dog facility ii) Ready to start iii) External wiring iv) Emergency stop v) External check-back signal vi) DP fault vii) Test 1 with shut-down viii) Test 2 without shut-down ix) Reset **d) OPERATING AND DIAGNOSTICS DATA** The IMC shall continuously monitor and provide the following data for display (local /remote) i) 3-Phase currents ii) Motor ON / OFF status iii) Motor Fault / Switchgear Disturbance iv) Overload trip status v) Overload alarm status vi) Operating hours vii) Number of switching operations viii) Number of overload trips ix) At least last 5 trip data with time stamping in non-volatile memory of IMC in FIFO sequence x) 3 Phase Voltages xi) 3 Phase Power xii) 3 phase Energy **e) LED INDICATIONS** i) Controller healthy ii) Controller fault iii) Controller power supply healthy.	1	
		CONTROL MCB 6A, 10KA	2	

TECHNICAL DATA PART - A

ANNEXURE-A.2

MODULE WISE BOM

		NEUTRAL LINK-16A	2	
		AUX. CONTACTOR, 2NO+2NC, CV. 110 V AC	2	
		INDICATING LAMP	3	
		CURRENT TRANSFORMER , 5VA, CL-1, INSL CL-E OR BETTER	1	
		CURRENT TRANSDUCER (DC), 4-20 mA, DUAL O/P	1	
		CONTROL TERMINALS (DRAWOUT)	As required	
		INTERPOSING/ COUPLING RELAY WITH BUILT IN LED, TEST KNOB & FREEWHEELING DIODE	2	
		SP ON/ OFF SWITCH FOR MOTOR SPACE HEATER OF MOTOR FDR, 10A, 240V AC	1	
		POWER OFF DELAY TIMER	1	
28	**K2**	**UNIDIRECTIONAL MOTOR FEEDER BELOW 30KW (CONTROLLED FROM LCP)**		
		TP MPCB ADJ. S/C RELEASE	1	
		EXTENDED ROTARY HANDLE	1	
		AUXILIARY CONTACT FOR MPCB 1C/O	1	
		TP POWER CONTACTOR(AC) COIL VOLTAGE 110V AC	1	
		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	1	
		INTELLIGENT MOTOR CONTROLLER (IMC) WITH CURRENT SENSING MODULE AND CT (IN-BUILT/ EXTERNAL) SHALL HAVE FOLLOWING FUNCTIONS: **a) PROTECTION FUNCTIONS** i) Overload (I2t) Protection with site selectable Trip class 5 to 30 ii) Current imbalance iii) No. of starts/hr limitation iv) Stall Protection during start v) Load Jam protection during running **b) CONTROL FUNCTIONS** i) Close / Trip Command ii) Reversing starter **c) STANDARD CONTROL BLOCKS FOR VARIOUS FUNCTIONS** i) Watch dog facility ii) Ready to start iii) External wiring iv) Emergency stop v) External check-back signal vi) DP fault vii) Test 1 with shut-down viii) Test 2 without shut-down ix) Reset **d) OPERATING AND DIAGNOSTICS DATA** The IMC shall continuously monitor and provide the following data for display (local/ remote) i) 3-Phase currents ii) Motor ON / OFF status iii) Motor Fault / Switchgear Disturbance iv) Overload trip status v) Overload alarm status vi) Operating hours vii) Number of switching operations viii) Number of overload trips ix) At least last 5 trip data with time stamping in non-volatile memory of IMC in FIFO sequence **e) LED INDICATIONS** i) Controller healthy ii) Controller fault iii) Controller power supply healthy.	1	
		CONTROL MCB 6A, 10KA	1	
		NEUTRAL LINK-16A	1	
		AUX. CONTACTOR, 2NO+2NC, CV. 110 V AC	1	
		INDICATING LAMP	3	
		CONTROL TERMINALS (DRAWOUT)	As required	
29	**K21**	**UNIDIRECTIONAL MOTOR FEEDER RATED 30KW & BELOW 90KW (CONTROLLED FROM LCP)**		
		TP MCCB ADJ. S/C RELEASE	1	
		EXTENDED ROTARY HANDLE	1	
		AUXILIARY CONTACT FOR MCCB 1C/O	1	
		TP POWER CONTACTOR(AC) COIL VOLTAGE 110V AC	1	
		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	1	

TECHNICAL DATA PART - A

ANNEXURE-A.2

MODULE WISE BOM

		INTELLIGENT MOTOR CONTROLLER (IMC) WITH CURRENT & VOLTAGE SENSING MODULE AND BOTH CT & VT (IN-BUILT/ EXTERNAL) SHALL HAVE FOLLOWING FUNCTIONS: **a) PROTECTION FUNCTIONS** i) Overload (I2t) Protection with site selectable Trip class 5 to 30 ii) Current imbalance iii) No. of starts/hr limitation iv) Stall Protection during start v) Load Jam protection during running **b) CONTROL FUNCTIONS** i) Close / Trip Command ii) Reversing starter **c) STANDARD CONTROL BLOCKS FOR VARIOUS FUNCTIONS** i) Watch dog facility ii) Ready to start iii) External wiring iv) Emergency stop v) External check-back signal vi) DP fault vii) Test 1 with shut-down viii) Test 2 without shut-down ix) Reset **d) OPERATING AND DIAGNOSTICS DATA** The IMC shall continuously monitor and provide the following data for display (local /remote) i) 3-Phase currents ii) Motor ON / OFF status iii) Motor Fault / Switchgear Disturbance iv) Overload trip status v) Overload alarm status vi) Operating hours vii) Number of switching operations viii) Number of overload trips ix) At least last 5 trip data with time stamping in non-volatile memory of IMC in FIFO sequence x) 3 Phase Voltages xi) 3 Phase Power xii) 3 phase Energy **e) LED INDICATIONS** i) Controller healthy ii) Controller fault iii) Controller power supply healthy.	1	
		CONTROL MCB 6A, 10KA	2	
		NEUTRAL LINK-16A	2	
		AUX. CONTACTOR, 2NO+2NC, CV. 110 V AC	1	
		INDICATING LAMP	3	
		CONTROL TERMINALS (DRAWOUT)	As required	
		SP ON/ OFF SWITCH FOR MOTOR SPACE HEATER OF MOTOR FDR, 10A, 240V AC	1	
30	**K3**	**UNIDIRECTIONAL MOTOR FEEDER BELOW 30KW (CONTROLLED FROM LPBS)**		
		TP MPCB ADJ. S/C RELEASE	1	
		EXTENDED ROTARY HANDLE	1	
		AUXILIARY CONTACT FOR MPCB 1C/O	1	
		TP POWER CONTACTOR(AC) COIL VOLTAGE 110V AC	1	
		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	1	
		INTELLIGENT MOTOR CONTROLLER (IMC) WITH CURRENT SENSING MODULE AND CT (IN-BUILT/ EXTERNAL) SHALL HAVE FOLLOWING FUNCTIONS: **a) PROTECTION FUNCTIONS** i) Overload (I2t) Protection with site selectable Trip class 5 to 30 ii) Current imbalance iii) No. of starts/hr limitation iv) Stall Protection during start v) Load Jam protection during running **b) CONTROL FUNCTIONS** i) Close / Trip Command ii) Reversing starter **c) STANDARD CONTROL BLOCKS FOR VARIOUS FUNCTIONS** i) Watch dog facility ii) Ready to start iii) External wiring iv) Emergency stop v) External check-back signal vi) DP fault vii) Test 1 with shut-down viii) Test 2 without shut-down ix) Reset **d) OPERATING AND DIAGNOSTICS DATA** The IMC shall continuously monitor and provide the following data for display (local/ remote) i) 3-Phase currents ii) Motor ON / OFF status iii) Motor Fault / Switchgear Disturbance	1	

TECHNICAL DATA PART - A

ANNEXURE-A.2

MODULE WISE BOM

		iii) Motor Fault / Switchgear Disturbance iv) Overload trip status v) Overload alarm status vi) Operating hours vii) Number of switching operations viii) Number of overload trips ix) At least last 5 trip data with time stamping in non-volatile memory of IMC in FIFO sequence **e) LED INDICATIONS** i) Controller healthy ii) Controller fault iii) Controller power supply healthy.		
		CONTROL MCB 6A, 10KA	1	
		NEUTRAL LINK-16A	1	
		AUX. CONTACTOR, 2NO+2NC, CV. 110 V AC	1	
		INDICATING LAMP	3	
		CONTROL TERMINALS (DRAWOUT)	As required	
31	**K31**	**UNIDIRECTIONAL MOTOR FEEDER RATED 30KW & BELOW 90KW (CONTROLLED FROM LPBS)**		
		TP MCCB ADJ. S/C RELEASE	1	
		EXTENDED ROTARY HANDLE	1	
		AUXILIARY CONTACT FOR MCCB 1C/O	1	
		TP POWER CONTACTOR(AC) COIL VOLTAGE 110V AC	1	
		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	1	
		INTELLIGENT MOTOR CONTROLLER (IMC) WITH CURRENT & VOLTAGE SENSING MODULE AND BOTH CT & VT (IN-BUILT/ EXTERNAL) SHALL HAVE FOLLOWING FUNCTIONS: **a) PROTECTION FUNCTIONS** i) Overload (I2t) Protection with site selectable Trip class 5 to 30 ii) Current imbalance iii) No. of starts/hr limitation iv) Stall Protection during start v) Load Jam protection during running **b) CONTROL FUNCTIONS** i) Close / Trip Command ii) Reversing starter **c) STANDARD CONTROL BLOCKS FOR VARIOUS FUNCTIONS** i) Watch dog facility ii) Ready to start iii) External wiring iv) Emergency stop v) External check-back signal vi) DP fault vii) Test 1 with shut-down viii) Test 2 without shut-down ix) Reset **d) OPERATING AND DIAGNOSTICS DATA** The IMC shall continuously monitor and provide the following data for display (local /remote) i) 3-Phase currents ii) Motor ON / OFF status iii) Motor Fault / Switchgear Disturbance iv) Overload trip status v) Overload alarm status vi) Operating hours vii) Number of switching operations viii) Number of overload trips ix) At least last 5 trip data with time stamping in non-volatile memory of IMC in FIFO sequence x) 3 Phase Voltages xi) 3 Phase Power xii) 3 phase Energy **e) LED INDICATIONS** i) Controller healthy ii) Controller fault iii) Controller power supply healthy.	1	
		CONTROL MCB 6A, 10KA	2	
		NEUTRAL LINK-16A	2	
		AUX. CONTACTOR, 2NO+2NC, CV. 110 V AC	1	
		INDICATING LAMP	3	
		CONTROL TERMINALS (DRAWOUT)	As required	
		SP ON/ OFF SWITCH FOR MOTOR SPACE HEATER OF MOTOR FDR, 10A, 240V AC	1	
32	**DN1/PN1/AN1**	**BIDIRECTIONAL MOTOR FEEDER (CONTROLLED FROM DDCMIS/PLC/ATRS)**		
		TP MPCB ADJ. S/C RELEASE	1	
		EXTENDED ROTARY HANDLE	1	
		AUXILIARY CONTACT FOR MPCB 1C/O	1	
		TP POWER CONTACTOR(AC) COIL VOLTAGE 110V AC	2	
		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	2	

TECHNICAL DATA PART - A

ANNEXURE-A.2

MODULE WISE BOM

		INTELLIGENT MOTOR CONTROLLER (IMC) WITH CURRENT SENSING MODULE AND CT (IN-BUILT/ EXTERNAL) SHALL HAVE FOLLOWING FUNCTIONS: **a) PROTECTION FUNCTIONS** i) Overload (I2t) Protection with site selectable Trip class 5 to 30 ii) Current imbalance iii) No. of starts/hr limitation iv) Stall Protection during start v) Load Jam protection during running **b) CONTROL FUNCTIONS** i) Close / Trip Command ii) Reversing starter **c) STANDARD CONTROL BLOCKS FOR VARIOUS FUNCTIONS** i) Watch dog facility ii) Ready to start iii) External wiring iv) Emergency stop v) External check-back signal vi) DP fault vii) Test 1 with shut-down viii) Test 2 without shut-down ix) Reset **d) OPERATING AND DIAGNOSTICS DATA** The IMC shall continuously monitor and provide the following data for display (local/ remote) i) 3-Phase currents ii) Motor ON / OFF status iii) Motor Fault / Switchgear Disturbance iv) Overload trip status v) Overload alarm status vi) Operating hours vii) Number of switching operations viii) Number of overload trips ix) At least last 5 trip data with time stamping in non-volatile memory of IMC in FIFO sequence **e) LED INDICATIONS** i) Controller healthy ii) Controller fault iii) Controller power supply healthy.	1	
		CONTROL MCB 6A, 10KA	1	
		NEUTRAL LINK-16A	1	
		AUX. CONTACTOR, 2NO+2NC, CV. 110 V AC	3	
		INDICATING LAMP	4	
		CONTROL TERMINALS (DRAWOUT)	As required	
		INTERPOSING/ COUPLING RELAY WITH BUILT IN LED, TEST KNOB & FREEWHEELING DIODE	3	
33	**EA3**	**3 PHASE MCCB CONTACTOR CONTROLLED FEEDER (CONTROLLED FROM DDCMIS)**		
		TP MCCB ADJ. S/C RELEASE	1	
		EXTENDED ROTARY HANDLE	1	
		AUXILIARY CONTACT FOR MCCB 1C/O	1	
		TP POWER CONTACTOR(AC) COIL VOLTAGE 110V AC	1	
		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	1	
		INTELLIGENT MOTOR CONTROLLER (IMC) WITH CURRENT SENSING MODULE AND CT (IN-BUILT/ EXTERNAL) SHALL HAVE FOLLOWING FUNCTIONS: **a) PROTECTION FUNCTIONS** i) Overload (I2t) Protection with site selectable Trip class 5 to 30 ii) Current imbalance iii) No. of starts/hr limitation iv) Stall Protection during start v) Load Jam protection during running **b) CONTROL FUNCTIONS** i) Close / Trip Command ii) Reversing starter **c) STANDARD CONTROL BLOCKS FOR VARIOUS FUNCTIONS** i) Watch dog facility ii) Ready to start iii) External wiring iv) Emergency stop v) External check-back signal vi) DP fault vii) Test 1 with shut-down viii) Test 2 without shut-down ix) Reset **d) OPERATING AND DIAGNOSTICS DATA** The IMC shall continuously monitor and provide the following data for display (local/ remote) i) 3-Phase currents ii) Motor ON / OFF status iii) Motor Fault / Switchgear Disturbance iv) Overload trip status v) Overload alarm status vi) Operating hours vii) Number of switching operations viii) Number of overload trips ix) At least last 5 trip data with time stamping in non-volatile memory of IMC in FIFO sequence **e) LED INDICATIONS** i) Controller healthy ii) Controller fault iii) Controller power supply healthy.	1	
		CONTROL MCB 6A, 10KA	1	
		NEUTRAL LINK-16A	1	

TECHNICAL DATA PART - A

ANNEXURE-A.2

MODULE WISE BOM

		AUX. CONTACTOR, 2NO+2NC, CV. 110 V AC	2	
		INDICATING LAMP	3	
		CONTROL TERMINALS (DRAWOUT)	As required	
		INTERPOSING/ COUPLING RELAY WITH BUILT IN LED, TEST KNOB & FREEWHEELING DIODE	2	
34	**EA1**	**1 PHASE MCCB CONTACTOR CONTROLLED FEEDER (CONTROLLED FROM DDCMIS)**		
		TP MCCB ADJ. S/C RELEASE	1	
		EXTENDED ROTARY HANDLE	1	
		AUXILIARY CONTACT FOR MCCB 1C/O	1	
		TP POWER CONTACTOR(AC) COIL VOLTAGE 110V AC	1	
		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	1	
		CONTROL MCB 6A, 10KA	1	
		NEUTRAL LINK-16A	1	
		AUX. CONTACTOR, 2NO+2NC, CV. 110 V AC	2	
		INDICATING LAMP	3	
		CONTROL TERMINALS (DRAWOUT)	As required	
		INTERPOSING/ COUPLING RELAY WITH BUILT IN LED, TEST KNOB & FREEWHEELING DIODE	2	
35	**SHS**	**240V AC SPACE HEATER SUPPLY MODULE**		
		CONTROL MCB	4	
		NEUTRAL LINK	4	
		POWER CONTACTOR(AC) COIL VOLTAGE 240V AC	1	
		4 POLE, 2 POSI., SELECTOR SWITCH	1	
		CONTROL TERMINALS (FIXED)	As required	
36	**PNL SP HTR**	**PANEL SPACE HEATER AND PLUGS & SOCKETS (IN CABLE ALLEY OF EACH VERTICAL)**		
		DP MCB	1	
		NEUTRAL LINK	1	
		SWITCH	1	
		THERMOSTAT 30-110 DEG C	1	
		SPACE HEATER 60W, 240V AC	1	
		3 PIN INDUSTRIAL SOCKET & PLUG	1	
		DOOR SWITCH	1	
		LED LAMP	1	
		CONTROL TERMINALS (FIXED)	As required	
37	**RM1**	**RAPPING MOTOR FEEDER WITH IMC**		
		TP MPCB ADJ. S/C RELEASE	1	
		EXTENDED ROTARY HANDLE	1	
		AUXILIARY CONTACT FOR MPCB 1C/O	1	
		TP POWER CONTACTOR(AC) COIL VOLTAGE 110V AC	1	
		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	1	
		INTELLIGENT MOTOR CONTROLLER (IMC) WITH CURRENT SENSING MODULE AND CT (IN-BUILT/ EXTERNAL) SHALL HAVE FOLLOWING FUNCTIONS: **a) PROTECTION FUNCTIONS** i) Overload (I2t) Protection with site selectable Trip class 5 to 30 ii) Current imbalance iii) No. of starts/hr limitation iv) Stall Protection during start v) Load Jam protection during running **b) CONTROL FUNCTIONS** i) Close / Trip Command ii) Reversing starter **c) STANDARD CONTROL BLOCKS FOR VARIOUS FUNCTIONS** i) Watch dog facility ii) Ready to start iii) External wiring iv) Emergency stop v) External check-back signal vi) DP fault vii) Test 1 with shut-down viii) Test 2 without shut-down ix) Reset **d) OPERATING AND DIAGNOSTICS DATA** The IMC shall continuously monitor and provide the following data for display (local/ remote) i) 3-Phase currents ii) Motor ON / OFF status iii) Motor Fault / Switchgear Disturbance iv) Overload trip status v) Overload alarm status vi) Operating hours vii) Number of switching operations viii) Number of overload trips ix) At least last 5 trip data with time stamping in non-volatile memory of IMC in FIFO sequence **e) LED INDICATIONS** i) Controller healthy ii) Controller fault iii) Controller power supply healthy.	1	
		CONTROL MCB 6A, 10KA	1	
		NEUTRAL LINK-16A	1	
		AUX. CONTACTOR, 2NO+2NC, CV. 110 V AC	2	
		INDICATING LAMP	3	

TECHNICAL DATA PART - A

ANNEXURE-A.2

MODULE WISE BOM

		2 POLE, 2 POSI., SELECTOR SWITCH (AUTO/ MANUAL), 110V AC	1	
		PUSH BUTTON	2	
		CONTROL TERMINALS (DRAWOUT)	As required	
38	**RM2**	**RAPPING MOTOR FEEDER WITH OLR**		
		TP MPCB ADJ. S/C RELEASE	1	
		EXTENDED ROTARY HANDLE	1	
		AUXILIARY CONTACT FOR MPCB 1C/O	1	
		TP POWER CONTACTOR(AC) COIL VOLTAGE 110V AC	1	
		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	1	
		OVERLOAD RELAY,BUILT IN SPPR FEATURE 1NO+1NC	1	
		AUX. & INDEPENDENT MOUNTING TYPE MOUNTING KIT FOR O/L RELAY	1	
		RESET CORD ACTUATOR	1	
		CONTROL MCB 6A, 10KA	1	
		NEUTRAL LINK-16A	1	
		AUX. CONTACTOR, 2NO+2NC, CV. 110 V AC	2	
		INDICATING LAMP	3	
		2 POLE, 2 POSI., SELECTOR SWITCH (AUTO/ MANUAL), 110V AC	1	
		PUSH BUTTON	2	
		CONTROL TERMINALS (DRAWOUT)	As required	
39	**DDM**	**DUST DENSITY MONITOR FEEDER**		
		TP MPCB ADJ. S/C RELEASE	1	
		EXTENDED ROTARY HANDLE	1	
		AUXILIARY CONTACT FOR MPCB 1C/O	1	
		TP POWER CONTACTOR(AC) COIL VOLTAGE 110V AC	2	
		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	2	
		INTELLIGENT MOTOR CONTROLLER (IMC) WITH CURRENT SENSING MODULE AND CT (IN-BUILT/ EXTERNAL) SHALL HAVE FOLLOWING FUNCTIONS: **a) PROTECTION FUNCTIONS** i) Overload (I2t) Protection with site selectable Trip class 5 to 30 ii) Current imbalance iii) No. of starts/hr limitation iv) Stall Protection during start v) Load Jam protection during running **b) CONTROL FUNCTIONS** i) Close / Trip Command ii) Reversing starter **c) STANDARD CONTROL BLOCKS FOR VARIOUS FUNCTIONS** i) Watch dog facility ii) Ready to start iii) External wiring iv) Emergency stop v) External check-back signal vi) DP fault vii) Test 1 with shut-down viii) Test 2 without shut-down ix) Reset **d) OPERATING AND DIAGNOSTICS DATA** The IMC shall continuously monitor and provide the following data for display (local/ remote) i) 3-Phase currents ii) Motor ON / OFF status iii) Motor Fault / Switchgear Disturbance iv) Overload trip status v) Overload alarm status vi) Operating hours vii) Number of switching operations viii) Number of overload trips ix) At least last 5 trip data with time stamping in non-volatile memory of IMC in FIFO sequence **e) LED INDICATIONS** i) Controller healthy ii) Controller fault iii) Controller power supply healthy.	2	
		CONTROL MCB 6A, 10KA	2	
		NEUTRAL LINK-16A	2	
		AUX. CONTACTOR, 2NO+2NC, CV. 110 V AC	2	
		INDICATING LAMP	5	
		ROTARY ON/OFF SWITCH	1	
		CONTROL TERMINALS (DRAWOUT)	As required	
40	**HH**	**HOPPER HEATER FEEDER**		
		TP MCCB ADJ. S/C RELEASE	1	
		EXTENDED ROTARY HANDLE	1	
		AUXILIARY CONTACT FOR MCCB 1C/O	1	
		CONTROL MCB 6A, 10KA	1	
		NEUTRAL LINK-16A	1	
		AUX. CONTACTOR, 2NO+2NC, CV. 110 V AC	1	
		INDICATING LAMP	2	
		CURRENT TRANSFORMER (METERING), 10VA, CL-1, INSL CL-E OR BETTER	3	
		AC AMMETER	1	
		AMMETER SELECTOR SWITCH	1	
		CT SHORTING TERMINAL - STUD TYPE	As required	
		CONTROL TERMINALS (DRAWOUT)	As required	

TECHNICAL DATA PART - A

ANNEXURE-A.2

MODULE WISE BOM

41	**HS**	**SHAFT INSULATOR HEATER FEEDER**		
		TP MCCB ADJ. S/C RELEASE	1	
		EXTENDED ROTARY HANDLE	1	
		AUXILIARY CONTACT FOR MCCB 1C/O	1	
		TP POWER CONTACTOR(AC) COIL VOLTAGE 110V AC	1	
		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	1	
		CONTROL MCB 6A, 10KA	1	
		NEUTRAL LINK-16A	1	
		INDICATING LAMP	2	
		CURRENT TRANSFORMER (METERING), 10VA, CL-1, INSL CL-E OR BETTER	3	
		AC AMMETER	1	
		AMMETER SELECTOR SWITCH	1	
		ROTARY ON/OFF SWITCH	1	
		CT SHORTING TERMINAL - STUD TYPE	As required	
		CONTROL TERMINALS (DRAWOUT)	As required	
42	**HI**	**SUPPORT INSULATOR HEATER FEEDER**		
		TP MCCB ADJ. S/C RELEASE	1	
		EXTENDED ROTARY HANDLE	1	
		AUXILIARY CONTACT FOR MCCB 1C/O	1	
		TP POWER CONTACTOR(AC) COIL VOLTAGE 110V AC	1	
		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	1	
		CONTROL MCB 6A, 10KA	1	
		NEUTRAL LINK-16A	1	
		INDICATING LAMP	2	
		CURRENT TRANSFORMER (METERING), 10VA, CL-1, INSL CL-E OR BETTER	3	
		AC AMMETER	1	
		AMMETER SELECTOR SWITCH	1	
		ROTARY ON/OFF SWITCH	1	
		CT SHORTING TERMINAL - STUD TYPE	As required	
		CONTROL TERMINALS (DRAWOUT)	As required	
43	**ALI(H)**	**ASH LEVEL INDICATOR (HIGH) FEEDER**		
		CONTROL MCB 6A, 10KA	1	
		NEUTRAL LINK-16A	1	
		AUX. CONTACTOR, 2NO+2NC, CV. 110 V AC	10	
		INDICATING LAMP	11	
		TIMER WITH 2C/O	10	
		PUSH BUTTON WITH 1NC	1	
		DOUBLE POLE ON/OFF SWITCH, 32 A, 110 V AC	1	
		CONTROL TERMINALS (FIXED)	As required	
44	**ALI(L)**	**ASH LEVEL INDICATOR (LOW) FEEDER**		
		CONTROL MCB 6A, 10KA	1	
		NEUTRAL LINK-16A	1	
		AUX. CONTACTOR, 2NO+2NC, CV. 110 V AC	10	
		INDICATING LAMP	11	
		TIMER WITH 2C/O	10	
		PUSH BUTTON WITH 1NC	1	
		DOUBLE POLE ON/OFF SWITCH, 32 A, 110 V AC	1	
		CONTROL TERMINALS (FIXED)	As required	
45	**ARECA**	**ARECA MARSHALING MODULE FEEDER**		
		TP MCCB ADJ. S/C RELEASE	1	
		EXTENDED ROTARY HANDLE	1	
		AUXILIARY CONTACT FOR MCCB 1C/O	1	
		CONTROL TRANSFORMER, DRY TYPE, CAST RESIN, 415/24V, INS. CL-B OR BETTER	1	
		CT SHORTING TERMINAL - STUD TYPE	As required	
		CONTROL TERMINALS (FIXED)	As required	
46	**WLT**	**WAVE LEVEL TRANSMITTER FEEDER**		
		TP MCCB ADJ. S/C RELEASE	1	
		EXTENDED ROTARY HANDLE	1	
		AUXILIARY CONTACT FOR MCCB 1C/O	1	
		CONTROL TRANSFORMER, DRY TYPE, CAST RESIN, 415/24V, INS. CL-B OR BETTER	1	
		RECTIFIER	1	
		CT SHORTING TERMINAL - STUD TYPE	As required	
		CONTROL TERMINALS (FIXED)	As required	
47	**MM**	**MARSHALING MODULE FOR SSPB OF RAPPING MOTOR AND HOPPER HEATER FEEDBACK**		
		CONTROL TERMINALS (FIXED)	As required	
48	**WB**	**WALL BLOWER FEEDER**		
		TP MPCB ADJ. S/C RELEASE	1	
		EXTENDED ROTARY HANDLE	1	
		AUXILIARY CONTACT FOR MPCB 1C/O	1	
		TP POWER CONTACTOR(AC) COIL VOLTAGE 110V AC	3	
		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	2	
		OVERLOAD RELAY,BUILT IN SPPR FEATURE 1NO+1NC	2	
		AUX. & INDEPENDENT MOUNTING TYPE MOUNTING KIT FOR O/L RELAY	2	
		RESET CORD ACTUATOR	2	
		CONTROL MCB 6A, 10KA	1	
		NEUTRAL LINK-16A	1	
		AUX. CONTACTOR, 2NO+2NC, CV. 110 V AC	1	

TECHNICAL DATA PART - A

ANNEXURE-A.2

MODULE WISE BOM

		INDICATING LAMP	3	
		CONTROL TERMINALS (DRAWOUT)	As required	
		Note: Further for details of Wall Blower feeder refer SBMCC Drawing.		
49	**LR**	**LR BLOWER FEEDER**		
		TP MPCB ADJ. S/C RELEASE	1	
		EXTENDED ROTARY HANDLE	1	
		AUXILIARY CONTACT FOR MPCB 1C/O	1	
		TP POWER CONTACTOR(AC) COIL VOLTAGE 110V AC	3	
		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	2	
		OVERLOAD RELAY,BUILT IN SPPR FEATURE 1NO+1NC	2	
		AUX. & INDEPENDENT MOUNTING TYPE MOUNTING KIT FOR O/L RELAY	2	
		RESET CORD ACTUATOR	2	
		CONTROL MCB 6A, 10KA	1	
		NEUTRAL LINK-16A	1	
		AUX. CONTACTOR, 2NO+2NC, CV. 110 V AC	1	
		INDICATING LAMP	3	
		CONTROL TERMINALS (DRAWOUT)	As required	
		Note: Further for details of LR Blower feeder refer SBMCC Drawing.		
50	**AH**	**AH BLOWER FEEDER**		
		TP MPCB ADJ. S/C RELEASE	1	
		EXTENDED ROTARY HANDLE	1	
		AUXILIARY CONTACT FOR MPCB 1C/O	1	
		TP POWER CONTACTOR(AC) COIL VOLTAGE 110V AC	2	
		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	2	
		OVERLOAD RELAY,BUILT IN SPPR FEATURE 1NO+1NC	1	
		AUX. & INDEPENDENT MOUNTING TYPE MOUNTING KIT FOR O/L RELAY	1	
		RESET CORD ACTUATOR	1	
		CONTROL MCB 6A, 10KA	1	
		NEUTRAL LINK-16A	1	
		AUX. CONTACTOR, 2NO+2NC, CV. 110 V AC	1	
		INDICATING LAMP	3	
		CONTROL TERMINALS (DRAWOUT)	As required	
		Note: Further for details of AH Blower feeder refer SBMCC Drawing.		
51	**JAMMING RELAY MODULE**	**JAMMING RELAY FOR SOOT BLOWER MCC**		
		CURRENT TRANSFORMER, CLASS-5P20, -- VA	1	
		CT DISCONNECTING TERMINALS	4	
		MCB DP 6A, C CURVE, 10kA BC	1	
		ELECTRONIC TYPE JAMMING RELAY OCR	1	
		CONTROL TERMINAL SUITABLE UPTO 2.5 Sq.mm WIRE	As required	
52	**WTS1**	**WIRELESS TEMPERATURE SENSOR (WTS1) MODULE (IN ONE ACB/PCC PANEL WITH SINGLE ACB)**		
		TEMPERATURE SENSORS	**9**	Quantity shall be finalised during detailed engineering
		TRANSMITTER	As required	
		RECEIVER	As required	
		ADDITIONAL COMPONENTS (EXCEPT NETWORKING HARDWARE & CABLE i.e. ANNEXURE B3) REQUIRED FOR COMPLETENESS	As required	
53	**WTS2**	**WIRELESS TEMPERATURE SENSOR (WTS2) MODULE (IN ONE ACB/PCC PANEL WITH DOUBLE ACB)**		
		TEMPERATURE SENSORS	**18**	Quantity shall be finalised during detailed engineering
		TRANSMITTER	As required	
		RECEIVER	As required	
		ADDITIONAL COMPONENTS (EXCEPT NETWORKING HARDWARE & CABLE i.e. ANNEXURE B3) REQUIRED FOR COMPLETENESS	As required	
54	**WTS3**	**WIRELESS TEMPERATURE SENSOR (WTS3) MODULE (IN ONE MCC PANEL)**		
		TEMPERATURE SENSORS	**6**	Quantity shall be finalised during detailed engineering
		TRANSMITTER	As required	
		RECEIVER	As required	
		ADDITIONAL COMPONENTS (EXCEPT NETWORKING HARDWARE & CABLE i.e. ANNEXURE B3) REQUIRED FOR COMPLETENESS	As required	
55	**ALARM MODULE**	**ALARM MODULE -**		
		CONTROL MCB 6A - 1	1	
		9 WINDOWS ALARM ANNUNCIATION -1	1	
		ELECTRONIC HOOTER (96SQMM) - 1	1	
		TEST/ACCEPT/RESET PB WITH 1 NO CONTACT - TOTAL 3	3	
		TERMINALS (FIXED) - AS REQUIRED	As required	Quantity shall be finalised during detailed engineering
56	**ET3**	**3 PHASE MCCB CONTACTOR CONTROLLED FEEDER WITHOUT IMC (CONTROLLED FROM DDCMIS)**		
		TP MCCB ADJ. S/C RELEASE	1	
		EXTENDED ROTARY HANDLE	1	
		AUXILIARY CONTACT FOR MCCB 1C/O	1	
		TP POWER CONTACTOR(AC) COIL VOLTAGE 110V AC	1	
		ADD ON AUX. CONTACTOR BLOCK 2NO+2NC	1	
		CONTROL MCB 6A, 10KA	1	
		NEUTRAL LINK-16A	1	
		AUX. CONTACTOR, 2NO+2NC, CV. 110 V AC	2	
		INDICATING LAMP	3	
		CONTROL TERMINALS (DRAWOUT)	As required	
		INTERPOSING/ COUPLING RELAY WITH BUILT IN LED, TEST KNOB & FREEWHEELING DIODE	2	

CLAUSE NO.	SUPPLIER SPECIFIC INFORMATION (To be filled by Supplier)
	LT Switchgears
1.00.00	**SWITCHGEAR & MCC**
	a) General
	i) Manufacturer's Name .....
	ii) Type designation .....
	iii) Country of origin .....
	b) Rated voltage .....
	c) Symmetrical short circuit withstand current at rated voltage of switchgear /MCC cubicle. .....
	d) Peak short circuit withstand current .....
	e) Rated current at ambient .....
	f) Degree of protection as per IS:13947
	i) Breaker / MCC cubicles .....
	ii) Busbar chamber .....
	g) Cubicle sheet metal details
	i) Cold rolled / hot rolled .....
	ii) Thickness, structural & load bearing members .....
	iii) Thickness, front & rear .....
	iv) Thickness, Sides & top .....
	v) Thickness of gland plates .....
	h) Painting shade & Thickness as per IS :5
	i) External surfaces(front & rear) .....
	ii) Extreme end covers .....
	i) Minimum Clearance in air for Busbars
	i) Between phases .....
	ii) Between phase & earth .....
	j) Standard height, width & depth of typical panel
	i) Circuit breaker panel .....
	ii) MCC panels (S.F./D.F.) .....

CLAUSE NO.	DATA REQUIREMENTS	
	iii) Circuit breaker panel with Bus trunking /Bus Duct Termination	.....
	iv) ACDB/DCDB	.....
	v) AC/DC Fuse boards	.....
	k) Width of cable alley	.....
	l) Shrouding arrangement in cable alley provided or not	YES/NO
	m) Earth busbar size & material	.....
	n) Approx. Weight of one panel With circuit breaker	.....
	o) Recommended dynamic loading for foundation design	.....
	p) Approx. weight of one MCC panel	.....
	q) Form of Internal Separation as per IEC-61439-2	.....
2.00.00	**POWER BUSBARS & INSULATORS**	
	a) Material & applicable standards	.....
	b) Bare/painted / epoxy insulated/sleeved	.....
	c) Continuous current rating at an ambient temp. of 50^0C	.....
	d) Temperature rise over design ambient temperature for continuous current rating deg. C	.....
	e) Material of the support insulators	.....
	f) One second current rating (kA)	.....
3.00.00	**CONTROL SUPPLY TRANSFORMER**	
	a) Make	.....
	b) Type	.....
	c) Material & class of insulation	.....
	d) Voltage rating & taps	.....
	e) Continuous rating (VA)	.....
4.00.00	**CIRCUIT BREAKER**	
	a) Manufacturer's name and country of manufacturer	.....
	b) Manufacture's type and designation	.....
	c) Rated Voltage	.....
	d) Rated operating duty	.....

CLAUSE NO.	DATA REQUIREMENTS	
	e) Design ambient temperature	.....
	f) Rated current at design ambient temperature	.....
	g) Derating factor for site operating conditions inside panel	.....
	h) Continuous current at ambient temp.	.....
	i) Rated symmetrical breaking current	.....
	j) Rated peak making current	.....
	k) Rated short time rating (for 1 sec.)	.....
	l) Rated peak momentary rating	.....
	m) Number of openings, the circuit breaker is capable of performing without inspection, replacement of contacts or other parts at 100% rated breaking current	.....
	n) No. of breaker auxiliary contacts provided on fixed portion of breaker & their rating	.....
	o) Trip free and anti pumping features have been provided (Furnish description)	YES/NO
	p) Power operating mechanism	.....
	q) Spring charging motor details	
	i) Type	.....
	ii) Rating Watts	.....
	iii) Rated voltage	.....
	iv) Class of insulation	.....
	v) Time for fully charging the closing spring	.....
	r) Emergency Manual charging facility provided	YES/NO
	s) Limits of voltage for satisfactory operation of the following devices as percentage of normal voltage	
	i) Motor	.....
	ii) Closing coil	.....
	iii) Tripping coil	.....
	t) Manual operating mechanism	.....
	u) i) Type of Releases provided	.....
	ii) Available range of following parameters for each type of release offered	.....

CLAUSE NO.	DATA REQUIREMENTS	
	v) i) Maximum Tripping Time	.....
	ii) Maximum Closing time	.....
	w) i) Closing coil VA	.....
	ii) Tripping coil VA	.....
	x) Telescopic trolley	
	i) Make	.....
	ii) Type designation	.....
	iii) Dimensions	.....
5.00.00	**AIR BREAK SWITCHES**	
	(The following details shall be furnished for each type & rating)	
	a) Make	.....
	b) Type	.....
	c) Applicable standards	.....
	d) Rated current at design ambient temperature (Amps)	.....
	e) Design ambient temperature Deg C	.....
	f) Rated breaking current (kA)	.....
	g) Maximum through fault current withstand kA	.....
	h) Door interlock as specified has been provided ?	YES/NO
	i) No. of auxiliary contacts and its rating	.....
6.00.00	**CONTROL/SELECTOR SWITCH**	
	a) Make	.....
	b) Type Designation	.....
	c) Voltage grade	.....
7.00.00	**CONTACTOR**	
	(The following details shall be furnished for each type and rating)	
	a) Make	.....
	b) Type & applicable standards	.....
	c) Rated voltage of main and auxiliary contacts	.....

CLAUSE NO.	DATA REQUIREMENTS
	d) Rated voltage of coils .....
	e) Limits of operation
	i) Supply voltage variation +/-% .....
	ii) Supply frequency variation for closing (+/-)% .....
	iii) Drop out voltage % .....
	f) Rated (thermal) current A .....
	g) Rated duty .....
	h) Rated utilisation category as per IS:13947 .....
	i) Rated breaking capacity kA .....
	j) Rated making capacity - kA .....
	k) Coil VA burden .....
8.00.00	**AUXILIARY CONTACTOR**
	a) Make .....
	b) Type .....
	c) Catalogue attached as Annexure No. .....
9.00.00	**FUSES**
	a) Make .....
	b) Type .....
	c) Category .....
10.00.00	**CURRENT TRANSFORMERS**
	(The following details shall be provided for each type & rating)
	a) Make .....
	b) Applicable standards .....
	c) Ratio .....
	d) VA Rating .....
	e) Accuracy class .....
	f) Class & type of insulation .....
11.00.00	**VOLTAGE TRANSFORMERS**

CLAUSE NO.	DATA REQUIREMENTS	
	a) Make	.....
	b) Ratio	.....
	c) VA Rating	.....
	d) Accuracy class	.....
	e) Over voltage factor	.....
	f) Class & type of insulation	.....
12.00.00	**Numerical relays**	
	a) General Technical Details and Drawings Enclosed	.....
	b) Make/Model No	.....
	c) Place of Manufacture	.....
	d) Hardware version number	.....
	e) Firmware version number	.....
	f) Rated Voltage Vn (phase-to-neutral)	.....
	g) Rated Current In	.....
	h) Rated Frequency	.....
	i) Over voltage capability - continuous	.....
	j) Over voltage capability – 3s	.....
	k) Burden on voltage transformers (VA per phase)	.....
	l) Over current capability - continuous	.....
	m) Over current capability – 1s	.....
	n) Burden on current transformers (VA per phase)	.....
	o) Reference standards	.....
	p) Operating principle	.....
	q) No Of communication Ports	.....
	r) Compliance to IEC-61850	.....
	s) Built-in functions provided in the relay (list out)	.....
	t) Protection Functions	.....
	u) Measurements	.....

CLAUSE NO.	DATA REQUIREMENTS
	v) Monitoring Functions .....
	w) Control functions .....
	x) Detailed Technical Catalogue for offered Relays enclosed .....
	y) Spares and Repairs
	a) State availability of spares in country and spares holding in country of origin .....
	b) Maximum repair turnaround time .....
	c) Define the proposed repair strategy .....
	d) Recommended spares list .....
	z) List of reference sites in operation for more than 1 year .....
13.00.00	**THERMAL OVERLOAD RELAY & SINGLE PHASING PREVENTER**
	(The following details shall be furnished for each type & rating)
	a) Make & type designation .....
	b) Catalogue .....
14.00.00	**VOLTMETER**
	a) Make .....
	b) Type .....
	c) Catalogue .....
15.00.00	**AMMETER**
	a) Make .....
	b) Type .....
	c) Catalogue .....
16.00.00	**PUSH BUTTONS**
	a) Make .....
	b) Type designation .....
	c) Catalogue .....
17.00.00	**INDICATING LAMPS**
	a) Make .....
	b) Type .....

CLAUSE NO.	DATA REQUIREMENTS
	c) Catalogue .....

CLAUSE NO.	DATA REQUIREMENTS
21.00.00	**MCCB**
	a) Rated voltage
	b) Rated insulation level .....
	c) Rated ultimate &Service S.C.breaking capacity .....
	d) Rated making capacity .....
	e) Utilization category .....
22.00.00	**Ethernet switches (For Networking of Numerical Relays)**
	a) Compliance to IEC 61850 .....
	b) No of Ports .....
	c) Power supply to Ethernet Switches .....

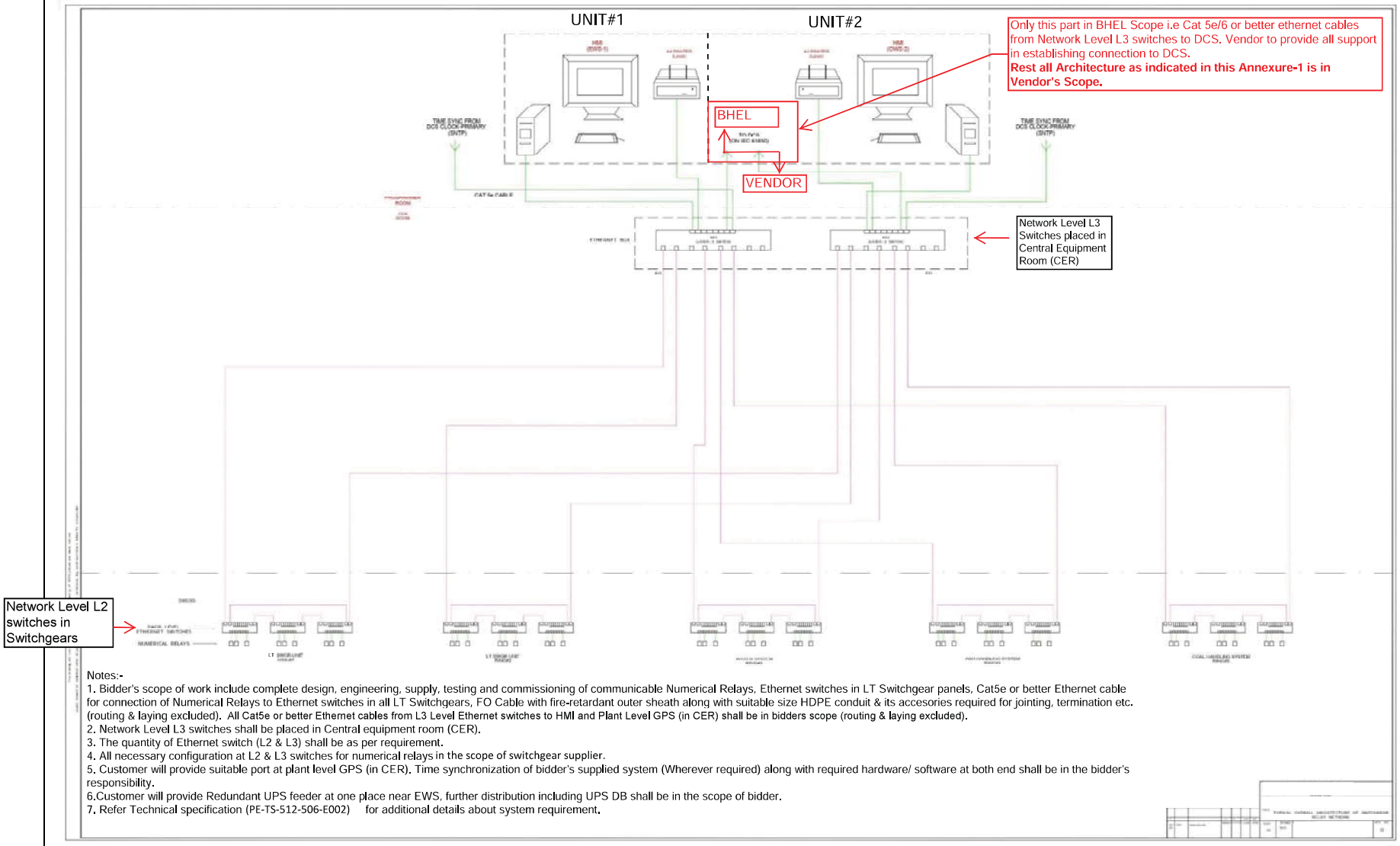
List of Compliance Drawings:

SL.NO	DESCRIPTION	REMARKS
1	Typical Switchgear Relay Network Architecture	Annexure-1
2	Typical IMC Network Architecture	Annexure-2
3	Tentative Switchboard location	Annexure-3
4	Tentative LV Switchgear Schemes	Annexure-4
5	Soot Blower MCC Scheme	Annexure-5

Typical Switchgear Relay Network Architecture

ANNEXURE-1

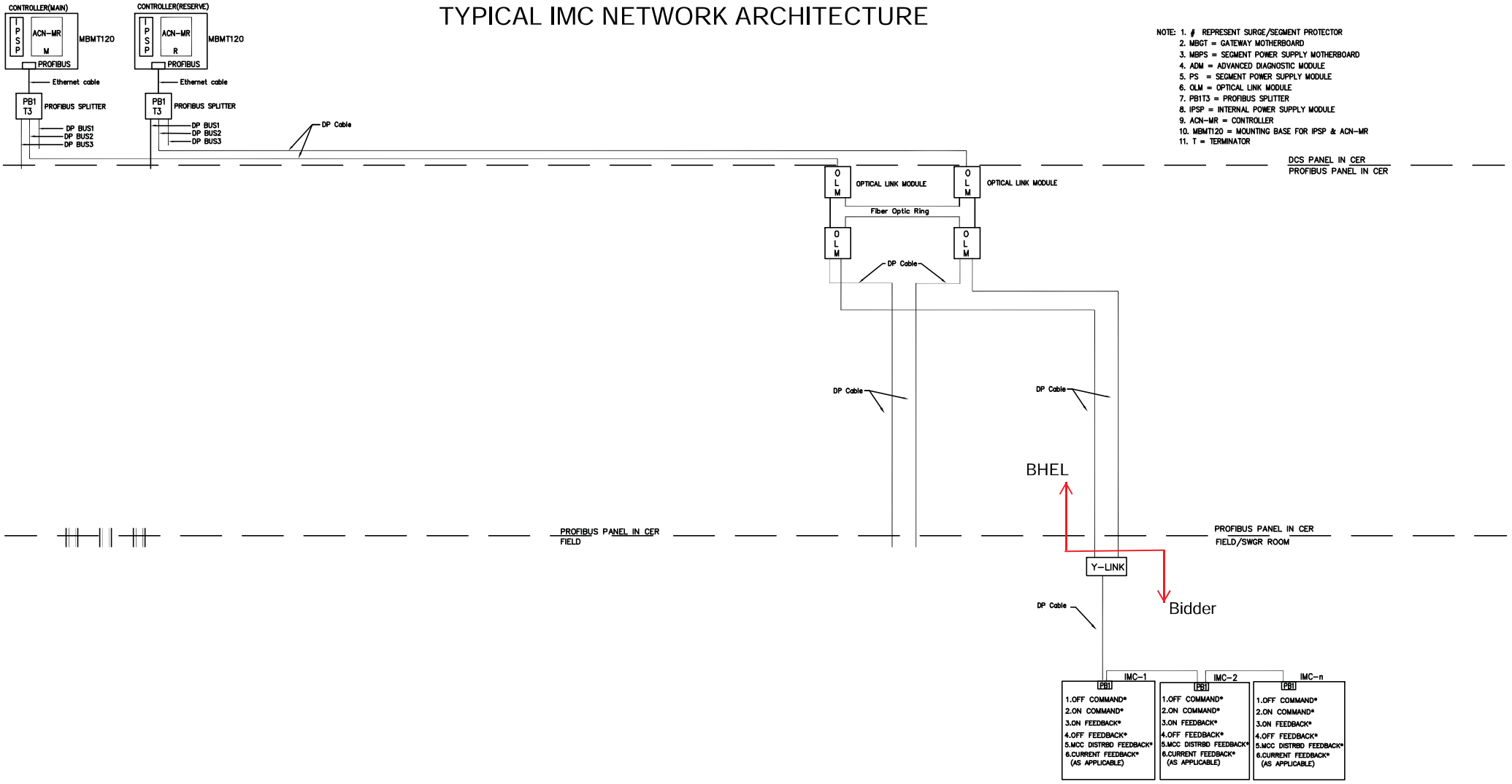
CLAUSE NO.	TECHNICAL REQUIREMENT



Notes:-

1. Bidder's scope of work include complete design, engineering, supply, testing and commissioning of communicable Numerical Relays, Ethernet switches in LT Switchgear panels, Cat5e or better Ethernet cable for connection of Numerical Relays to Ethernet switches in all LT Switchgears, FO Cable with fire-retardant outer sheath along with suitable size HDPE conduit & its accesories required for jointing, termination etc. (routing & laying excluded). All Cat5e or better Ethernet cables from L3 Level Ethernet switches to HMI and Plant Level GPS (in CER) shall be in bidders scope (routing & laying excluded).
2. Network Level L3 switches shall be placed in Central equipment room (CER).
3. The quantity of Ethernet switch (L2 & L3) shall be as per requirement.
4. All necessary configuration at L2 & L3 switches for numerical relays in the scope of switchgear supplier.
5. Customer will provide suitable port at plant level GPS (in CER). Time synchronization of bidder's supplied system (Wherever required) along with required hardware/ software at both end shall be in the bidder's responsibility.
6. Customer will provide Redundant UPS feeder at one place near EWS, further distribution including UPS DB shall be in the scope of bidder.
7. Refer Technical specification (PE-TS-512-506-E002) for additional details about system requirement.

TYPICAL IMC NETWORK ARCHITECTURE



Notes:

1.Bidder's scope of work include complete design, engineering, supply, testing and commissioning of IMC network along with Y-Link.

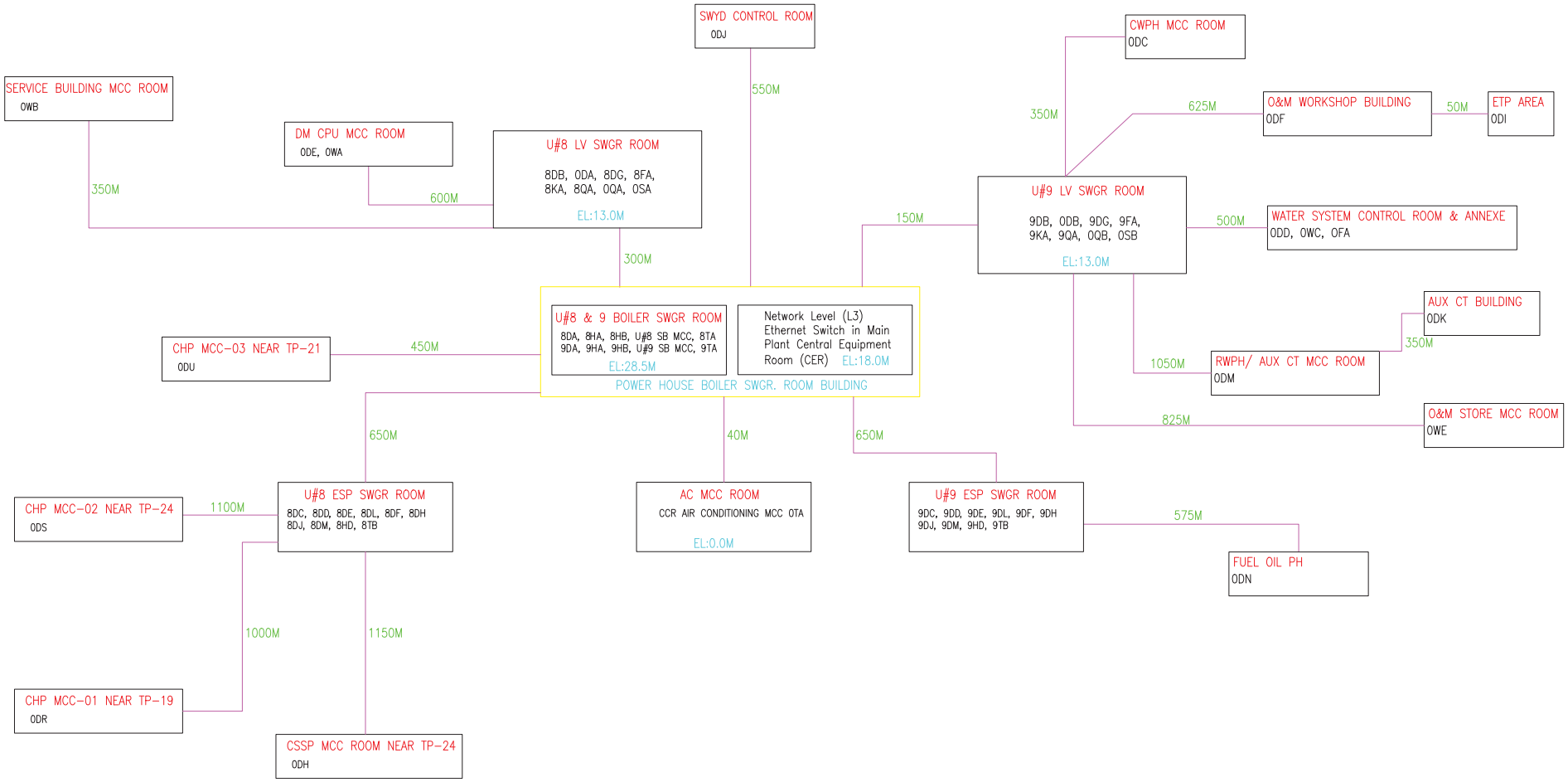
2. Bidder to provide suitable port along with termination accessories at Y-link end for connection with DDCMIS through profibus DP Cable /FO cable (Depending on distance, shall be decided during detail engineering)

3. The Bidder is required to provide the necessary support to establish seamless communication between DDCMIS and Y-Link.

BHEL	DDCMIS INTERFACE WITH PROFIBUS BASED IMCs,ACTUATORS,CONTROL VALVES & INSTRUMENTS(TYPICAL SCHEME)	DRG.NO.	
		SHT	30A OF 30

TENTATIVE SWITCHBOARD LOCATION DETAILS FOR 2X800MW SINGRAULI STPP STAGE-III

ANNEXURE-3



NOTE: TENTATIVE ROUTE LENGTH IN METERS SHOWN ON THIS DOCUMENT

TENTATIVE LV SWITCHGEAR SCHEMES

CLAUSE NO.	TECHNICAL REQUIREMENT

LEGEND	DESCRIPTION
52	CIRCUIT BREAKER
42	CONTACTOR
LA	SURGE ARRESTOR
	CURRENT TRANSFORMER
	CORE BALANCE CURRENT TRANSFORMER
	VOLTAGE TRANSFORMER
50	TRIPLE POLE IDMTL/DMT O/C PROTECTION
51	TRIPLE POLE INSTANTENIOUS C/C PROTECTION
50N	IDMTL/DMT SENSITIVE/F PROTECTION
51N	INSTATENIOUS E/F PROTECTION
49	THREE PHASE THERMAL O/L PROTN.WTH O/L ALARM & RESTART INHIBITE FUNCTION
48/51LR	STALLING/LOCKED ROTOR PROTECTION
46	THREE PHASE NEGATIVE PHASE SEQUENCE PROTECTION
66	NUMBER OF START LIMITATION /REPATETIVE START PROTECTION
2	THE DELAY PROTECTION
60	FUSE FAILURE PROTECTION
87M	3 PHASE MOTOR DIFFERENTIAL PROTECTION
	MCB
	MPCB

LEGEND	DESCRIPTION
64R	RESTRICTED EARTH FAULT PROTECTION
51G	STAND BY EARTH FAULT PROTECTION
87T	3 PHASE UNDER VOLTAGE TRANSFORMER DIFFERENTIAL PROTECTION
27M	3 PHASE UNDER VOLTAGE TRANSFORMER FOR MOTOR TRIPPING
27U	3 PHASE BUS UNDER VOLTAGE
27N	NO VOLT PROTECTION FOR BUS
50BF	CIRCUIT BREAKER FAILURE PROTECTION
86	LOCKOUT FUNCTION
A	3 PHASE CURRENT MEASUREMENT
In	NEUTRAL CURRENT MEASUREMENT
V	3 PHASE VOLTAGE MEASUREMENT
Vn	RESIDUAL VOLTAGE MEASUREMENT
P	ACTIVE POWER MEASUREMENT
Q	REACTIVE POWER MEASUREMENT
E	ENERGY MEASUREMENT
PF	POWER FACTOR MEASUREMENT
HZ	FREQUENCY MEASUREMENT
HR	HOUR RUN METER
	MCCB

FOR TENDER PURPOSE ONLY

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CLEARED BY				
C	E	M	C&I	ES

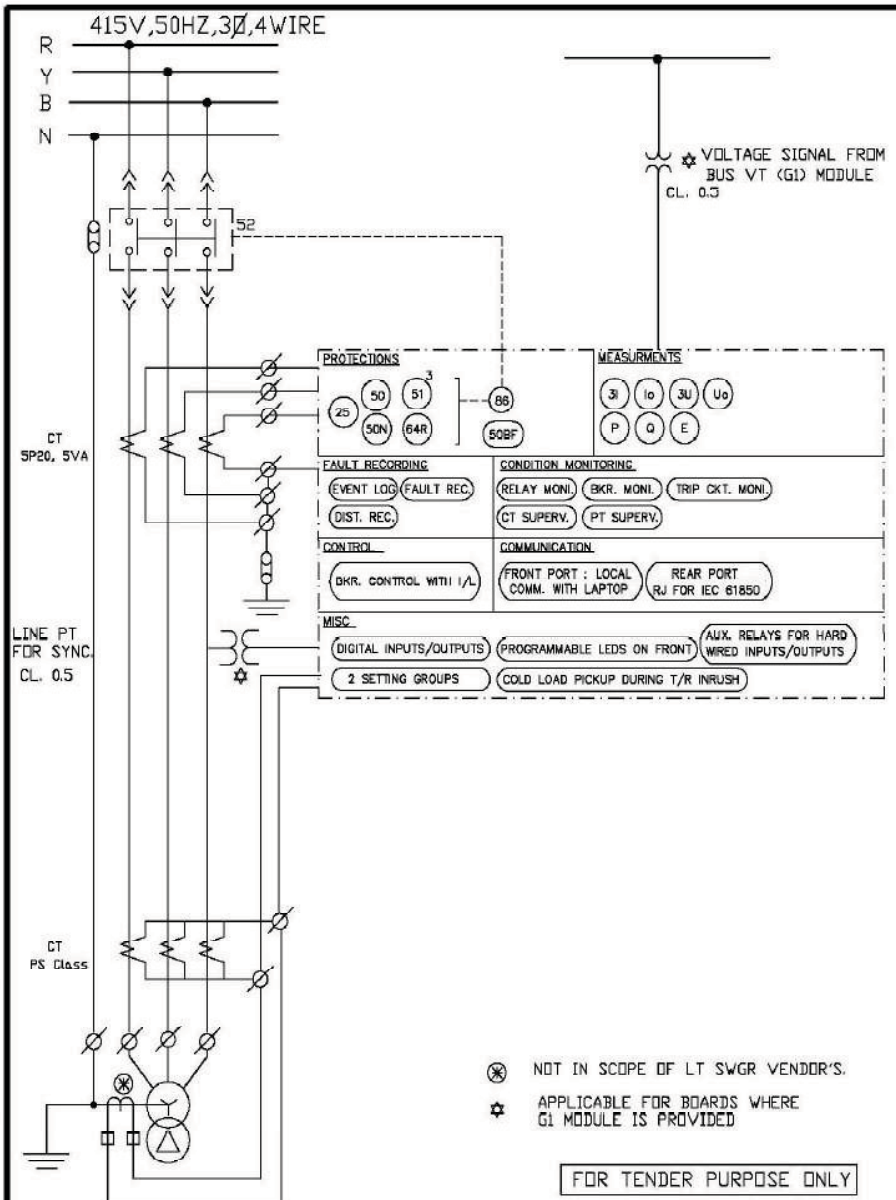
PROJECT: STANDARD

TITLE: LEGEND DETAIL

DRN	CGN	CHKD	APPD	DATE	SCALE	DRAWING No.	REV.
				18/05/18		0000-206-P0E-A-003	A

LEGEND DRAWING

A3 420X297



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CLEARED BY				
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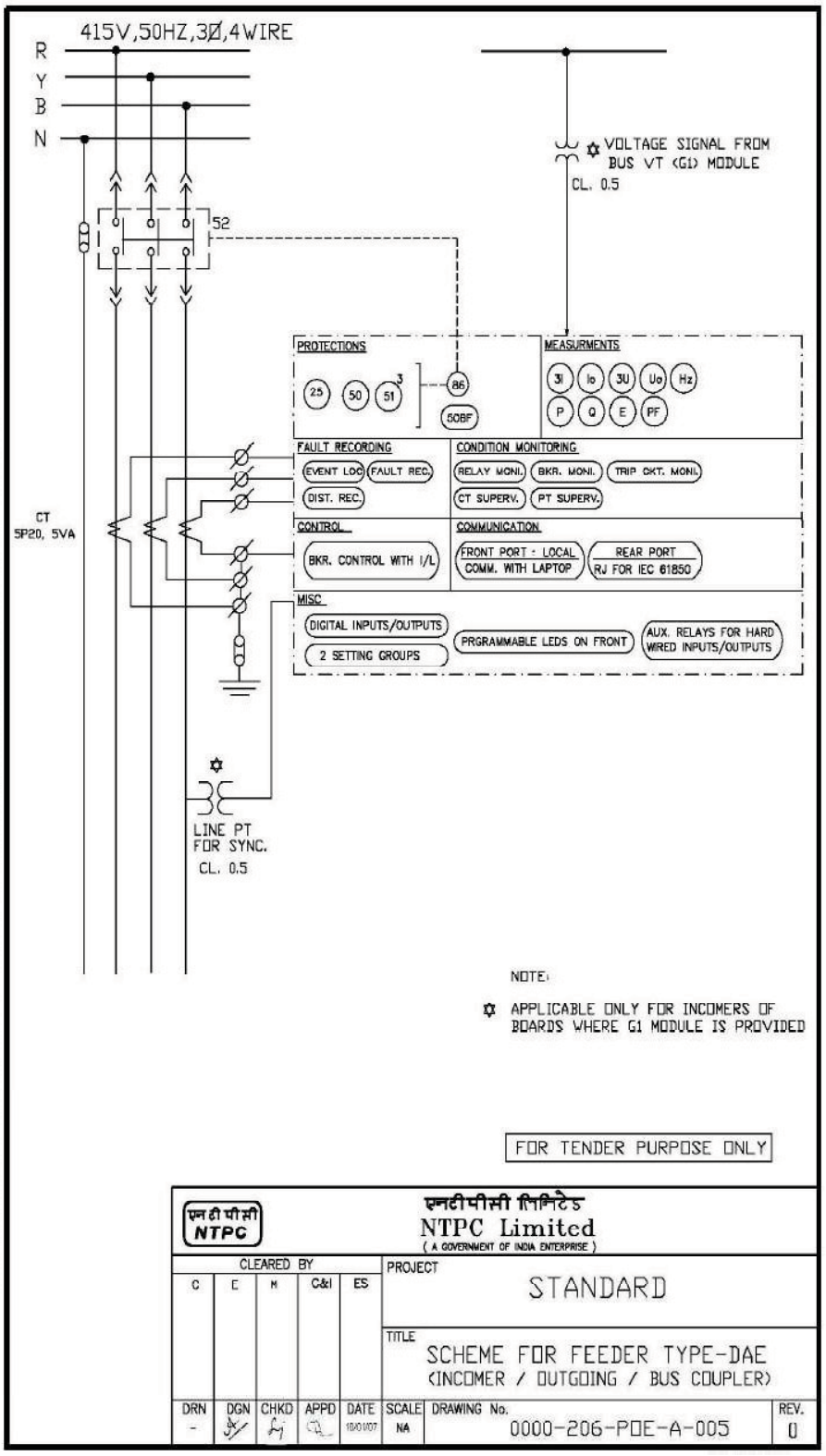
PROJECT: STANDARD

TITLE: SCHEME FOR FEEDER TYPE-DAET (INCOMER FROM TRANSFORMER)

DRN	DGN	CHKD	APPD	DATE	SCALE	DRAWING No.	REV.
-					NA	0000-206-PDE-A-004	0

A4 210X297



NOTE:

✡ APPLICABLE ONLY FOR INCOMERS OF BOARDS WHERE G1 MODULE IS PROVIDED

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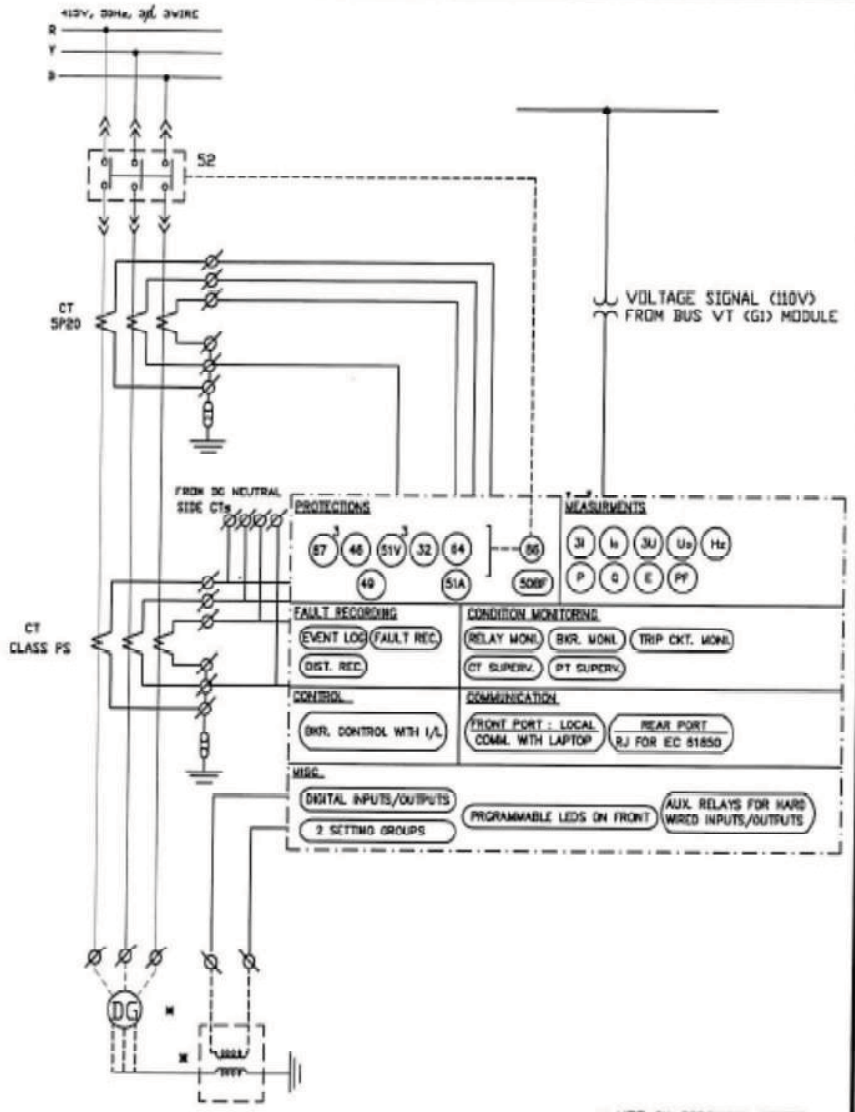
CLEARED BY					PROJECT
C	E	M	C&I	ES	STANDARD

TITLE
SCHEME FOR FEEDER TYPE-DAE
(INCOMER / OUTGOING / BUS COUPLER)

DRN	DGN	CHKD	APPD	DATE	SCALE	DRAWING No.	REV.
-				10/01/07	NA	0000-206-PDE-A-005	0



M NOT IN BIDDER'S SCOPE

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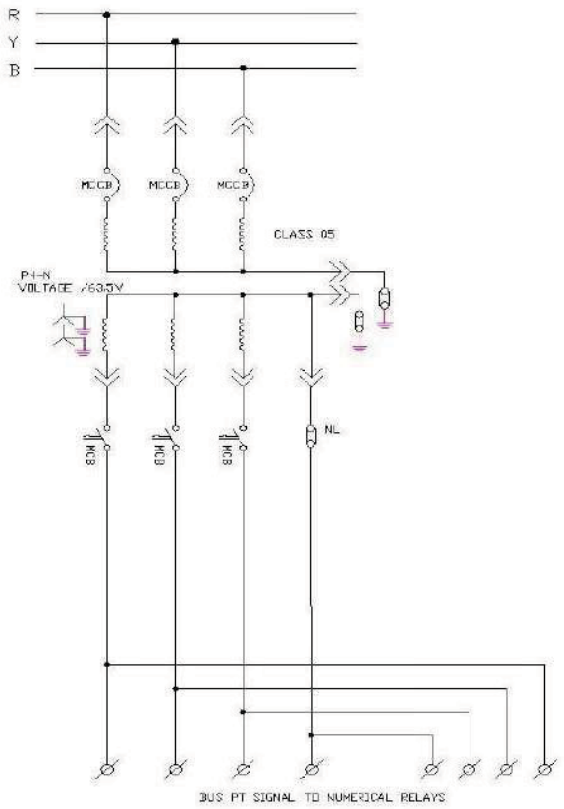
CLEARED BY					PROJECT
C	E	M	C&I	ES	STANDARD

TITLE: SCHEME FOR FEEDER TYPE-DG (INCOMER FROM DG)

DRN	DGN	CHKD	APPD	DATE	SCALE	DRAWING No.	REV.
-					NA	0000-206-POE-A-006	0

A4 210X297



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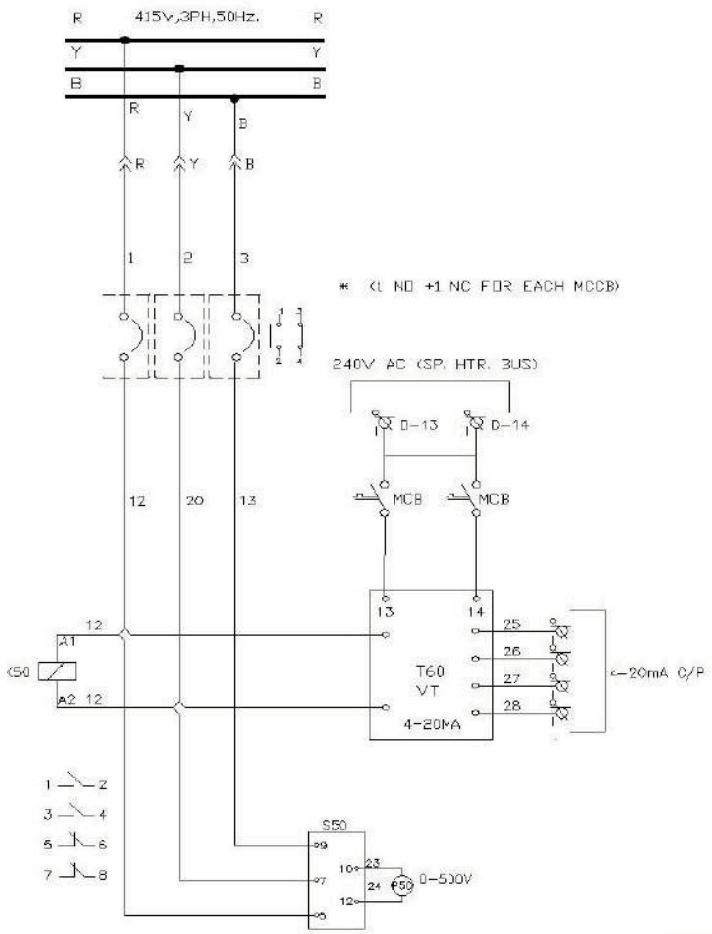
CLEARED BY					PROJECT
C	E	M	C&I	ES	STANDARD
					TITLE: SCHEME FOR MODULE TYPE-G1 (BUS PT)

DRN	DGN	CHKD	APPD	DATE	SCALE	DRAWING No.	REV.
				30/04/19		0000-206-POE-A-007	A

LT017.DWG

A3 420X297



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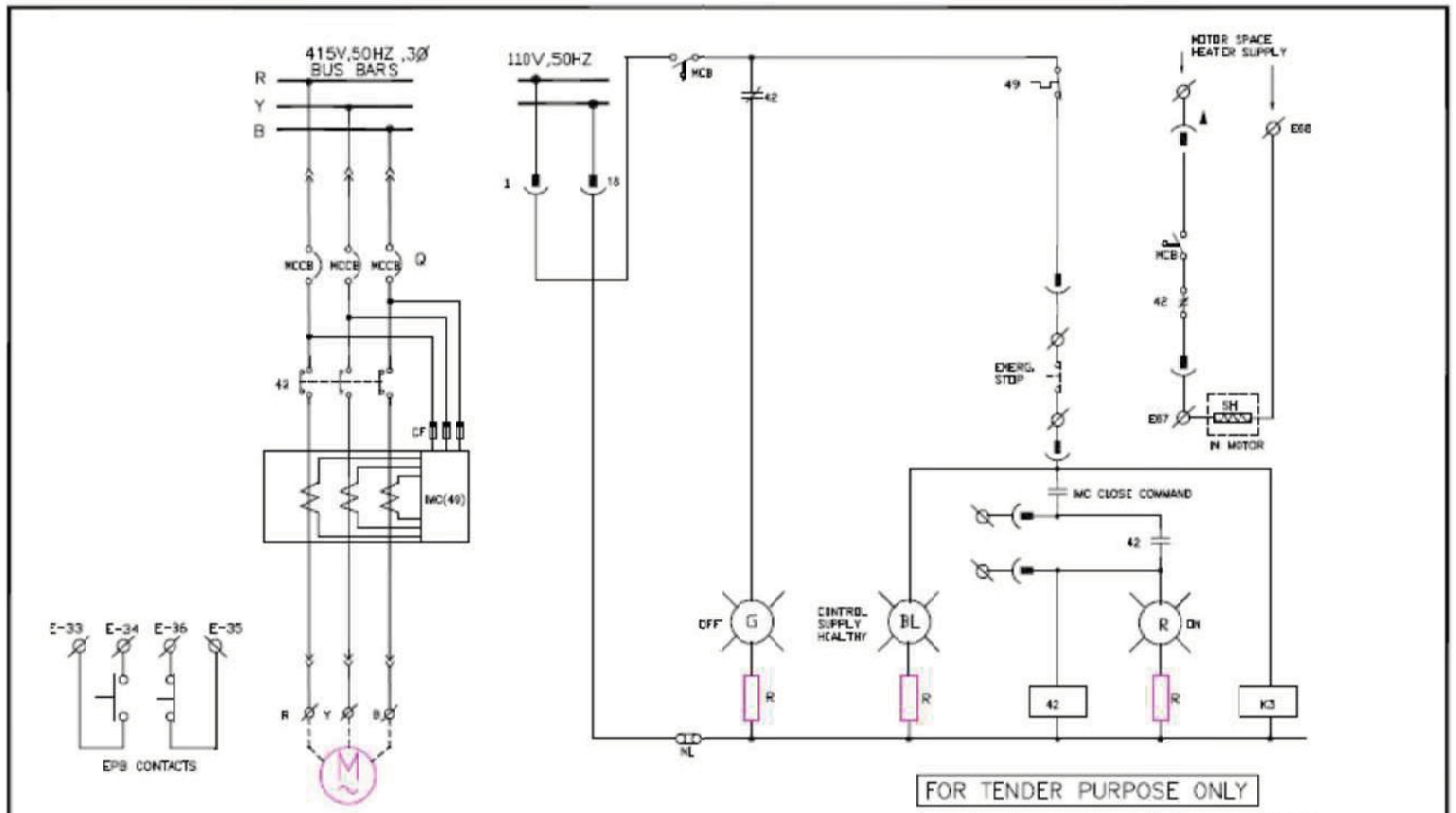
CLEARED BY					PROJECT	STANDARD		
C	E	I	C&I	ES	TITLE	TYPICAL SCHEMATIC FOR VM TYPE		
DRN	DGN	CHKD	APPD	DATE	SCALE	DRAWING No.		REV.
				18.05.13		0000-206-PCE-A-020		A

LTCL6.DWG

A3 420X297



FOR TENDER PURPOSE ONLY

TYPICAL FOR DDC/PLC CONTROLLED MOTORS

LEGEND

- POWER DRAW OUT CONTACT
- CONTROL DRAW OUT CONTACT
- FIXED TERMINAL ON MCC

NOTES:-

1. MOTOR SHALL BE CONTROLLED FROM DCS/PLC THROUGH IMC ON PROFIBUS PROTOCOL COMMUNICATION.
2. EPB WIRING FROM FIELD TO IMC INPUT AND CONTACTOR CONTROL HARDWIRED OUT TO BE DONE.

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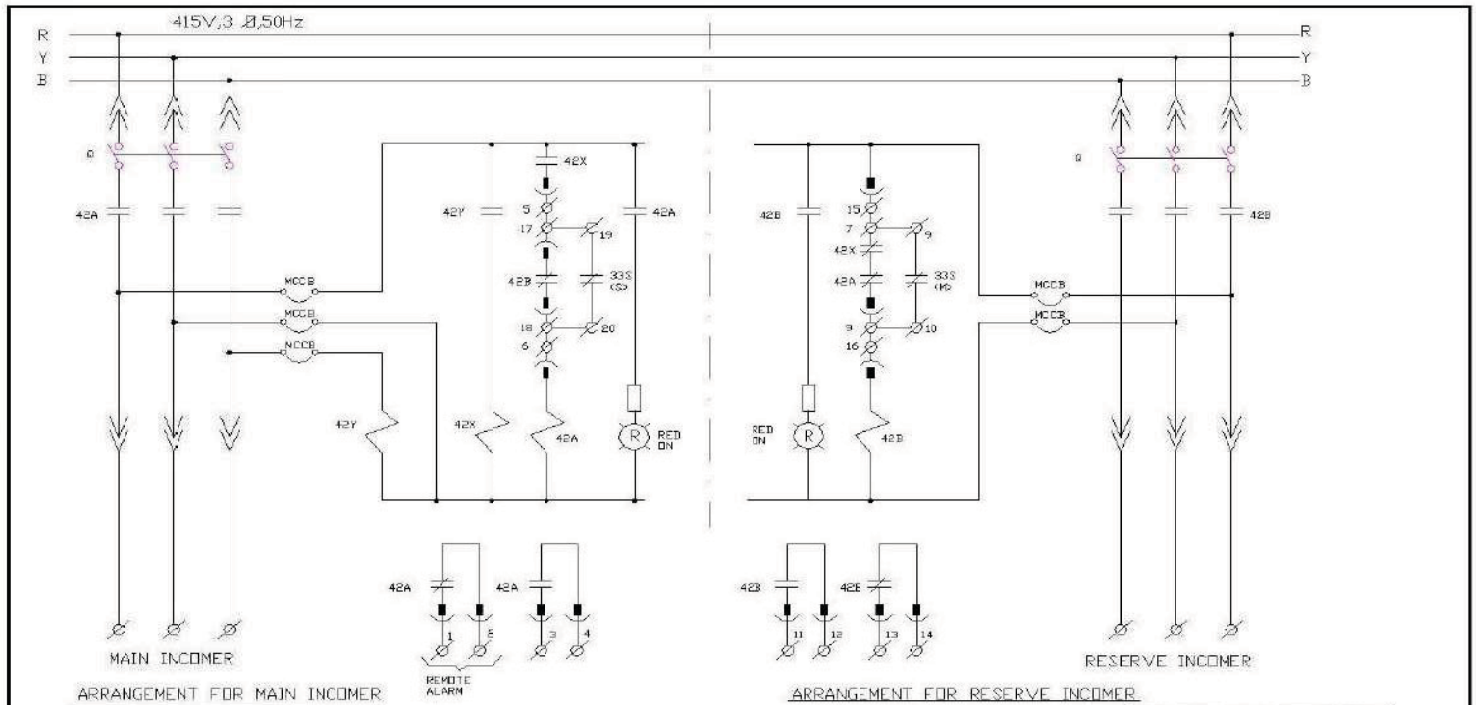
PROJECT: STANDARD

TITLE: SCHEME FOR MODULE TYPE-DK21
(CONTACTOR CONNTROLLED MOTOR)

DRN	DGN	CHKD	APPD	DATE	SCALE	DRAWING No.	REV.
				25.06.19		0000-206-POE-A-008B	A



ARRANGEMENT FOR MAIN INCOMER

ARRANGEMENT FOR RESERVE INCOMER

FOR TENDER PURPOSE ONLY

LEGEND

42A,42B-415V AC TRIPLE POLE CONTACTORS
42X,42Y-415V AC AUXILIARY CONTACTORS

NOTES

1. 33S(MAIN) & 33S(STANDBY) ARE SERVICE POSITION LIMIT SWITCH IN MAIN & RESERVE CUBICAL RESPECTIVELY.
2. THE ARRANGEMENT FOR MAIN AND RESERVE INCOMERS SHALL BE MADE IN SEPARATE MODULES AND THESE MODULES SHALL BE LOCATED IN DIFFERENT PANELS.
3. ALL CONTACTORS SHOULD HAVE COILS SUITABLE FOR 415V AC.

LT011.DVG

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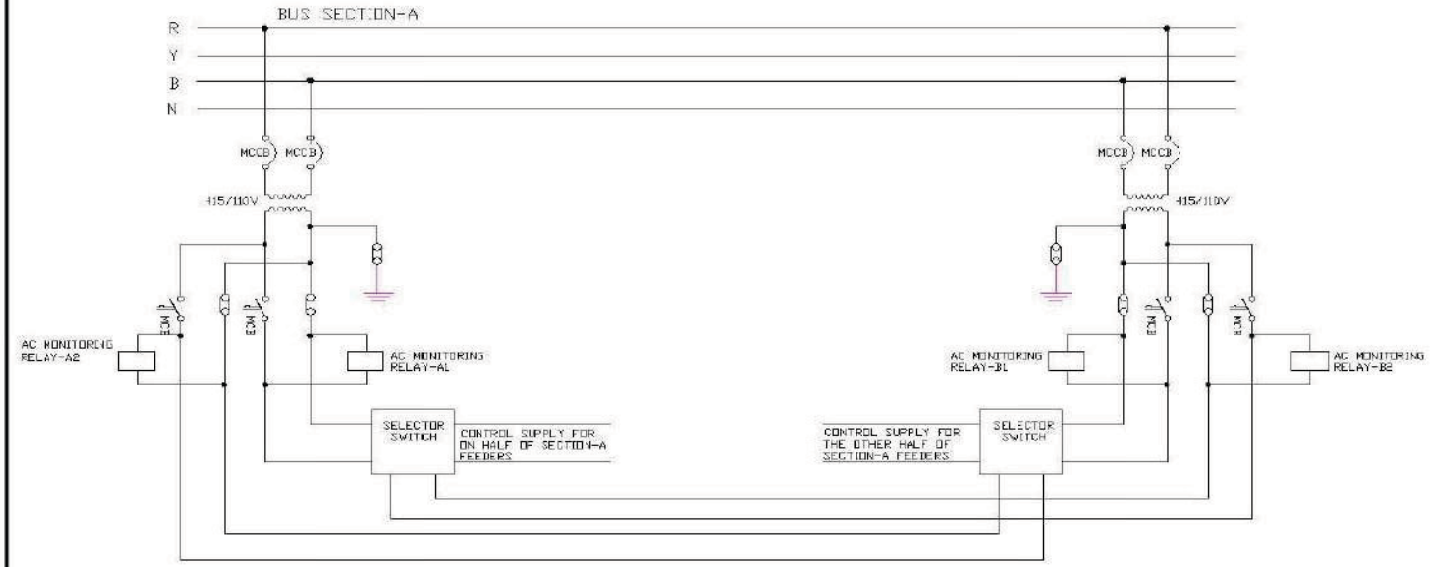
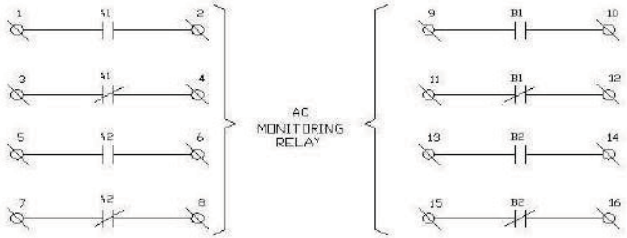
CLEARED BY					PROJECT	
C	E	M	C&I	ES		STANDARD
					TITLE	SCHEME FOR MODULE TYPE-CC (INCOMER WITH AUTO CHANGEOVER)

DRN	DGN	CHKD	APPD	DATE	SCALE	DRAWING No.	REV.
				30.04.18		0000-206-POE-A-009	A

A3 420X297





FOR TENDER PURPOSE ONLY

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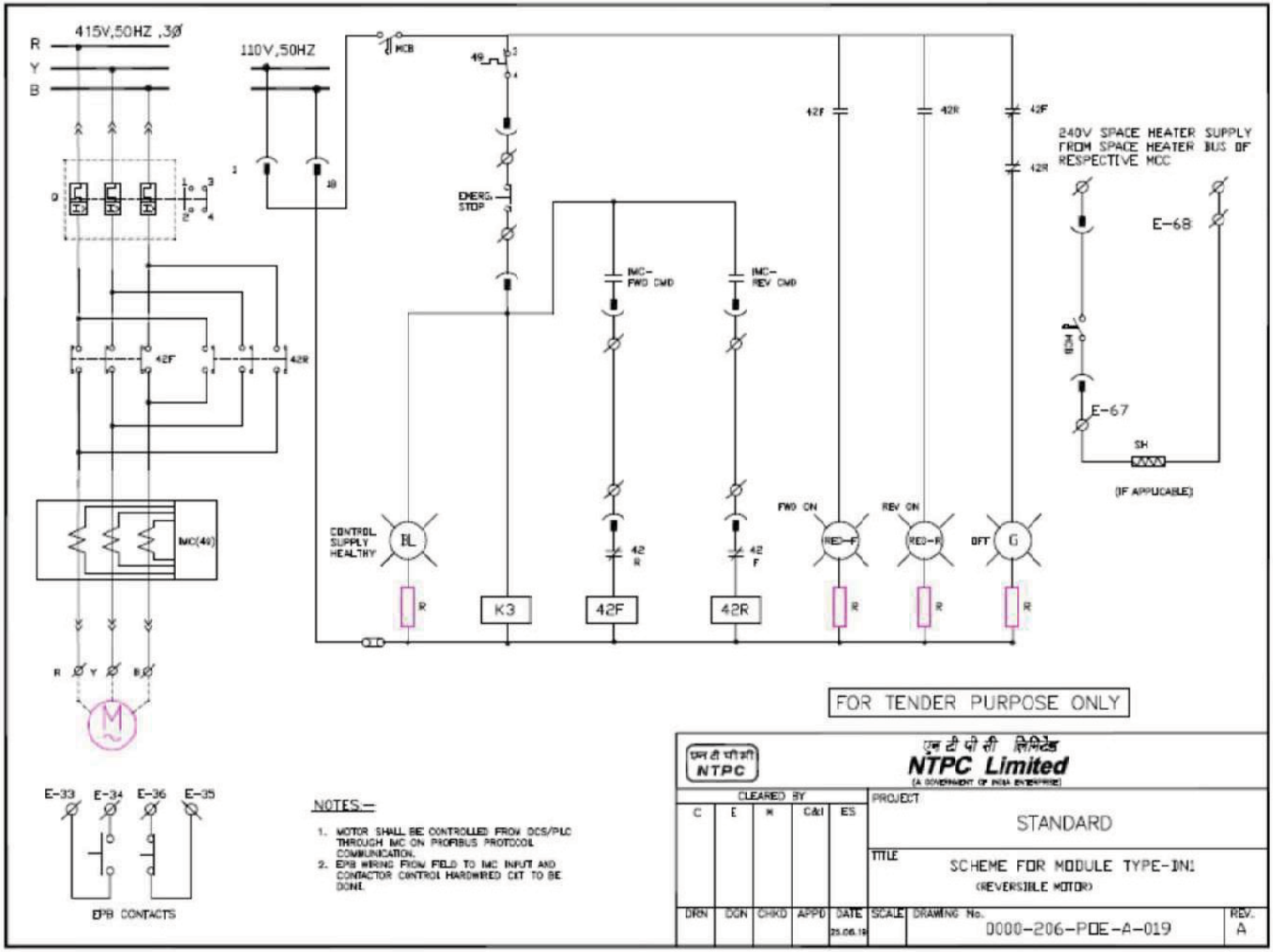
CLEARED BY					PROJECT
C	E	M	C&I	ES	STANDARD
					TITLE: SCHEME FOR MODULE TYPE-CS (CONTROL SUPPLY MODULE)
DRN	DGN	CHKD	APPD	DATE	SCALE / DRAWING No. / REV.
				30/4/08	0000-206-PDE-A-010 / A

LT012.DWG

A3 420X297



NOTES:-

1. MOTOR SHALL BE CONTROLLED FROM DCS/PLC THROUGH IMC ON PROFIBUS PROTOCOL COMMUNICATION.
2. EPB WIRING FROM FIELD TO IMC INPUT AND CONTACTOR CONTROL HARDWIRED CKT TO BE DONE.

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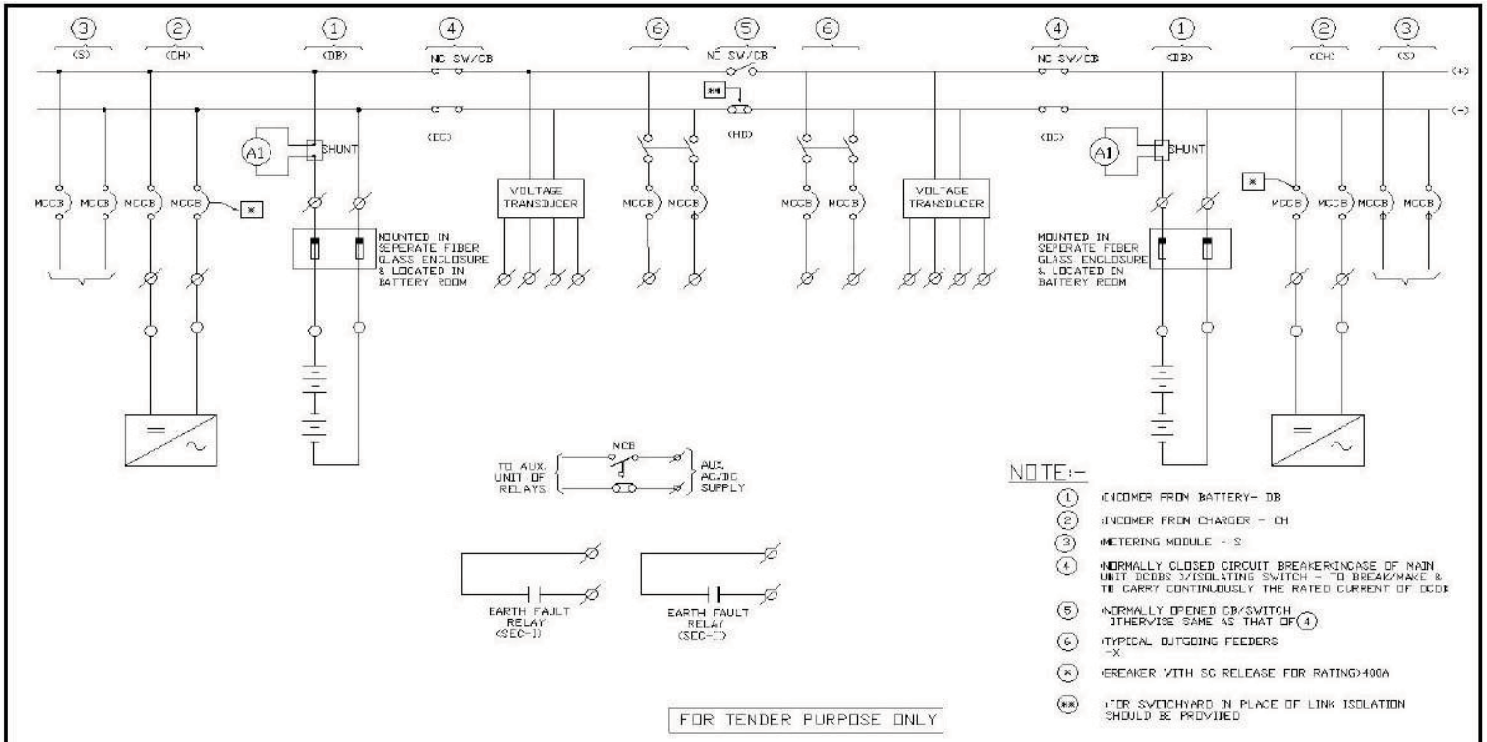
CLEARED BY					PROJECT
C	E	M	C&I	ES	STANDARD

TITLE: SCHEME FOR MODULE TYPE-IN1 (REVERSIBLE MOTOR)

DRN	DGN	CHKD	APPD	DATE	SCALE	DRAWING No.	REV.
				25.06.19		0000-206-POE-A-019	A



NOTE:-

1. INCOMER FROM BATTERY- DB
2. INCOMER FROM CHARGER - CH
3. METERING MODULE - S
4. NORMALLY CLOSED CIRCUIT BREAKER(INCASE OF MAIN UNIT DCDB) /ISOLATING SWITCH - TO BREAK/MAKE & TO CARRY CONTINUOUSLY THE RATED CURRENT OF DCDB
5. NORMALLY OPENED CB/SWITCH OTHERVISE SAME AS THAT OF (4)
6. TYPICAL OUTGOING FEEDERS -X
- (*) BREAKER WITH SC RELEASE FOR RATING>400A
- (**) FOR SWITCHYARD IN PLACE OF LINK ISOLATION SHOULD BE PROVIDED

FOR TENDER PURPOSE ONLY

NOTES:-

(1) MODULE TYPE -HD SHALL HAVE KEY INTERLOCK WITH MODULE TYPE DC IN BOTH SECTIONS IN SUCH A WAY THAT WHEN SWITCH HD' IS IN OPEN CONDITION THE KEY SHALL BE TRAPPED. ON CLOSING MODULE 'HD' THE KEY SHALL BE RELESED. MODULE TYPE 'DC' CAN ONLY BE OPENED ON INSERTING THE ABOVE KEY IN ANY ONE OF THE SECTION.

(2) MODULE TYPE 'DC' AND 'HD' SHALL BE PROVIDED WITH AUXILIARY SWITCH WITH 2NO+2NC CONTACTS.

LT014.DWG

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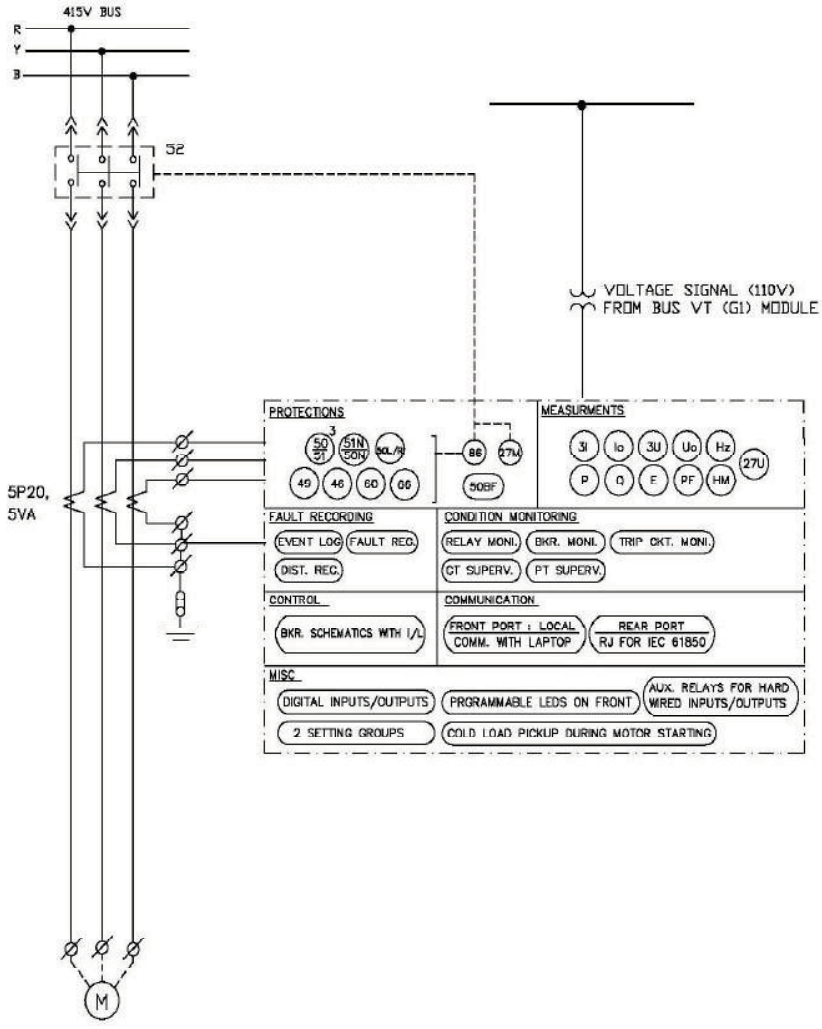
C	E	M	C&I	ES

PROJECT: STANDARD

TITLE: TYPICAL ARRANGEMENT OF FEEDERS IN 220V DCDB

DRN	DGN	CHKD	APPD	DATE	SCALE	DRAWING No.	REV.
				26.04.18		0300-206-POE-A-012	A



NOTE:
BREAKER OPEN / CLOSE COMMAND FROM OWNER'S DDCMIS (REMOTE) SHALL BE HARD WIRED.

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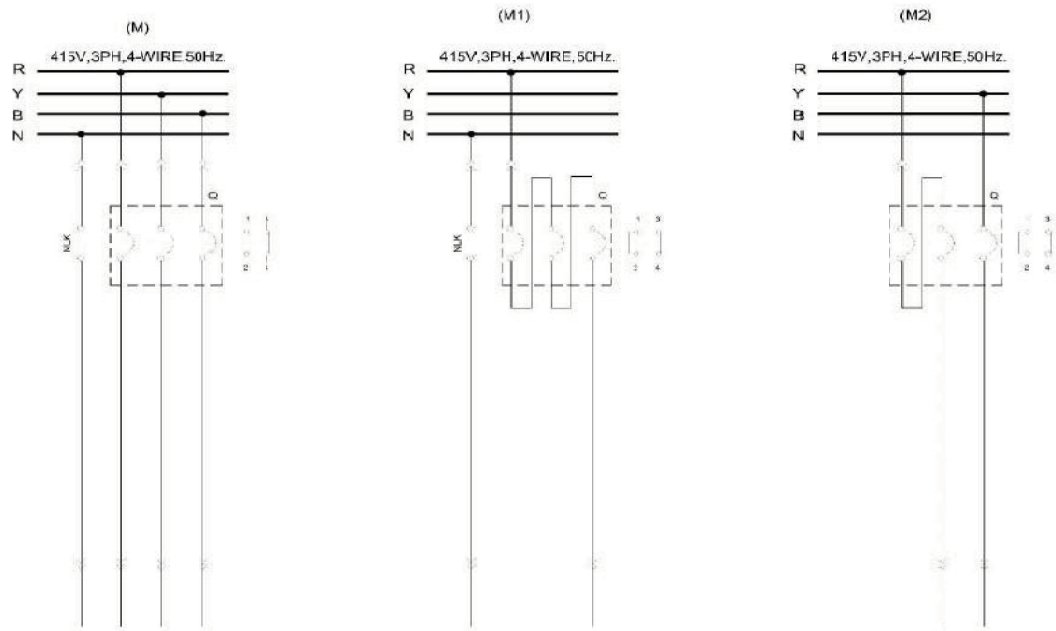
CLEARED BY					PROJECT
C	E	M	C&I	ES	STANDARD

TITLE: SCHEME FOR FEEDER TYPE-DM (MOTOR RATING 110kW AND ABOVE)

DRN	DGN	CHKD	APPD	DATE	SCALE	DRAWING No.	REV.
-				10/01/07	NA	0000-206-POE-A-014	0

A4 210X297



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CLEARED BY

C	E	M	C&I	ES

PROJECT

STANDARD

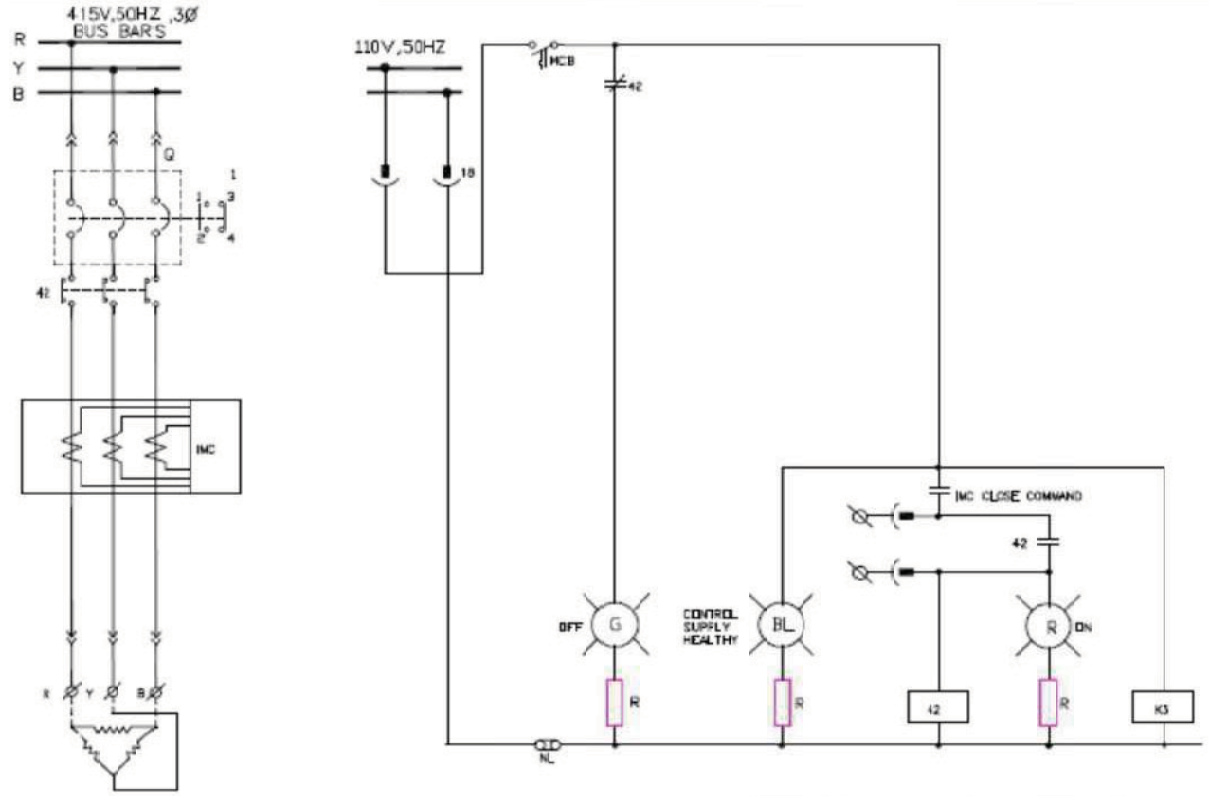
TITLE

TYPICAL SCHEMATIC FOR M/M1/M2

DRN	DGN	CHKD	APPD	DATE	SCALE	DRAWING No.	REV.
				16.05.18		000C-206-POE-A-018	A

LT016.DWG

A3 420X297



FOR TENDER PURPOSE ONLY

LEGEND

- POWER DRAW OUT CONTACT
- CONTROL DRAW OUT CONTACT
- FIXED TERMINAL ON MCC

NOTES:–

1. HEATER SHALL BE CONTROLLED FROM DCS/PLC THROUGH IMC ON PROFIBUS PROTOCOL COMMUNICATION.

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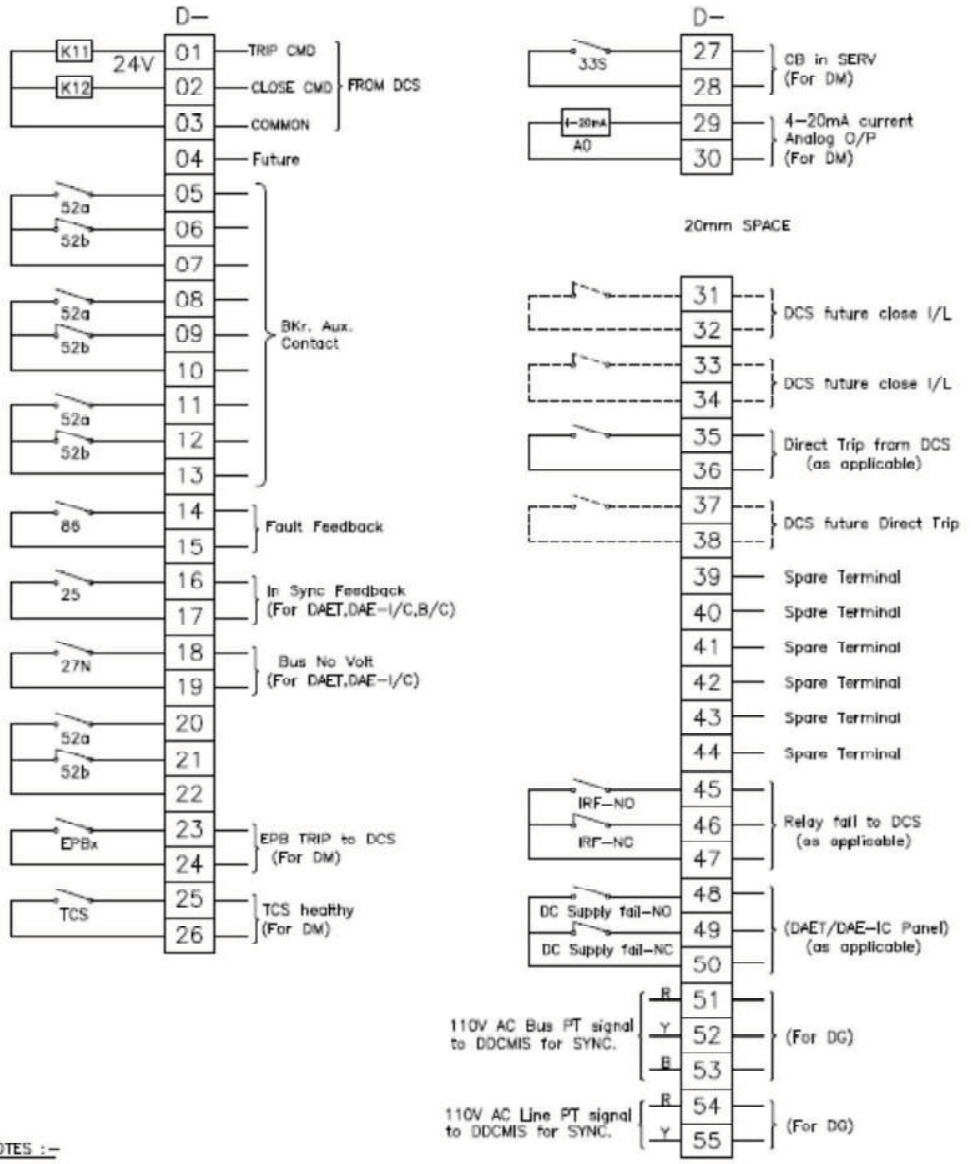
CLEARED BY					PROJECT			
C	E	M	C&I	ES	STANDARD			
					TITLE: SCHEME FOR MODULE TYPE-HTR (CONTRACTOR CONNTROLLED HEATER)			
DRN	CGN	CHKD	APPD	DATE	SCALE	DRAWING No.	REV.
				25.06.19		0000-206-POE-A-021	A



NOTES :–

1. 52a &52b shown above are breaker aux. contacts when breaker is in Service position.
2. If any signal (except 52a & 52b signals,future & Spare terminals marked) is not applicable for a module type, associated terminals/terminal nos. may be absent in the panel.
3. If any new signal not covered in this list is required to be wired to DCS during detail engg,new terminal nos as per above philosophy shall be assigned.

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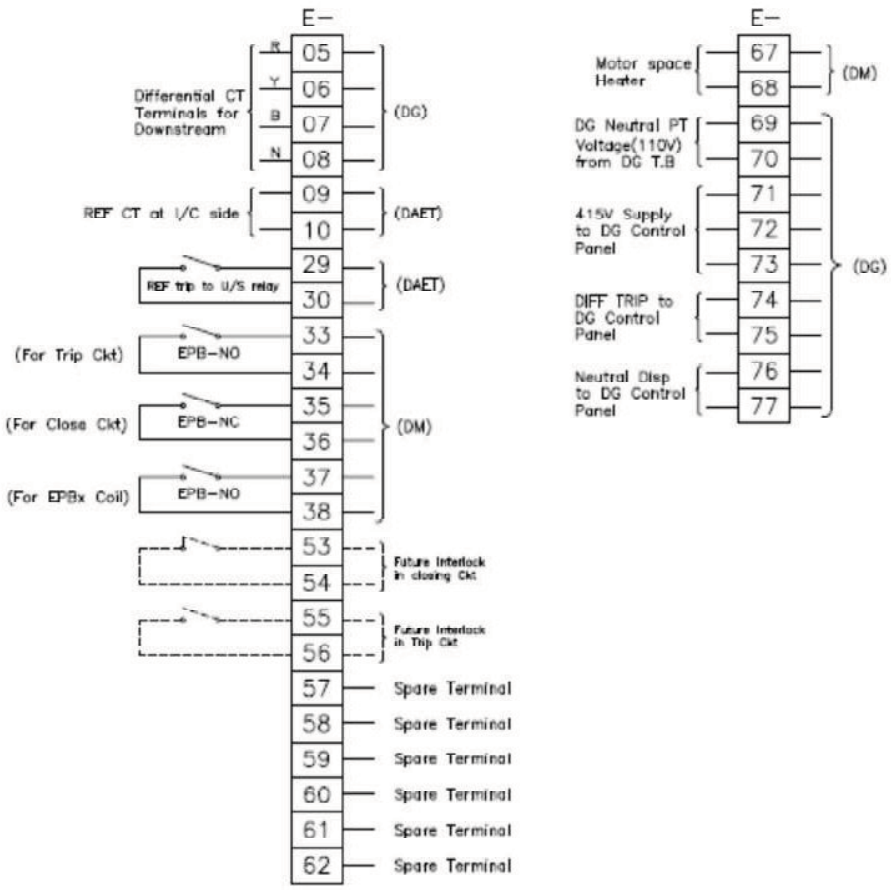
CLEARED BY					PROJECT	STANDARD	
C	E	M	C&I	ES			
					TITLE	STANDARD "D" TERMINALS (FOR CABLING BETWEEN SWGR & DCS) FOR LT SWGR	
DRN -	DGN	CHKD	APPD	DATE	SCALE NA	DRAWING No. 0000–206–POE–A–022	REV. A

A4 210X297



NOTES :–

1. 52a &52b shown above are breaker aux. contacts when breaker is in Service position.
2. If any signal (except 52a & 52b signals,future & Spare terminals marked) is not applicable for a module type, associated terminals/terminal nos. may be absent in the panel.
3. If any new signal not covered in this list is required to be wired to any other external equipment during detail engg,new terminal nos as per above philosophy shall be assigned.

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CLEARED BY					PROJECT	STANDARD	
C	E	M	C&I	ES			
					TITLE	STANDARD 'E' TERMINALS (FOR CABLING BETWEEN SWGR TO MOTOR,SWGR TO TRF & INTERBOARD CABLING) FOR LT SWGR	
DRN	DGN	CHKD	APPD	DATE	SCALE	DRAWING No.	REV.
-					NA	0000–206–POE–A–023	A

A4 210X297

DRAWING NO: 3-96-186-16421

ANNEXURE-5

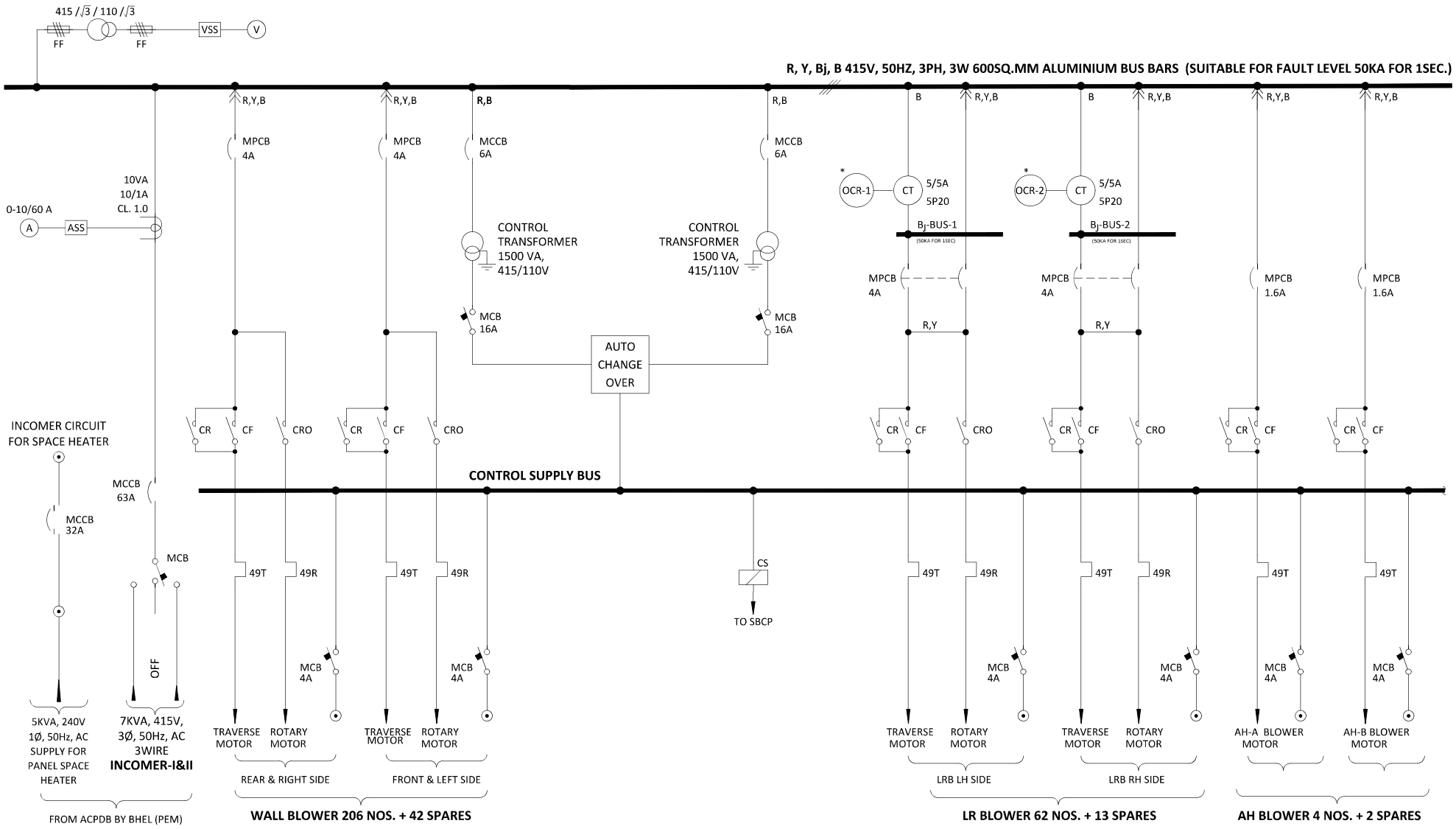
SOOT BLOWER MCC SCHEME

LEGEND	
49R	THERMAL OVER LOAD RELAY ROTARY
49T	THERMAL OVER LOAD RELAY TRAVERSE
74	AUX. CONTACTORS
A	AMMETER
CF	CONTACTOR FOR FORWARD
CR	CONTACTOR FOR REVERSE
CRO	CONTACTOR FOR ROTARY
CS	CONTROL SUPPLY HEALTHY
CT	CURRENT TRANSFORMER
FF	FUSE
LSTE	WALL BLOWER HOME POSITION LIMIT SWITCH
LSTR	WALL BLOWER ROTARY LIMIT SWITCH
LSTS	WALL BLOWER FORWARD END POSITION LIMIT SWITCH
LS1	LRB/AHB FORWARD END POSITION LIMIT SWITCH
LS2	LRB/AHB HOME POSITION LIMIT SWITCH
MCB	MINIATURE CIRCUIT BREAKER
MCCB	MOULDED CASE CIRCUIT BREAKER
MPCB	MOTOR PROTECTION CIRCUIT BREAKER
SBC	SOOTBLOWER CONTROLS SYSTEM
V	VOLTMETER

LEGEND	
∅	SB CP TERMINALS
⊙	SB MCC TERMINALS
○	LOCAL TERMINALS
	POWER / AUX. CONTACTOR
	"NO" CONTACT OF CONTACTOR
	"NC" CONTACT OF CONTACTOR
	OFF DELAY TIMER
	"NO" CONTACT OF TIMER
	INDICATING LAMP (A-AMBER) (B-BLUE)
	MPCB/MCCB
	MCB
	SWITCH
	DRAWOUT TYPE TERMINALS
	CURRENT TRANSFORMER
	POTENTIAL TRANSFORMER

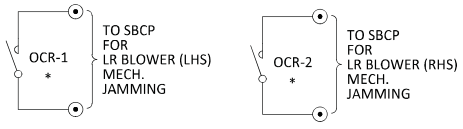
FILE NAME: SINSBS02

DRAWING NO: 3-96-186-16422



FILE NAME: SINSBS03

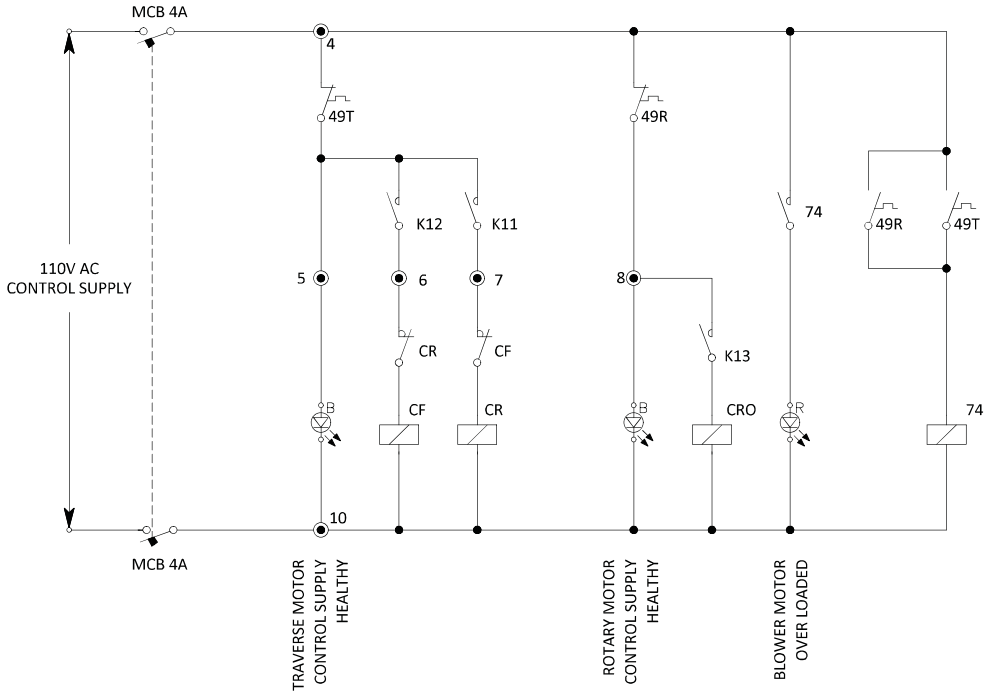
DRAWING NO: 3-96-186-16423

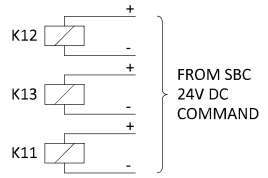


*NON-COMMUNICABLE NUMERICAL RELAY TO BE PROVIDED FOR OVER CURRENT SENSING FOR LR BLOWERS (OCR 1 & 2).

DESCRIPTION	INCOMER FOR SPACE HEATER	INCOMER-I	INCOMER-II	WALL BLOWERS		LR BLOWERS		AH BLOWER
FEEDER NO. DETAILS	1	1	1	206 + 42 SPARES		62 + 13 SPARES		4 NOS. + 2 SPARE
DRIVE DETAILS	-	-	-	TRAVERSE	ROTARY	TRAVERSE	ROTARY	
MOTOR CAPACITY IN KW	5 KVA	7 KVA	7 KVA	0.56	0.09	0.56	0.736	0.18
FULL LOAD CURRENT IN AMPS	-	-	-	1.36	0.64	1.4	1.65	0.56
O/L RELAY RANGE IN AMPS	-	-	-	0.9-1.5	0.45-0.75	0.9-1.5	1.0-2.0	0.45-0.75
MCCB/MPCB RATING IN AMPS	32A	63 A	63 A	4	4	4	4	1.6
POWER CONTACTOR	-	-	-	16	16	16	16	16
CABLE SIZE	3CX6SQ.MM(AL) PC	3CX10SQ.MM(AL) PC	3CX10SQ.MM(AL) PC	3CX2.5SQ.MM(CU)	3CX2.5SQ.MM(CU)	3CX2.5SQ.MM(CU)	3CX2.5SQ.MM(CU)	3CX2.5SQ.MM(CU)

DRAWING NO: 3-96-186-16424





LIMIT SWITCH CONTACT DEVELOPMENT				
CONTACT	POSITION	HOME	INTER MEDIATE	FORWARD END
LSTS	1-2	-	-	X
	3-4	X	X	-
LSTE	9-10	-	X	X
	7-8	X	-	-
LSTR	5-6	-	-	MAKES AFTER 1 Rev.
X CONTACT CLOSED, - CONTACT OPEN				

ALL LIMIT SWITCHES ARE WIRED TO DCS.

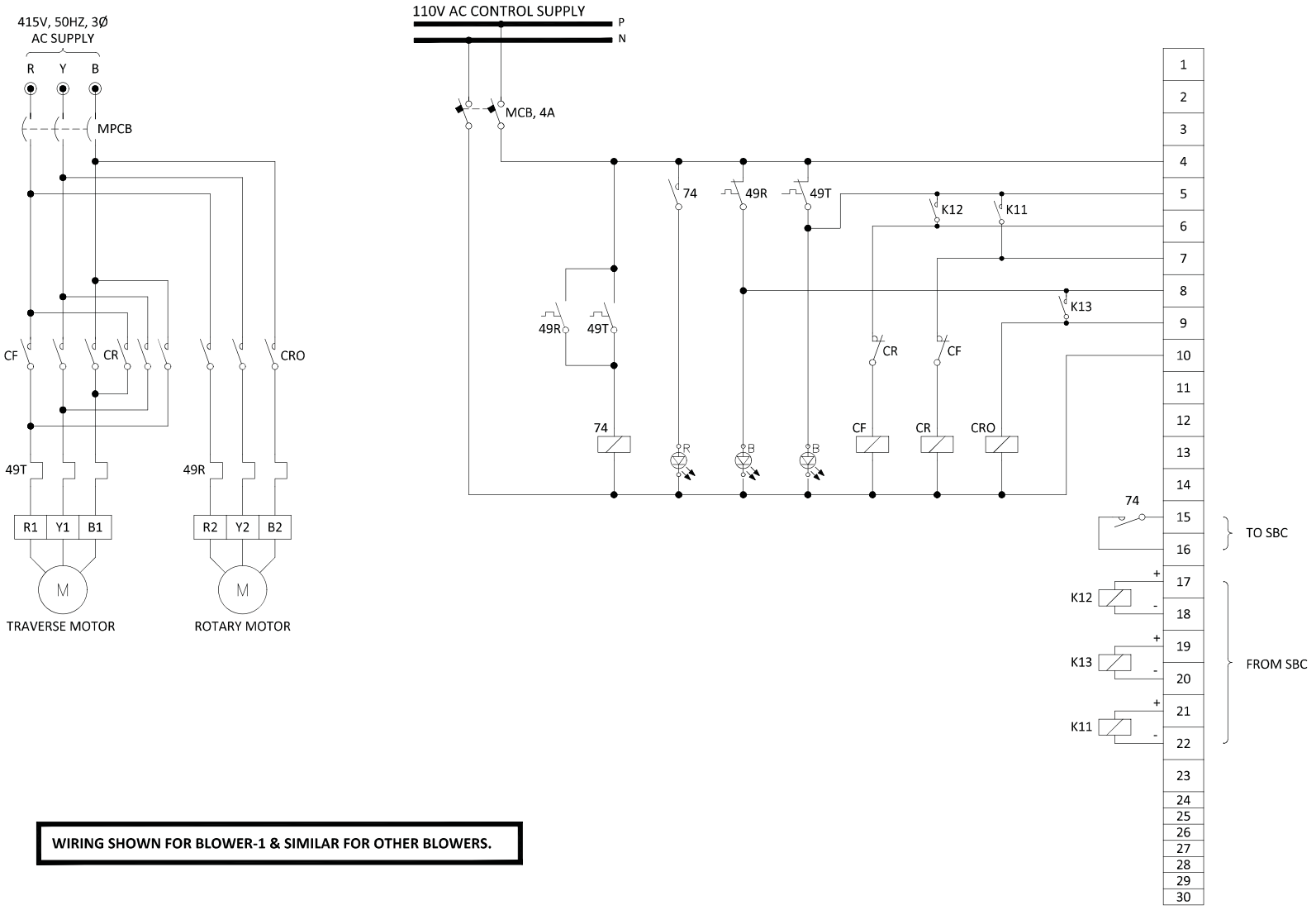
WRITE UP ON OPERATION OF WALL BLOWERS

There are 3 limit switches and two motors, one for traverse motion and the other for rotary motion. At a time only one motion will take place. When an impulse is given for the blower start, the forward Motion starts. When the blower reaches its full forward position , it actuates the limit switch LSTS. This gives an impulse to trip traverse motor and to start the rotary motor through SBC. When the blower completes its rotary motion, it actuates limit switch LSTR. This gives an impulse for the Blower to retract from SBC by energising the reverse contactor in the starter. Limit switch LSTR and LSTS resets. As soon as the blower leaves the forward end position resetting of LSTS, SBC trips the rotary motor. When it reaches Its initial position, it actuates limit switch LSTE and the blower is stopped.

N O T E

K11, K12, & K13 ARE ENERGISED BY 24V DC COMMANDS FROM SBC.
K12 - ADVANCE COMMAND
K13 - ROTATE COMMAND
K11 - RETRACT COMMAND

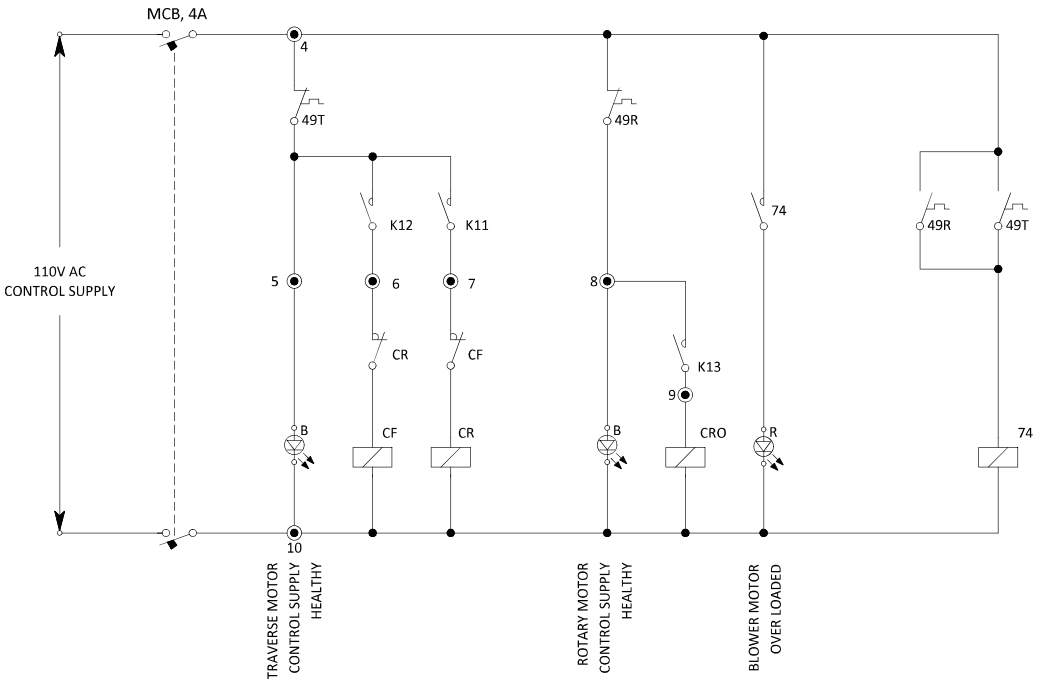
DRAWING NO: 3-96-186-16425

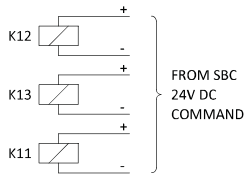


WIRING SHOWN FOR BLOWER-1 & SIMILAR FOR OTHER BLOWERS.

FILE NAME: SINSBS06

DRAWING NO: 3-96-186-16426





LIMIT SWITCH CONTACT DEVELOPMENT				
CONTACT	POSITION	HOME	INTER MEDIATE	FORWARD END
LS-1	1-2	X	X	-
LS-2	4-5	-	X	X
	4-6	X	-	-
X CONTACT CLOSED, - CONTACT OPEN				

ALL LIMIT SWITCHES ARE DIRECTLY WIRED TO DCS.

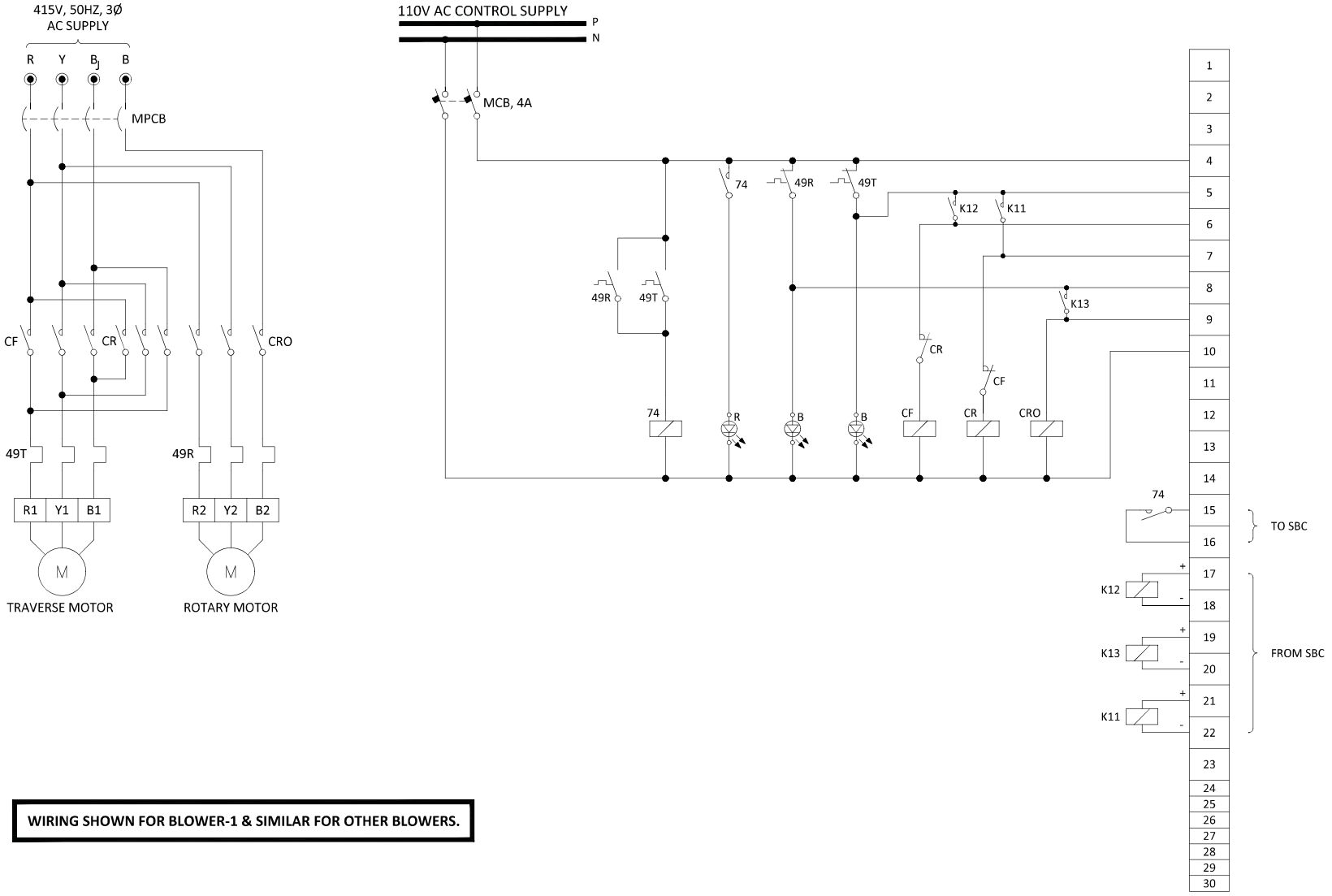
WRITE UP ON OPERATION OF LONG RETRACTABLE BLOWER.

The long retractable blower has dual electric motor drives. One motor moves the lance into and out of the boiler. The other rotates it always in the same direction. Rotation is continuous from the moment the lance starts to extend until retraction is completed. At the end of travel into boiler the two jets always return over a different path than that taken while the lance was extending. To start the LR blower, First the rotary motor is given command forward and starts rotating. Then the traverse motor starts is given start command. The limit switch LS-2 (contact 4,5) closes as soon as the blower starts moving. At the end of the forward Motion limit switch LS-1 opens (contacts 1,2). This will be used for reseting forward command and to issue retract command. When the blower reaches the home position. The limit switch LS-2 (contact 4,5) opens and the blower stops.

N O T E

K11, K12, & K13 ARE ENERGISED BY 24V DC COMMANDS FROM SBC.
K12 - ADVANCE COMMAND
K13 - ROTATE COMMAND
K11 - RETRACT COMMAND

DRAWING NO: 3-96-186-16427



WIRING SHOWN FOR BLOWER-1 & SIMILAR FOR OTHER BLOWERS.

FILE NAME: SINSBS08

DRAWING NO: 3-96-186-16428

LIMIT SWITCH CONTACT DEVELOPMENT

CONTACT	POSITION	HOME	INTER MEDIATE	FORWARD END
LS-1	1-2	X	X	-
LS-2	4-5	-	X	X
	4-6	X	-	-

X CONTACT CLOSED, - CONTACT OPEN

ALL LIMIT SWITCHES ARE WIRED TO DCS.

WRITE UP ON OPERATION OF AIR HEATER BLOWERS

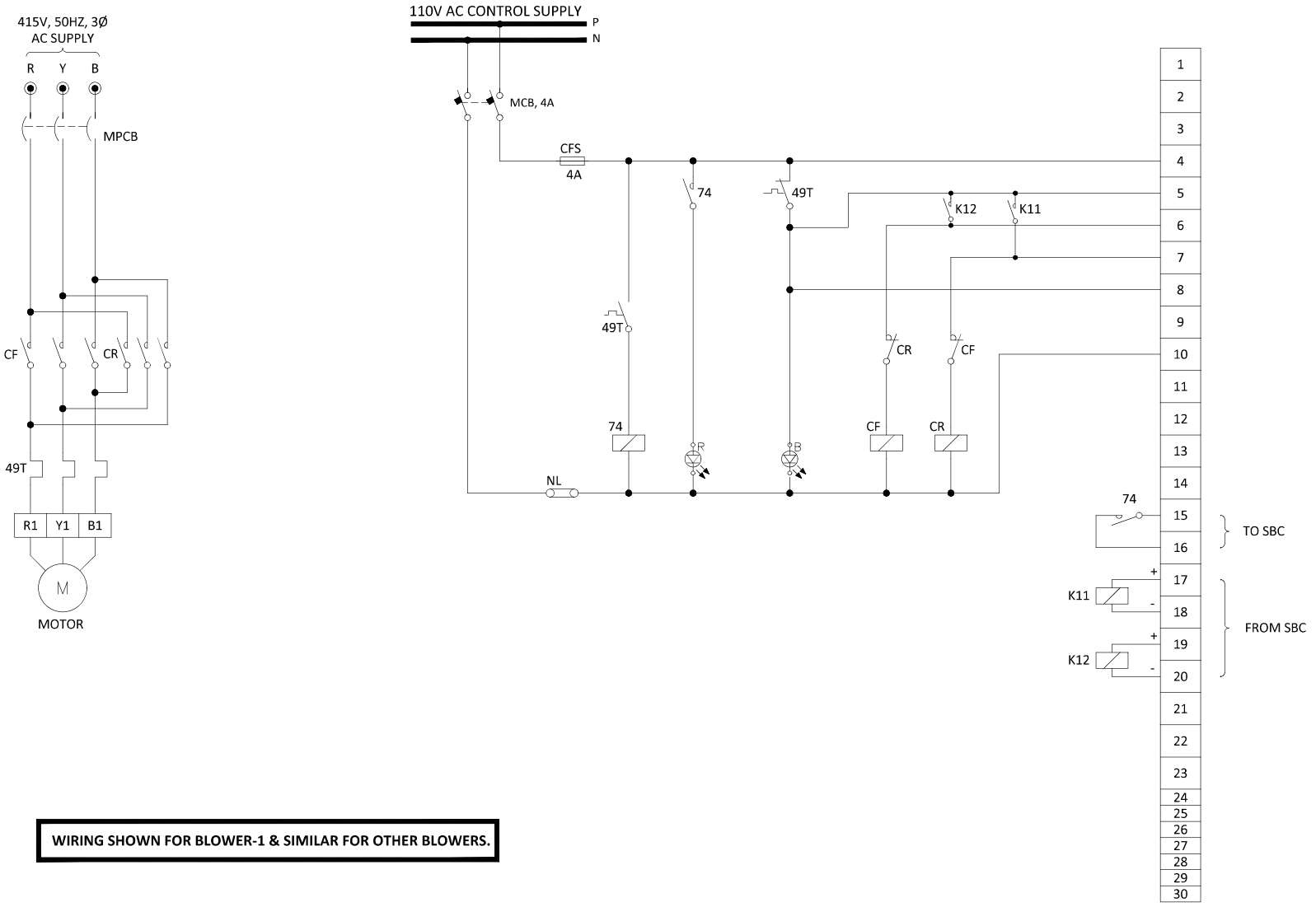
There are 2 limit switches (LS-1 & LS-2) and one motor. When an impulse is given for the blower start, the forward motion starts. When the blower moves from home position limit switch LS-2 (Contact 4,5) contact makes and associated solenoid valve shall be given open command from DDCMIS. Opening the solenoid valve will admit the steam through AH blower. When the blower reaches forward end position limit switch LS-1 opens. This issues retract command to the blower. During retract cycle there will be no steam blowing. When the blower completes its retract motion, limit switch LS-2 (Contact 4,5) opens and blower stops.

N O T E

K11 & K12 ARE ENERGISED BY 24V DC COMMANDS FROM SBC.
K11 - RETRACT COMMAND
K12 - ADVANCE COMMAND

FILE NAME: SINSBS09

DRAWING NO: 3-96-186-16429



WIRING SHOWN FOR BLOWER-1 & SIMILAR FOR OTHER BLOWERS.

FILE NAME: SINSBS10

QUALITY PLAN

		MANUFACTURE'S NAME & ADDRESS		MANUFACTURING QUALITY PLAN					PROJECT : CUSTOMER : END USER :					
				PACKAGE : ITEM : LT SWITCHGEAR PANELS (DRAW OUT TYPE AND FIXED TYPE)			QAP NO : REV. : DATE : PAGE :							
SR. NO	COMPONENT & OPERATION	CHARACTERISTICS	CLASSIFICATION	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY 10				REMARKS
1	2	3	4	5	M	C/N	7	8	9	D*	M**	C	N	11
1	**RAW MATERIAL**													
1.1	Angles, Channels & Sheet Steel for Fabrication (CR/HR)	i) Thickness	Major	Meas.	1 sample of each type & size/lot	-	Approved Drawing/IS-513, IS-1079, IS-2062	Approved Drawing/ IS-513, IS-1079, IS-2062	QC records/ MTC		P	-	-	
		ii) Surface finish & check for waviness / flatness	Major	Visual	-do-	-	Approved Drawing/IS-513, IS-1079, IS-2062	Approved Drawing/ IS-513, IS-1079, IS-2062	QC records/ MTC		P	-	-	
		iii) Bending Test	Major	Mech.	Sample	-	Approved Drawing/IS-513-1994	Approved Drawing/ IS-513-1994	MTC		V	-	-	
1.2	Bus Bar – Copper / Aluminum	i) Dimension	Major	Meas.	1 sample of each type & size/lot	-	As per IS- 5082 / IS-1897/ Approved Drg.	As per IS- 5082 / IS-1897/Approved Drg.	QC records/ MTC		P	V	V	
		ii) Physical and Chemical Test	Major	Meas.	-do-	-	As per IS- 5082 / IS-1897/ Approved Drg.	As per IS- 5082 / IS-1897/Approved Drg.	QC records/ MTC		P	V	V	
		iii) Surface Finish	Major	Visual	-do-	-	As per IS- 5082 / IS-1897	As per IS- 5082 / IS-1897	QC Records		P	V	V	
		iv) Conductivity	Major	Ele.	10% Sample	-	As per IS- 5082 / IS-1897	As per IS- 5082 / IS-1897	MTC		P	V	V	
2	**BROUGHT OUT ITEMS**													
2.1	Air Circuit Breaker	i) Make, Type, Rating	Major	Visual	100%	-	Approved Drg. /Data sheet/IEC 60947-2	Approved Drg. /Data sheet/ IEC 60947-2	QC Records		P	V	V	
		ii) All Routine test	Critical	Tests	-do-	-	Approved Drg. /Data sheet/IEC 60947-2	Approved Drg. /Data sheet/ IEC 60947-2	MTC	✓	V	V	V	

	Suman Nakwal HARISH KUMAR	* Records, identified with "TICK"(✓) shall be included by contractor in documentation. **M: Manufacturer/Sub-Contractor, C: Contractor / Nominated Inspection Agency, N: End User . Indicated "P" PERFORM, "W" WITNESS & "V" VERIFICATION "W" Indicated in column N shall be "CHP" of NTPC. (FS – Factory Standard) **Note**: COC - Wherever mention shall be COC by Pyrotech.	FOR END USER	DOC NO : REV NO : CAT :
Manufacturer / Sub Supplier	Main Supplier			
SIGNATURE			REVIEWED BY	APPROVED BY / APPROVAL SEAL

		MANUFACTURE'S NAME & ADDRESS		MANUFACTURING QUALITY PLAN					PROJECT : CUSTOMER : END USER :					
				PACKAGE : ITEM : LT SWITCHGEAR PANELS (DRAW OUT TYPE AND FIXED TYPE)			QAP NO : REV. : DATE : PAGE :							
SR. NO	COMPONENT & OPERATION	CHARACTERISTICS	CLASSIFICATION	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY 10				REMARKS
1	2	3	4	5	M	C/N	7	8	9	D*	M**	C	N	11
2.2	CT's	i) Overall dimensions & mounting arrangement	Major	Meas.	10% of each type & rating per lot	-	Approved Drg. /Data sheet	Approved Drg. /Data sheet	QC Records / MTC		P	-	-	
		ii) Make, Type, Rating, Accuracy class	Major	Visual	-do-	-	Approved Drg. /Data sheet	Approved Drg. /Data sheet	QC Records/ MTC		P	V	V	
		iii) All routine tests	Critical	Ele.	100%	10%	IS-2705	IS-2705	MTC	✓	V	V	V	
2.3	PT's	i) Overall dimensions & mounting arrangement	Major	Meas.	10% of each type & rating per lot	-	Approved Drg. /Data sheet	Approved Drg. /Data sheet	QC Records / MTC		P	-	-	
		ii) Make, Type, Rating, Accuracy class	Major	Visual	-do-	-	Approved Drg. /Data sheet	Approved Drg. /Data sheet	QC Records / MTC		P	V	V	
		iii) All routine tests	Critical	Ele.	100%	10%	IS-3156	IS-3156	MTC	✓	V	V	V	
2.4	Air Break Switch, Fuse, MCCB, MPCB, Push Button, MCB, Control & Selector Switches AC/DC Power & aux. Contactor, Timers, OLR, Coupling relay, Indicating lamp	i) Make, Type, Rating	Major	Visual	10% of each type & rating per lot	-	Approved Drg. /Data sheet	Approved Drg. /Data sheet	COC/ QC Records		P	V	V	
2.5	Indicating Instruments	i) Make, Type, Rating, Accuracy class	Major	Visual	10% of each type & rating/lot	-	Approved Drg. /Data sheet	Approved Drg. /Data sheet	MTC		P	V	-	

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Manufacturer / Sub Supplier	Main Supplier					
SIGNATURE				REVIEWED BY	APPROVED BY	APPROVAL SEAL

	MANUFACTURE'S NAME & ADDRESS	MANUFACTURING QUALITY PLAN		PROJECT : CUSTOMER : END USER :
		PACKAGE : ITEM : LT SWITCHGEAR PANELS (DRAW OUT TYPE AND FIXED TYPE)	QAP NO : REV. : DATE : PAGE :	

SR. NO	COMPONENT & OPERATION	CHARACTERISTICS	CLASSIFICATION	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY 10				REMARKS
1	2	3	4	5	M	C/N	7	8	9	D*	M**	C	N	11
		ii) Routine tests	Major	Ele.	100%	100 %	IS-1248	IS-1248	MTC	✓	V	V	V	
2.6	Transducer, MFM, IMC, Energy Meter.	i) Make, Type, Rating, Accuracy class	Major	Visual	10% of each type & rating/lot	-	Approved Drg. /Data sheet	Approved Drg. /Data sheet	QC RECORD/ MTC		P	V	-	
		ii) Routine tests	Major	Ele.	100%	10%	Approved Drg. /Data sheet/ IEC-60688/ IEC62052/ IEC60947	Approved Drg. /Data sheet/ IEC-60688/IEC62052/IEC60947	MTC	✓	V	V	V	
2.7	Control Transformer	i) Make, Type, Rating	Major	Visual	10% of each type & rating/lot		Approved Drg. /Data sheet	Approved Drg. /Data sheet	QC RECORD		P	V	V	
		ii) Routine tests including Voltage Ratio	Major	Ele.	100%	10%	Approved Drg. / Data sheet/ IS-12021	Approved Drg. /Data sheet/ IS-12021	MTC	✓	V	V	V	
2.8	PVC Wires / Cables (Multi strand FRLS)	i) Make, Type, Rating	Major	Visual	10% of each type & rating/lot		IS-694	IS-694	QC RECORD		P	-	-	BIS CERTIFIED WIRE (ISI MARK)
		ii) Routine tests including FRLS test	Major	Ele.	100%	10%	IS-694	IS-694	MTC		V	V	V	
2.9	Insulating Barriers, Shrouds and Bus-bar Insulators	i) Visual	Major	Visual	1 Sample per lot	1 Sample per lot	As per approved Drg.	As per approved Drg.	QC Record		P			

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Manufacturer / Sub Supplier	Main Supplier				
SIGNATURE				REVIEWED BY	APPROVED BY / APPROVAL SEAL

	MANUFACTURE'S NAME & ADDRESS	MANUFACTURING QUALITY PLAN												
		PACKAGE : ITEM : LT SWITCHGEAR PANELS (DRAW OUT TYPE AND FIXED TYPE)			QAP NO : REV. : DATE : PAGE :			PROJECT : CUSTOMER : END USER :					
SR. NO	COMPONENT & OPERATION	CHARACTERISTICS	CLASSIFICATION	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY 10				REMARKS
1	2	3	4	5	M	C/N	7	8	9	D*	M**	C	N	11
		ii) Flame Resistance Test	Major	Elec.	1 Sample per lot	1 Sample per lot	As per approved Data Sheet	As per approved Data Sheet	MTC / COC/ QC Record		V	V	V	UL 94 V0 MATERIAL TO BE USED.
2.10	ACB handling Trolley	i)Dimensional & Functional Check	Major	Test	10% of each type & rating of first lot	--	Approved Drg.	Approved Drg.	QC Records		P	V		Subsequent lot will be cleared based on COC
2.11	Space heater, Thermostat, 3-pin socket, Hooter, Terminal Block	i) Make, Type, Rating	Major	Visual	1 Sample of each type/lot	-	Approved Drg. /Data sheet	Approved Drg. /Data sheet	QC Records		V	-	-	
2.12	Numerical Relay	i)Make, Type, Rating	Major	Meas.	100%	-	Approved Drg. /Data sheet	Approved Drg. /Data sheet	QC Records		V	-	-	
		ii) Routine test report	Major	Ele.	100%	100 %	Approved Drg. /Data sheet/ IEC 60255/ IEC 61850	Approved Drg. /Data sheet/ IEC 60255/IEC 61850	MTC	✓	V	V	V	CHP OF NUMERICAL RELAY TO BE SHOWN AT THE TIME OF FINAL INSPECTION.
		iii) Numerical Relay Testing	Major	Ele.	10% of each type, & rating/lot	10% of each type, & Rating /lot	Approved FAT Procedure	Approved FAT Procedure		✓	P	W	W	SEPARATE FAT PROCEDURE IS TO BE FURNISHED FOR NTPC REVIEW AND APPROVAL.

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				PACKAGE : ITEM : LT SWITCHGEAR PANELS (DRAW OUT TYPE AND FIXED TYPE)			QAP NO : REV. : DATE : PAGE :							
SR. NO	COMPONENT & OPERATION	CHARACTERISTICS	CLASSIFICATION	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY 10				REMARKS
1	2	3	4	5	M	C/N	7	8	9	D*	M**	C	N	11
2.13	Synthetic rubber Gasket/ Neoprene rubber gasket	i) Visual & Dimension, Profile, shore hardness, Elongation at break & ageing & compression Test, Ozone Resistance Test	Major	Review of Documents	100%	-	Approved Drg. /Data sheet	Approved Drg. /Data sheet	QC Records/ COC	✓	P	V	V	Gaskets as per type tested design
2.14	High Tensile Bolt	i) Appearance and Dimension	Major	Visual	Sample	-	Approved Drawing	Approved Drawing	QC Records/ COC		V	-	-	
		ii) Mechanical Properties	Major	Mech.	Sample	-	Approved Drawing/IS 1367	Approved Drawing/IS 1367	QC Records/ COC/ MTC		V	-	-	
2.15	PVC Sleeve	i) Visual	Major	Visual	Sample	-	Approved Drawing	Approved Drawing	QC Records/ COC /MTC		V	-	-	UL224 Sleeve to be used
3	**IN PROCESS INSPECTION**													
3.1	Panel Fabrication	i) Cutting, punching, shearing & bending	Major	Meas.	Mfr. Practice	-	Manufacturer's Standard	Manufacturer's Standard	QC Records		P	-	-	
		ii) panel front door cut-outs punching	Major	Meas.	-do-	-	Approved Drg.	Approved Drg.	QC Records		P	-	-	
3.2	Paint Check	i) Pre- Treatment of sheet	Major	Process	Mfr. Practice	-	Manufacturer's Standard/IS-6005	Manufacturer's Standard/IS-6005	QC Records		P	-	-	

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SIGNATURE				**REVIEWED BY**	**APPROVED BY** / **APPROVAL SEAL**

	MANUFACTURE'S NAME & ADDRESS	MANUFACTURING QUALITY PLAN		PROJECT : CUSTOMER : END USER :
		PACKAGE : ITEM : LT SWITCHGEAR PANELS (DRAW OUT TYPE AND FIXED TYPE)	QAP NO : REV. : DATE : PAGE :	

SR. NO	COMPONENT & OPERATION	CHARACTERISTICS	CLASSIFICATION	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY 10				REMARKS
1	2	3	4	5	M	C/N	7	8	9	D*	M**	C	N	11
		ii) Paint Shade, Thickness & Adhesion	Major	Process	1 sample per lot	-	Approved Drg. / Annexure-II	Approved Drg. / Annexure-II	QC Records		P	-	-	Cross Hatch method using Adhesive tape
3.3	Panel Assembly	i) Panel shell assembly, Top & back cover assembly, Panel door assembly, hinge fitting & door knob fitting etc.	Major	Process	100%	-	Mfr Internal Drgs made to meet Appd. GA Drgs.	Mfr Internal Drgs made to meet Appd. GA Drgs.	QC Records		P	-	-	
		ii) Size of busbar & busbar finish	Major	Process	100%	-	-do-	-do-	QC Records		P	-	-	
		iii) Colour coding of busbar	Major	Visual	100%	-	-do-	-do-	QC Records		P	-	-	
		iv) Insulator type & mounting	Major	Process	100%	-	-do-	-do-	QC Records		P	-	-	
		v) Busbar support distance & tightness of bolts for Main bus bars and bus bar joints	Major	Process	100%	-	Manufacturer's Standard	Manufacturer's Standard	QC Records		P	-	-	
		vi) Main , Control & Auxiliary Busbar Clearances	Major	Process	100%	-	Mfr Internal Drgs made to meet Appd. GA Drgs.	Mfr Internal Drgs made to meet Appd. GA Drgs.	QC Records		P	-	-	
		vii) CT / PT mounting arrangement & tightness	Major	Process	100%	-	-do-	-do-	QC Records		P	-	-	

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	MANUFACTURE'S NAME & ADDRESS	MANUFACTURING QUALITY PLAN		PROJECT : CUSTOMER : END USER :
		PACKAGE : ITEM : LT SWITCHGEAR PANELS (DRAW OUT TYPE AND FIXED TYPE)	QAP NO : REV. : DATE : PAGE :	

SR. NO	COMPONENT & OPERATION	CHARACTERISTICS	CLASSIFICATION	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY 10				REMARKS
1	2	3	4	5	M	C/N	7	8	9	D*	M**	C	N	11
		viii) Termination for power & control circuits	Major	Process	100%	-	-do-	-do-	QC Records		P	-	-	
		ix) Lug size & crimping quality	Major	Process	100%	-	-do-	-do-	QC Records		P	-	-	
		x) Earthing busbar size & continuity; earth-ing of panel & doors	Major	Process	100%	-	-do-	-do-	QC Records		P	-	-	
		xi) Breaker safety shutter operation	Major	Process	100%	-	-do-	-do-	QC Records		P	-	-	
		xii)Spring loaded power and control contact alignment	Major	Process	100%	-	-do-	-do-	QC Records		P	-	-	
		xiii) Tin/Silver plating/ bimetallic strip between Cu. & Al. joint	Major	Process	100%	-	-do-	-do-	QC Records		P	-	-	
3.4	Module assembly	i) Component identification	Major	Process	100%	-	-do-	-do-	QC Records		P	-	-	
		ii) Component layout, mounting & dimensions	Major	Process	100%	-	-do-	-do-	QC Records		P	-	-	
		iii) Incoming & outgoing power & control contacts assembly & alignment	Major	Process	100%	-	-do-	-do-	QC Records		P	-	-	

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				PACKAGE : ITEM : LT SWITCHGEAR PANELS (DRAW OUT TYPE AND FIXED TYPE)			QAP NO : REV. : DATE : PAGE :							
SR. NO	COMPONENT & OPERATION	CHARACTERISTICS	CLASSIFICATION	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY 10				REMARKS
1	2	3	4	5	M	C/N	7	8	9	D*	M**	C	N	11
		iv) Power circuit wire / strip termination & clearances	Major	Process	100%	-	Mfr Internal Drgs made to meet Appd. GA Drgs.	Mfr Internal Drgs made to meet Appd. GA Drgs.	QC Records		P	-	-	
		v) Bus bar joints	Major	Process	100%	-	-do-	-do-	QC Records		P	-	-	
		vi) Functional Checks	Major	Process	100%	-	-do-	-do-	QC Records		P	-	-	
3.5	Control Wiring	i) Wire Size & lug size. Color of wire	Minor	Visual	100%	-	As Per apprd. Wiring diagram	As Per apprd. Wiring diagram	QC Records		P	-	-	
		ii) Proper wire Clamping & Ferruling	Minor	Visual	100%	-	Mfr std	Mfr std	QC Records		P	-	-	
		iii) Continuity as per wiring drg.	Critical	Test	Sample	-	As Per Apprd. Drg.	As Per Apprd. Drg.	QC Records		P	-	-	
		iv) Tightness of termination & crimping check	Major	Test	100%	-	Mfr std	Mfr std	QC Records		P	-	-	
4	**FINAL INSPECTION & TESTING**													
4.1	Visual & Dimension Check	i) Overall visual check for aesthetics, verticality of panels and alignment between two transport sections	Major	Visual	100%	10%	Approved GA Drgs	Approved GA Drgs	QC Records	✓	P	W	W	

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	MANUFACTURE'S NAME & ADDRESS	MANUFACTURING QUALITY PLAN		PROJECT : CUSTOMER : END USER :
		PACKAGE : ITEM : LT SWITCHGEAR PANELS (DRAW OUT TYPE AND FIXED TYPE)	QAP NO : REV. : DATE : PAGE :	

SR. NO	COMPONENT & OPERATION	CHARACTERISTICS	CLASSIFICATION	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY 10				REMARKS
1	2	3	4	5	M	C/N	7	8	9	D*	M**	C	N	11
		ii) Verification of overall dimensions Including sheet steel thickness	Major	Meas.	100%	1 sample of each type of panel / lot	Approved GA Drgs	Approved GA Drgs	QC Records	✓	P	W	W	
		iii) Bus duct interface, phase sequence, flange dimensions & clearances	Major	Visual	100%	100%	Approved GA Drgs	Approved GA Drgs	QC Records	✓	P	W	W	
		iv) Bus bar (Main – horizontal) – clearances, color coding, phase sequence identification for each Transport unit including sleeve insulation checking	Critical	Meas. & Visual	100%	10%	As Per Approved Drgs	As Per Approved Drgs	QC Records	✓	P	W	W	
		v) Verification of tightness of bus bar joints by torque wrench	Critical	Mech.	100%	10%	As Per Approved Drgs / Technical Specification	As Per Approved Drgs / Technical Specification	QC Records	✓	P	W	W	Torque marking on bolt head will be done.

	Suman Nakwal HARISH KUMAR	* Records, identified with "TICK"(✓) shall be included by contractor in documentation. **M: Manufacturer/Sub-Contractor, C: Contractor / Nominated Inspection Agency, N: End User . Indicated "P" PERFORM, "W" WITNESS & "V" VERIFICATION "W" Indicated in column N shall be "CHP" of NTPC. (FS – Factory Standard) **Note**: COC - Wherever mention shall be COC by Pyrotech.	FOR END USER	DOC NO : REV NO : CAT :
Manufacturer / Sub Supplier	Main Supplier			
SIGNATURE			REVIEWED BY	APPROVED BY / APPROVAL SEAL

	MANUFACTURE'S NAME & ADDRESS	MANUFACTURING QUALITY PLAN		PROJECT : CUSTOMER : END USER :
		PACKAGE : ITEM : LT SWITCHGEAR PANELS (DRAW OUT TYPE AND FIXED TYPE)	QAP NO : REV. : DATE : PAGE :	

SR. NO	COMPONENT & OPERATION	CHARACTERISTICS	CLASSIFICATION	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY 10				REMARKS
1	2	3	4	5	M	C/N	7	8	9	D*	M**	C	N	11
		vi) CT/PT fixing & mounting arrangement	Major	Visual	100%	10%	Mfr. Std.	Mfr. Std.	QC Records	✓	P	W	W	Clearance between CT and busbar to be ensured.
		vii) Check shrouding of accessible live parts, Cable supports and tool falling shroud in cable alley and application of PVC sleeves on bus bars.	Major	Visual	100%	10%	Technical Specification	Technical Specification	QC Records	✓	P	W	W	Form-4B as per IEC-61439
		viii) Verification of Components for make, type, rating & layout	Major	Visual	100%	10% of each type of module/lot	As per approved scheme drg/ Make List	As per approved scheme drg/ Make List	QC Records	✓	P	W	W	
		ix) Check control wiring / terminal arrangement & ferruling	Major	Visual	100%	Same as above	NTPC approved drg.	NTPC approved drg.	QC Records	✓	P	W	W	
		x) Safety Shutters operation check	Critical	Ele.	100%	Same as above	Technical Specification	Technical Specification	QC Records	✓	P	W	W	
		xi) Check door interlock & defeat interlock feature	Major	Ele.	100%	Same as above	Technical Specification	Technical Specification	QC Records	✓	P	W	W	

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Manufacturer / Sub Supplier	Main Supplier		
SIGNATURE			REVIEWED BY / APPROVED BY / APPROVAL SEAL

		MANUFACTURE'S NAME & ADDRESS		MANUFACTURING QUALITY PLAN					PROJECT : CUSTOMER : END USER :					
				PACKAGE : ITEM : LT SWITCHGEAR PANELS (DRAW OUT TYPE AND FIXED TYPE)			QAP NO : REV. : DATE : PAGE :							
SR. NO	COMPONENT & OPERATION	CHARACTERISTICS	CLASSIFICATION	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY 10				REMARKS
1	2	3	4	5	M	C/N	7	8	9	D*	M**	C	N	11
		xii) Mech operation test for ACB as per IS	Critical	Ele.	100%	Same as above	IS 13947/IEC 60947	IS 13947/IEC 60947	QC Records	✓	P	W	W	
		xiii) Breaker operation at service, test & isolate position	Critical	Ele.	100%	100 %	IS 13947/IEC 60947; As per app. Drg	IS 13947/IEC 60947; As per app. Drg	QC Records	✓	P	W	W	
		xiv) Power & control draw-out contacts alignment check	Major	Ele.	100%	10% of each type of module/ lot	Technical Specification	Technical Specification	QC Records	✓	P	W	W	
		xv)Check for Breaker Anti-pumping & trip free feature	Major	Ele.	100%	100 %	Technical Specification	Technical Specification	QC Records	✓	P	W	W	
		xvi) Earthing of ACB Cradle	Major	Visual	100%	100 %	Technical Specification	Technical Specification	QC Records	✓	P	W	W	
		xvii) Interlocks & operation check: elect. / mech open, close: under test , service & isolation position	Critical	Ele.	100%	10% of each type of module/ lot	As per Approved drgs.	As per Approved drgs.	QC Records	✓	P	W	W	

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Manufacturer / Sub Supplier	Main Supplier					
SIGNATURE				REVIEWED BY	APPROVED BY	APPROVAL SEAL

		MANUFACTURE'S NAME & ADDRESS		MANUFACTURING QUALITY PLAN										
				PACKAGE : ITEM : LT SWITCHGEAR PANELS (DRAW OUT TYPE AND FIXED TYPE)		QAP NO : REV. : DATE : PAGE :			PROJECT : CUSTOMER : END USER :					
SR. NO	COMPONENT & OPERATION	CHARACTERISTICS	CLASSIFICATION	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY 10				REMARKS
1	2	3	4	5	M	C/N	7	8	9	D*	M**	C	N	11
		xviii) interchangeability check for draw-out modules	Major	Mech.	100%	10%	Technical Specification	Technical Specification	QC Records	✓	P	W	W	
		xix) Earth bus dimensions, earthing of draw-out modules, door etc.	Major	Ele.	100%	10% of each type of module/lot	As per Approved drgs.	As per Approved drgs.	QC Records	✓	P	W	W	SEPARATE COPPER EARTH BUS FOR IMC
		xx) Check Paint shade, thickness, Adhesion & finish	Major	Visual/ Test	100% for shade & finish; 2-3 samples / lot for thickness & adhesion check	2-3 samples / board	As per approved drg. /Data Sheet	Approved drg./ Data Sheet	QC Records	✓	P	W	W	
		xxi) Bus-bar support arrangement, center to center distance between supports	Major	Mech.	100%	10%	As per Approved drgs.	As per Approved drgs.	QC Records	✓	P	W	W	
		xxii) Overlapping of Bus bar joints	Major	Mech.	100%	10%	As per Approved drgs.	As per Approved drgs.	QC Records	✓	P	W	W	

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Manufacturer / Sub Supplier	Main Supplier				
SIGNATURE				REVIEWED BY	APPROVED BY / APPROVAL SEAL

		MANUFACTURE'S NAME & ADDRESS		MANUFACTURING QUALITY PLAN					PROJECT : CUSTOMER : END USER :					
				PACKAGE : ITEM : LT SWITCHGEAR PANELS (DRAW OUT TYPE AND FIXED TYPE)			QAP NO : REV. : DATE : PAGE :							
SR. NO	COMPONENT & OPERATION	CHARACTERISTICS	CLASSIFICATION	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY 10				REMARKS
1	2	3	4	5	M	C/N	7	8	9	D*	M**	C	N	11
		xxiii) Draw in- draw out- draw- in of modules at random and check damages of contacts including module/breaker interchangeability check.		Visual	Random			No Damages		QC Records	P	W	W	
		xxiv) Degree of protection check, check profile & fixing of gaskets	Major	Visual	2 – 5 samples at gasketted joints/ board	2-5 samples at gasketted joints/ board	As per approved drgs / Technical Specification	No insertion possible from openings & gasketted joints	QC Records	✓	P	W	W	Paper insertion method for IP 5X compartments & 1 mm wire insertion method for IP 4X Compartments.
		xxv) Degree of Protection Check for IMC	Major	Visual	2 – 5 sample	2-5 sample	As per approved drgs / Technical Specification	As per approved drgs / Technical Specification	QC Records	✓	P	W	W	
		xxvi) Functional test on each type of draw out module	Major	Ele.	100%	10% of each type of module	As per Approved drgs.	As per Approved drgs.	QC Records	✓	P	W	W	
		xxvii) Close door operation check	Major	Mech.	100%	10% of each type of module	As per Approved drgs.	As per Approved drgs.	QC Records	✓	P	W	W	

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		MANUFACTURE'S NAME & ADDRESS		MANUFACTURING QUALITY PLAN PACKAGE : ITEM : LT SWITCHGEAR PANELS (DRAW OUT TYPE AND FIXED TYPE) QAP NO : REV. : DATE : PAGE :					PROJECT : CUSTOMER : END USER :					
SR. NO	COMPONENT & OPERATION	CHARACTERISTICS	CLASSIFICATION	TYPE OF CHECK	QUANTUM OF CHECK		REFERENCE DOCUMENT	ACCEPTANCE NORMS	FORMAT OF RECORD	AGENCY 10				REMARKS
1	2	3	4	5	M	C/N	7	8	9	D*	M**	C	N	11
		xxviii)Provision of symmetric guide	Major	Mech.	100%	10% of each type of module	As per Approved drgs/ As per Approved General Notes	As per Approved drgs/ As per Approved General Notes	QC Records	✓	P	W	W	For module size >300 mm will use 4 nos. guide rails
		xxix) Gap checking of busbar and module contact at test position	Major	Mech.	100%	10% of each type of module	As per Approved drgs/ As per Approved General Notes	As per Approved drgs/ As per Approved General Notes	QC Records	✓	P	W	W	
		xxx) Functional test on IMC Module with input/output checking	Major	Ele.	100%	10% of each type of module	As per Approved drgs.	As per Approved drgs.	QC Records	✓	P	W	W	
		xxxi) IR Test before & after the HV Test	Major	Ele.	100%	100%	IS-8623/IEC 61439	IS-8623/ IEC 61439	QC Records	✓	P	W	W	
		xxxii) HV test on Power circuit.	Critical	Ele.	100%	100%	IS-8623/ IEC 61439	IS-8623/ IEC 61439	QC Records	✓	P	W	W	
		xxxiii) Prototype Panel with offered panel	Critical	Visual	100%	100%	Technical Specifications, Approved Design & Data Sheet	Technical Specifications, Approved Design & Data Sheet	QC Records	✓	P	W	W	To be retained with proper identification If required as per contract
5	Packing	i) Soundness of packing, Loading etc.	Major	Verification	100%	100%	Packing shall be as per Annexure-III	Packing shall be as per Annexure-III			P	V	-	

NOTE: Prototype Inspection shall be offered for joint inspection with PE-Electrical, CQA & RIO before start of manufacturing of LT Switchgear.

	Suman Nakwal HARISH KUMAR	* Records, identified with "TICK"(✓) shall be included by contractor in documentation. **M: Manufacturer/Sub-Contractor, C: Contractor / Nominated Inspection Agency, N: End User . Indicated "P" PERFORM, "W" WITNESS & "V" VERIFICATION "W" Indicated in column N shall be "CHP" of NTPC. (FS – Factory Standard) **Note**: COC - Wherever mention shall be COC by Pyrotech.	FOR END USER	DOC NO : REV NO : CAT :
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SUB VENDOR LIST

S. No.	Item Description	Proposed Vendors
1	MOULDED CASE CIRCUIT BREAKER (MCCB)	
2	MOTOR PROTECTION CIRCUIT BREAKER (MPCB)	
3	MINIATURE CIRCUIT BREAKER (MCB)	
4	AC POWER CONTACTOR	
5	AC AUXILIARY CONTACTOR	
6	DC POWER CONTACTOR	
7	DC AUXILIARY CONTACTOR	
8	INTELLIGENT MOTOR CONTROLLER	
9	AMMETER (ANALOG)	
10	AMMETER (DIGITAL)	
11	VOLTMETER (ANALOG)	
12	VOLTMETER (DIGITAL)	
13	ENERGY METER (ANALOG)	
14	ENERGY METER (DIGITAL)	
15	MULTIFUNCTION METER (MFM)	
16	TRANSDUCER	
17	ELECTRONIC MOTOR PROTECTION RELAY (EMPR)	
18	AUXILIARY RELAY	
19	INTERPOSING/COUPLING RELAY	
20	TIMER/TIME DELAY RELAY	
21	INDICATION LAMP	
22	INDUSTRIAL SOCKET	
23	CONTROL SWITCHES/ SELECTOR SWITCH	
24	DC SWITCH	
25	DIODES	
26	PUSH BUTTON	
27	CABLE GLANDS	
28	CABLE LUGS	
29	TERMINAL BLOCK (FIXED/DRAWOUT)	
30	LT SWITCH GEAR (FIXED/DRAWOUT) PANELS	
31	DATA CONCENTRATOR	
32	ETHERNET SWITCHES	
33	Y-LINK	
34	DP CABLE	
35	OPTICAL FIBRE CABLE	
36	THERMAL OVERLOAD RELAY	
Note:	Bidder may include items alongwith subvendors that are not listed above.	
	Make of all the equipment/instrument under this specification shall be subjected to NTPC/BHEL approval in the event of order. NTPC/BHEL reserves the right to accept/reject any make or sub-vendor and to add new sub-vendors for the project after award of contract. Approval, rejection or addition of makes shall not have any price implication to BHEL after award of contract.	

NTPC APPROVED SUB-VENDOR LIST

12.1	Numerical Relays	CAT I								
					SEL	Pullman, USA	A			
					GE T&D	Stafford, UK	A		P14X, P34X, P44X, P64X, P74X models	
					GE T&D	Chennai	A		P14X, P24X, P34X, P44X, P64X, P74X models	
					ABB	Finland	A			
					ABB	Baroda	A		For 6XX Series	
					GE Multilin	Zamudio, Vizcaya, Spain/ Markham, Ontario, Canada	A		F-650 only	
					Schneider	Stone- UK , Vassa- Finland	A		PX30, PX40, VAMP 5X and VAMP 2XX models	
					Siemens	Germany	A		7SX Series only	
					Siemens	Goa	A			
12.2	LV Air Circuit Breaker	CAT II								
					C&S Electric	Noida	A			
					L&T	Mumbai	A			
					GE	Bangalore	A			
					Siemens	Germany	A			
					Schneider	France	A			
12.3	LT CT/PT/CBCT/ Control Transformer	CAT III								
					Kappa	Bangalore	A			
					Southern Electric	Chennai	A			
					Precise	Mumbai	A			
					G&M	Baroda	A		CBCT Only	
					Silkaans	Mumbai	A			
					Ind Coil	Mumbai	A			
					Pragati	Thane	A			
					Prayog	Pune	A			
					AE	Mumbai	A			
					Logicstat	Delhi	A		For control transformer only	
					C&S Electric	Noida	A		For CT only	
					Newtek	Aurangabad	A		For CT/PT/Control transformer	

Note:

Make of all the equipment/instrument under this specification shall be subjected to NTPC/BHEL approval in the event of order. The bidder may propose name of additional sub-vendors make, which will be subject to NTPC/BHEL approval. NTPC/BHEL reserves the right to accept/reject any make or sub-vendor and to add new sub-vendors for the project after award of contract. Approval, rejection or addition of makes shall not have any price implication to the Purchaser after award of contract.

PAINTING REQUIREMNENT

Package	Condition	Surface Preparation	Primer Coat	No. of Coats	DFT (in Microns)	Intermediate Coat (in Microns)	No. of Coats	DFT (in Microns)	Final Coat	No. of Coats	DFT (in Microns)	Total DFT
LT SWITCHGEAR	Plain Area	As per Manufacturer Std.	As per Manufacturer Std.	As per Manufacturer Std.	As per Manufacturer Std.	As per Manufacturer Std.	As per Manufacturer Std.	As per Manufacturer Std.	As per Manufacturer Std.	As per Manufacturer Std.	50	100

Painting shade on exterior shall be RAL 9002 for complete panel except RAL 5012 for extreme ends and RAL 9002 for Mounting Plate & Trolley. Paint finish coat shall be minimum 50 microns (minimum total DFT shall be 100 microns). However, in case electrostatic process of painting is offered, minimum paint thickness of 50 microns shall be acceptable for finish coat.

GENERAL PAINTING SPECIFICATION
FOR
LOW VOLTAGE SWITCHGEAR

1. General Specification:

All 415V switchgears, MCC's, AC & DC distribution boards etc. shall be painted by powder coating process.

2. Pre-Treatment or Surface Preparation:

Minimum 7 tank process or better shall be used for pre-treatment or surface preparation of sheet steel used for enclosures. The sequence of pre-treatment process shall include but not be limited to the following steps:

TANK-1: DEGREASING

Sheet Metal Surface shall be cleaned of grease, oils, soils, lubricants, oxide films, Heat Treatment / welding Scales etc. by using ALKALINE DEGREASER at Room Temperature for a Duration of 30-40 Minutes

TANK-2: WATER RINSE-I

Sheet Metal Surface shall be rinsed with water

TANK-3: DERUSTING

Sheet Metal Surface shall be cleaned of Rust by using Mixed HYDROCHLORIC ACID at Room Temperature for a Duration of 20 Minutes.

TANK-4: WATER RINSE-II

Sheet Metal Surface shall be rinsed with water

TANK-5: SURFACE ACTIVATION

Sheet Metal Surface shall be activated for Zn & Mn phosphate Coating by using ACTIVATION CHEMICALS ACID at Room Temperature for a Duration of 20 Minutes.

TANK-6: PHOSPHATING

Sheet Metal Surface shall be smoothly & uniformly coated with Zn Phosphate by using ZINC PHOSPHATE SOLUTION at Room Temperature for a Duration of 5 - 20 Minutes

TANK-7: WATER RINSE-III

Sheet Metal Surface shall be rinsed with water

TANK-8: PASSIVATION

For Sealing Pores of Sheet Metal Surface for obtaining Maximum Corrosion Resistance over Phosphate Coating by DECXYLITE SOLUTION at Room Temperature for a Duration of 15 - 20 Minutes

3. **Powder Coating:**
The following steps shall be followed to complete the powder coating process -

- **OVEN DRYING**
Sheet Metal Parts shall be dried by HOT AIR at 150 Deg C Process, Duration-10-20 Minutes.

- **POWDER COATING**
Within 24 Hours of Oven Drying, Sheet Metal parts shall be coated with Powder of shade desired by client through Spraying in Spray Booths, and then Epoxy-Powder Coated/Sprayed Sheet Metal parts are BAKED in an electrically fired oven at 140-150 Deg C for 10-15 Minutes.

4. **Paint Thickness:**
To be followed as per Customer Specifications or Project-wise Technical Specification documents.

5. **Paint Shade:**
To be followed as per Customer Specifications or Project-wise Technical Specification documents.

6. **Testing and Verification of Painting Process:**
To be followed as per Customer Approved or Project-wise approved Quality Plan.

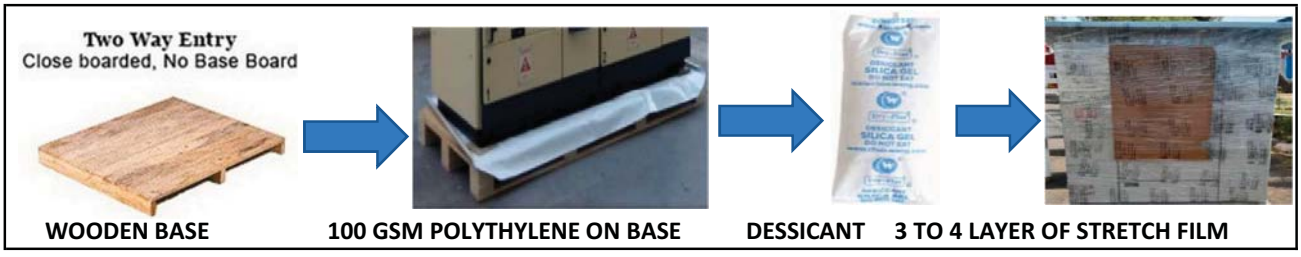
Routine tests:
a. Test for Paint shade with reference to shade card
b. Paint thickness measurement
c. Adhesion test

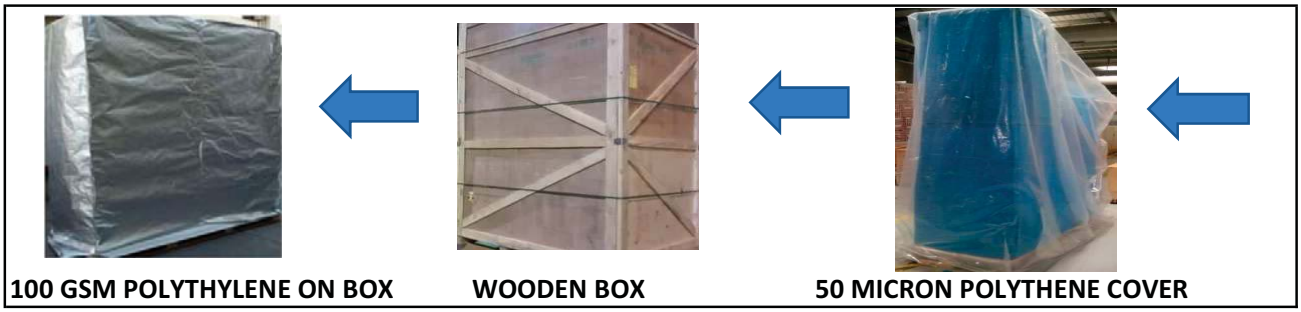
Special Tests:
If any special tests are specified, the same shall be carried out as per approved Quality Plan

PACKING REQUIREMENT

Sl.no	DESCRIPTION
1	TYPE OF PACKING :
1.1	Each switchboard/Item must be thoroughly cleaned inside and outside before packing. Remove all foreign particles, dust, oil, grease, and weld spatter. Ensure no extra hardware or tools remain inside the panel.
1.2	Item shall be fully covered with 3 to 4 layer of stretch film sheet (at least 25 micron) and shall be packed inside wooden box, fixed on wooden base depending upon the size.
1.3	Item shall be fixed on wooden base only & height of the bottom support/ wooden base shall be 18cm minimum. 100GSM (Colourless) Multi Layered Cross Laminated Polyethylene to be placed on the bottom of panels. As mentioned above 3 to 4 layer of stretch film with protective cushon on critical component with minimum 30% overlap shall be done. After which panel shall be covered with minimum 50 micron polythene.
1.4	All Items shall be firmly fixed to the bottom of the packing box i.e. wooden base with the help of supports/blocks to arrest the movement from all sides. All opening shall be protected with polyethylene blind end caps.
1.5	Ply Wood Case/Box shall be used to pack the panels after fixing of supports on the wooden base. Plywood must be of appropriate thickness used for making packing box. Construction of plywood box must give strength, stability, and durability during transportation & unloading of material to site.
1.6	Finally 100GSM (Colourless) Multi Layered Cross Laminated Polyethylene are used to make covers to the Wooden box individually. The cross lamination shall have qualities of extra toughness, together with flexibility and lightness coupled with good weather resistance to ultra violet rays. It is preferable to have a single piece of the above Multi-layered cross laminated polyethylene sheet fixed on the four sides. In case jointing is unavoidable, it should be done by overlapping of approximately 100mm.
1.7	Loose items/Spares/ accessories shall be separately packed with strectch film & then polyethylene sheet of at least 100 GSM inside the packing box.
1.8	Planks for Wooden Box support
a	Horizontal, vertical, diagonal planks shall be given for binding of Wooden Box.
b	Thickness of planks for Front, rear, top and bottom sides and binding, jointing battens shall be 25/20mm +2/-3 mm.
c	Suitable Width of binding planks & Suitable distance between any 2 binding planks shall be provided.
d	Diagonal planks shall be used in between vertical binding planks when distance between inner to inner of vertical planks is more than 750mm.
e	Diagonal planks are not required for top planks and width side, if the width of pallet is less than 750mm.
f	Single length planks shall be used for cubicles whose overall length is less than 2400mm.

2	QUALITY OF WOODS:
2.1	Wood used for packing box shall be Pinewood, Rubber wood, Mango wood, Fir wood, Silver Oak wood or other as per availability with moisture content not exceeding 30%.
3	CUSHONING MATERIAL & MOISTURE ABSORBER :
3.1	Suitable cushioning shall be provided by rubberized coir/ thermocol / expanded soft polyethylene foam. Provide extra potections on cores, edges or critical components i.e. HMI, Numerical Relay etc.
3.2	Adequate quantity of packed silica gel, VCI Powder/Tablets, packed in thin muslin cloth cotton bags shall be suitably placed inside the packing box.
4	NAILS
4.1	Adequate diameter and length of nails shall be provided.
5	HOOP IRON STRIPS
5.1	These are used for strapping the boxes. The material shall be free from rust. If sufficient nailing is done for bigger boxes thickness, strapping need not be done. Clips shall be used for strapping the hoop iron strips on the boxes.
6	BRACKETS
6.1	These brackets are used for nailing to the corners of cubicle boxes. The brackets shall be of mild steel of suitable. The brackets shall be of “L" shape. Two holes shall be provided towards the end of each side for screwing /nailing.
7	FASTENERS
7.1	Bolts, double nuts, spring washers will have to be used to hold the job that there shall be no jerk.
8	PACKING SLIP & HOLDER :
8.1	Packing slip kept in polyethylene bag shall be placed inside the wooden box at appropriate place.
8.2	One copy of packing slip wrapped in polyethylene bag covered in galvanized iron tin sheet/ aluminium packing slip holder shall be fixed on the external surface the packing box.
9	Refer below illustration for typical packing stages. Images are shown for representation only and it is manufacturer responsibility to ensure proper packing.





DOCUMENTATION REQUIREMENT

a)	DRAWINGS & DOCUMENTS TO BE SUBMITTED ALONG WITH THE BID
Sl. No.	DOCUMENT
1	PQR Credentials
2	Compliance Sheet
3	Un-priced Schedule alongwith Annexure-A, B, C, D, E, F, G & H duly stamped and signed by the bidder.
4	Sub QR Data
5	Complete dimensions of all the boards including no of panels (PCC as well as MCC panels)
6	Dimensions of each type of panel
7	Module size of each type of feeder

b) DRAWINGS & DOCUMENTS TO BE SUBMITTED BY SUCCESSFUL BIDDER AFTER AWARD OF CONTRACT ALONG WITH SUBMISSION SCHEDULE

Sl. No.	*BHEL Drawing No.*	*Drawing Title*	*Vendor Sub (Days)**	*Vendor Sub (Days)#*	*Remarks*
Primary Documents					
1	PE-V0-512-506-E101	COMPONENT SELECTION CHART & GENERAL NOTES AND LEGENDS	35	7	Refer Remark-1
2	PE-V0-512-506-E102	DATA SHEETS FOR LT SWITCHGEAR	35	7	Refer Remark-1
3	PE-V0-512-506-E103	BUSBAR SIZING CALCULATION FOR LT SWITCHGEAR	35	7	Refer Remark-1
4	PE-V0-512-506-E104	TYPE-2 COORDINATION CHART	35	7	Refer Remark-1
5	PE-V0-512-506-E105	MODULE SIZE SELECTION CHART	35	7	Refer Remark-1
6	PE-V0-512-506-E902	MQP FOR LT SWITCHGEAR PANEL ALONGWITH MAKE OF COMPONENTS & EQUIPMENTS AND FAT PROCEDURE OF NUMERICAL RELAYS	35	7	Refer Remark-1
7	PE-V0-512-506-E2XX	CONTROL SCHEMES	35	7	Refer Remark-1
8	PE-V0-512-506-E3XX	GA & SLD FOR LV SWITCHBOARDS	10	5	Refer Remark-2a & 2b
Secondary Documents					
1	PE-V0-512-506-E5XX	BILL OF MATERIAL FOR MODULE's	10	5	After Approval of Scheme
2	PE-V0-512-506-E106	TYPE TEST REPORT FOR - LT SWITCHGEAR	35	7	
3	PE-V0-512-506-E107	TOOLS & TACKLES FOR LT SWITCHGEAR	35	7	
4	PE-V0-512-506-E108	E&C SPARE FOR LT SWITCHGEAR	35	7	
5	PE-V0-512-506-E109	MANDATORY SPARE FOR LT SWITCHGEAR	35	7	

DOCUMENTATION REQUIREMENT

Remark-1:
Documents for which inputs are not required from BHEL shall be given by vendor (Schemes, General Notes, Datasheet, QP, Type Test Report, Type-2 coordination Chart etc.) as stipulated in specification.

Remark-2:

a) GA & SLD for LT Swithchboards to be submitted within 10 days from release of Load Data for respective board.
b) Every LT switchboard to be considered independently for drawing submission/re-submission & additional 1 day to be added in submission/re-submission days for each additional switchboard in case load data of more than 1 switchboard has been given on same day.
c) LT Switchboards shall be cleared for manufacturing in various Lots. Every Lot shall be cleared after approval of related drawings/ documents including QP.
d) Lot shall be released along with Cat-1 approved drawings/ documents applicable for the lot. Delivery time of the lot shall be 120 days from date of release of lot or date of issue of applicable Cat-1 approved drawings/ documents whichever is later. Delay by vendor in submission/re-submission of applicable drawing/documents shall be reduced from the given delivery period of respective Lot. However, delay in submission/re-submission of common drawing/documents shall not be considered for reduction of delivery period of subsequent lots.
e) In one lot, maximum 10 nos. LT Switchboards shall be cleared for manufacturing.
f) There shall be minimum 10 days gap between two consecutive lots.
g) PO validity shall be as per NIT.

NOTES:
a) * 1st submission within indicated days from date of purchase order.
b) # Re-submission (within indicated days) after incorporating all BHEL comments.
c) Primary documents shall be considered for Delay analysis.
d) Refer Annexure-7 (part of Documentation Requirement) for Tentative documents list to be submitted by Bidder. Final list shall be decided after ordering.

c)	DRAWINGS & DOCUMENTS TO BE SUBMITTED AS FINAL/AS-BUILT DOCUMENT
Sl. No.	DOCUMENT
1	Approved Documents. All final drawings shall be submitted in both PDF and Autocad (.dwg 2016 or lower version) format. Final SLD FOR LV SWITCHBOARDS to be submitted in Excel format incorporating module Nos.
2	O&M Manual
3	All Test Certificates

ANNEXURE-7

DOCUMENTS TO BE SUBMITTED

S.No.	NTPC Drawing No.	BHEL Drawing No.	Drawing Title	Remarks
1	-	PE-V0-512-506-E101	COMPONENT SELECTION CHART & GENERAL NOTES AND LEGENDS	
2	-	PE-V0-512-506-E102	DATA SHEETS FOR LT SWITCHGEAR	
3	-	PE-V0-512-506-E103	BUSBAR SIZING CALCULATION FOR LT SWITCHGEAR	
4	-	PE-V0-512-506-E104	TYPE-2 COORDINATION CHART	
5	-	PE-V0-512-506-E105	MODULE SIZE SELECTION CHART	
6	-	PE-V0-512-506-E106	TYPE TEST REPORT FOR - LT SWITCHGEAR	
7	-	PE-V0-512-506-E107	TOOLS & TACKLES FOR LT SWITCHGEAR	
8	-	PE-V0-512-506-E108	E&C SPARE FOR LT SWITCHGEAR	
9	-	PE-V0-512-506-E109	MANDATORY SPARE FOR LT SWITCHGEAR	
10	-	PE-V0-512-506-E110	TYPE TEST REPORT OF ETHERNET SWITCHES	
11	-	PE-V0-512-506-E111	CROSS SECTIONAL DRWG OF PROTOTYPE PANELS	
12	-	PE-V0-512-506-E112	DATA SHEET FOR DATA CABLE, FO CABLE	
13	-	PE-V0-512-506-E113	OVERALL SYSTEM ARCHITECTURE FOR LT SWITCHGEAR NETWORK	
14	-	PE-V0-512-506-E114	DATA LIST	
15	-	PE-V0-512-506-E115	FUNCTIONAL DESIGN SPECIFICATION	
16	-	PE-V0-512-506-E201	CONTROL SCHEME FOR 2 INCOMER +1 BUS COUPLER (2 DAET+1 DAE)	
17	-	PE-V0-512-506-E202	CONTROL SCHEME FOR 2 INCOMER (2 DAET)	
18	-	PE-V0-512-506-E203	CONTROL SCHEME FOR 2 INCOMER +1 BUS COUPLER (2 DAE+1 DAE)	
19	-	PE-V0-512-506-E204	CONTROL SCHEME FOR EMERGENCY SWITCH BOARD (2 DG IC+2 TIE IC+1 BC)	
20	-	PE-V0-512-506-E205	CONTROL SCHEME FOR PCC OUTGOING BREAKER FEEDER TYPE DAE	
21	-	PE-V0-512-506-E206	CONTROL SCHEME FOR OUTGOING TIE (DAE) FROM TURBINE PMCC TO UES	
22	-	PE-V0-512-506-E207	CONTROL SCHEME FOR ACB CONTROLLED MOTOR FEEDER (90KW & ABOVE) - TYPE DM	
23	-	PE-V0-512-506-E208	CONTROL SCHEME FOR BUS PT MODULE FOR PCC/PMCC (MODULE - G1)	
24	-	PE-V0-512-506-E209	CONTROL SCHEME FOR BUS PT MODULE FOR DG SWGR (MODULE - G2)	
25	-	PE-V0-512-506-E210	CONTROL SCHEME FOR METERING MODULE FOR MCC (MODULE - VM) DO/FIXED	
26	-	PE-V0-512-506-E211	CONTROL SCHEME FOR CONTROL TRAFSORMER MODULE TYPE CS	
27	-	PE-V0-512-506-E212	CONTROL SCHEME FOR 220V DCDB I/C & B/C (TYPE DC + DB + CH + HD)	
28	-	PE-V0-512-506-E213	CONTROL SCHEME FOR 48V DCDB I/C & B/C (TYPE DC + DB + CH + HD)	
29	-	PE-V0-512-506-E214	CONTROL SCHEME FOR DC METERING & PROTECTION MODULE TYPE S	
30	-	PE-V0-512-506-E215	220V/ 48V DC OUTGOING FEEDER TYPE X	
31	-	PE-V0-512-506-E216	CONTROL SCHEME FOR CONTACTOR CHANGEOVER BETWEEN TWO INCOMER MODULE TYPE CC (DO/FIXED)	
32	-	PE-V0-512-506-E217	CONTROL SCHEME FOR INCOMING MCCB (DO+FIXED) (MCCB) E3(I/C)	
33	-	PE-V0-512-506-E218	CONTROL SCHEME FOR BUSCOUPLER MODULE TYPE MCCB (DRAWOUT/FIXED) E3 (B/C)	
34	-	PE-V0-512-506-E219	CONTROL SCHEME FOR 3 PHASE NEUTRAL MCCB OUTGOING FEEDER (DRAWOUT/FIXED) E3 (O/G)	
35		PE-V0-512-506-E220	CONTROL SCHEME FOR 3 PHASE MCCB OUTGOING FEEDER (DRAWOUT/FIXED) E3-TP (O/G)	
36	-	PE-V0-512-506-E221	CONTROL SCHEME FOR 2 PHASE MCCB OUTGOING FEEDER TYPE E2 (DRAWOUT/FIXED)	
37	-	PE-V0-512-506-E222	CONTROL SCHEME FOR 1 PHASE MCCB OUTGOING FEEDER TYPE E1 (DRAWOUT/FIXED)	
38	-	PE-V0-512-506-E223	CONTROL SCHEME FOR TPN AC OUTGOING FOR SOLAR, MCCB OPERATED FEEDER FOR RATING UP TO 400A ES3	

ANNEXURE-7

DOCUMENTS TO BE SUBMITTED

S.No.	NTPC Drawing No.	BHEL Drawing No.	Drawing Title	Remarks
39	-	PE-V0-512-506-E224	CONTROL SCHEME FOR MOTORS TYPE DK2 (BELOW 30KW)	
40	-	PE-V0-512-506-E225	CONTROL SCHEME FOR MOTORS TYPE DK21 (30KW & BELOW 90KW)	
41	-	PE-V0-512-506-E226	CONTROL SCHEME FOR RE-ACCELARATION MOTORS MODULE TYPE DK2E (UPTO 30KW)	
42	-	PE-V0-512-506-E227	CONTROL SCHEME FOR RE-ACCELARATION MOTORS MODULE TYPE DK21E (ABOVE 30KW & BELOW 90KW)	
43	-	PE-V0-512-506-E228	CONTROL SCHEME FOR MOTORS TYPE K2 (UPTO 30KW)	
44	-	PE-V0-512-506-E229	CONTROL SCHEME FOR MOTORS TYPE K21 (ABOVE 30KW & BELOW 90KW)	
45	-	PE-V0-512-506-E230	CONTROL SCHEME FOR MOTORS TYPE K3 (UPTO 30KW)	
46	-	PE-V0-512-506-E231	CONTROL SCHEME FOR MOTORS TYPE K31 (ABOVE 30KW & BELOW 90KW)	
47	-	PE-V0-512-506-E232	CONTROL SCHEME FOR REVERSIBLE MOTOR TYPE DN1 (BELOW 30KW)	
48	-	PE-V0-512-506-E233	CONTROL SCHEME FOR REVERSIBLE MOTOR TYPE DN11 (30KW AND ABOVE)	
49	-	PE-V0-512-506-E234	CONTROL SCHEME FOR HEATERS TYPE EA3 (BELOW 30KW)	
50	-	PE-V0-512-506-E235	CONTROL SCHEME FOR HEATERS TYPE EA1	
51	-	PE-V0-512-506-E236	CONTROL SCHEME FOR SPACE HEATER SUPPLY SHS	
52	-	PE-V0-512-506-E237	CONTROL SCHEME FOR PANEL SPACE HEATER AND PLUGS & SOCKETS PNL SP HTR	
53	-	PE-V0-512-506-E238	CONTROL SCHEME FOR RAPPING MOTOR (RM)	
54	-	PE-V0-512-506-E239	CONTROL SCHEME FOR DUST DENSITY MONITOR (DDM)	
55	-	PE-V0-512-506-E240	CONTROL SCHEME FOR HOPPER HEATER (HH)	
56	-	PE-V0-512-506-E241	CONTROL SCHEME FOR SHAFT INSULATOR HEATER (HS)	
57	-	PE-V0-512-506-E242	CONTROL SCHEME FOR SUPPORT INSULATOR HEATER (HI)	
58	-	PE-V0-512-506-E243	CONTROL SCHEME FOR ASH LEVEL INDICATOR HIGH (ALI(H))	
59	-	PE-V0-512-506-E244	CONTROL SCHEME FOR ASH LEVEL INDICATOR LOW (ALI(L))	
60	-	PE-V0-512-506-E245	CONTROL SCHEME FOR ARECA MARSHALING MODULE (ARECA)	
61	-	PE-V0-512-506-E246	CONTROL SCHEME FOR WAVE LEVEL TRANSMITTER (WLT)	
62	-	PE-V0-512-506-E247	CONTROL SCHEME FOR MARSHALING MODULE (MM)	
63	-	PE-V0-512-506-E248	CONTROL SCHEME FOR WALL BLOWER	
64	-	PE-V0-512-506-E249	CONTROL SCHEME FOR LR BLOWER	
65	-	PE-V0-512-506-E250	CONTROL SCHEME FOR AH BLOWER	
66		PE-V0-512-506-E251	CONTROL SCHEME FOR ALARM MODULE	
67		PE-V0-512-506-E252	CONTROL SCHEME FOR TP MCCB CONTACTOR CONTROLLED FEEDER WITHOUT IMC (CONTROLLED FROM DDCMIS) ET3	
68	-	PE-V0-512-506-E301	GA & SLD DRAWING FOR U#8 EMERGENCY MCC	
69	-	PE-V0-512-506-E302	GA & SLD DRAWING FOR U#8 220V MAIN DCDB	
70	-	PE-V0-512-506-E303	GA & SLD DRAWING FOR U#8 BOILER SERVICE PMCC	
71	-	PE-V0-512-506-E304	GA & SLD DRAWING FOR U#8 BOILER VALVE & DAMPER ACDB	
72	-	PE-V0-512-506-E305	GA & SLD DRAWING FOR U#8 BOILER ACDB	
73	-	PE-V0-512-506-E306	GA & SLD DRAWING FOR U#8 SOOT BLOWER	
74	-	PE-V0-512-506-E307	GA & SLD DRAWING FOR U#8 TURBINE SERVICE PMCC	
75	-	PE-V0-512-506-E308	GA & SLD DRAWING FOR U#8 UNIT SERVICE ACDB	
76	-	PE-V0-512-506-E309	GA & SLD DRAWING FOR U#8 TURBINE VALVE DB	
77	-	PE-V0-512-506-E310	GA & SLD DRAWING FOR U#9 EMERGENCY MCC	
78	-	PE-V0-512-506-E311	GA & SLD DRAWING FOR U#9 220V MAIN DCDB	
79	-	PE-V0-512-506-E312	GA & SLD DRAWING FOR U#9 BOILER SERVICE PMCC	
80	-	PE-V0-512-506-E313	GA & SLD DRAWING FOR U#9 BOILER VALVE & DAMPER ACDB	

ANNEXURE-7

DOCUMENTS TO BE SUBMITTED

S.No.	NTPC Drawing No.	BHEL Drawing No.	Drawing Title	Remarks
81	-	PE-V0-512-506-E314	GA & SLD DRAWING FOR U#9 BOILER ACDB	
82	-	PE-V0-512-506-E315	GA & SLD DRAWING FOR U#9 SOOT BLOWER MCC	
83	-	PE-V0-512-506-E316	GA & SLD DRAWING FOR U#9 TURBINE SERVICE PMCC	
84	-	PE-V0-512-506-E317	GA & SLD DRAWING FOR U#9 UNIT SERVICE ACDB	
85	-	PE-V0-512-506-E318	GA & SLD DRAWING FOR U#9 TURBINE VALVE DB	
86	-	PE-V0-512-506-E319	GA & SLD DRAWING FOR U#8 & U#9 ESP PMCC's	
87	-	PE-V0-512-506-E320	GA & SLD DRAWING FOR U#8 ESP STANDBY PMCC-1	
88	-	PE-V0-512-506-E321	GA & SLD DRAWING FOR U#8 ESP STANDBY PMCC-2	
89	-	PE-V0-512-506-E322	GA & SLD DRAWING FOR U#9 ESP STANDBY PMCC-1	
90	-	PE-V0-512-506-E323	GA & SLD DRAWING FOR U#9 ESP STANDBY PMCC-2	
91	-	PE-V0-512-506-E324	GA & SLD DRAWING FOR U#8 ESP HVAC MCC	
92	-	PE-V0-512-506-E325	GA & SLD DRAWING FOR U#8 ESP & ID FAN AREA MCC	
93	-	PE-V0-512-506-E326	GA & SLD DRAWING FOR U#9 ESP HVAC MCC	
94	-	PE-V0-512-506-E327	GA & SLD DRAWING FOR U#9 ESP & ID FAN AREA MCC	
95	-	PE-V0-512-506-E328	GA & SLD DRAWING FOR U#8 STATION SERVICE PMCC	
96	-	PE-V0-512-506-E329	GA & SLD DRAWING FOR U#8 & 9 AIR CONDITIONING MCC	
97	-	PE-V0-512-506-E330	GA & SLD DRAWING FOR U#8 VENTILATION MCC	
98	-	PE-V0-512-506-E331	GA & SLD DRAWING FOR U#8 MISC. SERVICES MCC	
99	-	PE-V0-512-506-E332	GA & SLD DRAWING FOR U#8 AIR WASHER MCC	
100	-	PE-V0-512-506-E333	GA & SLD DRAWING FOR U#8 TRF AREA OUTDOOR SWGR	
101	-	PE-V0-512-506-E334	GA & SLD DRAWING FOR U#9 STATION SERVICE PMCC	
102	-	PE-V0-512-506-E335	GA & SLD DRAWING FOR U#9 VENTILATION MCC	
103	-	PE-V0-512-506-E336	GA & SLD DRAWING FOR U#9 MISC. SERVICES MCC	
104	-	PE-V0-512-506-E337	GA & SLD DRAWING FOR U#9 AIR WASHER MCC	
105	-	PE-V0-512-506-E338	GA & SLD DRAWING FOR U#9 TRF AREA OUTDOOR SWGR	
106	-	PE-V0-512-506-E339	GA & SLD DRAWING FOR DM/ CPU/ SERVICE PMCC	
107	-	PE-V0-512-506-E340	GA & SLD DRAWING FOR CPU MCC	
108	-	PE-V0-512-506-E341	GA & SLD DRAWING FOR SERVICE BUILDING MCC	
109	-	PE-V0-512-506-E342	GA & SLD DRAWING FOR WORKSHOP/ ETP PMCC	
110	-	PE-V0-512-506-E343	GA & SLD DRAWING FOR ETP MCC	
111	-	PE-V0-512-506-E344	GA & SLD DRAWING FOR RWPH/ AUX CT/ O&M STORE PMCC	
112	-	PE-V0-512-506-E345	GA & SLD DRAWING FOR AUX CT MCC	
113	-	PE-V0-512-506-E346	GA & SLD DRAWING FOR O&M STORE ACDB	
114	-	PE-V0-512-506-E347	GA & SLD DRAWING FOR SW/ CLW/ PTP PMCC	
115	-	PE-V0-512-506-E348	GA & SLD DRAWING FOR PTP MCC	
116	-	PE-V0-512-506-E349	GA & SLD DRAWING FOR 220V OFFSITE DCDB	
117	-	PE-V0-512-506-E350	GA & SLD DRAWING FOR FIRE WATER/CW/CLO2/CWTP PMCC	
118	-	PE-V0-512-506-E351	GA & SLD DRAWING FOR CSSP PMCC	
119	-	PE-V0-512-506-E352	GA & SLD DRAWING FOR FOPH PMCC	
120	-	PE-V0-512-506-E353	GA & SLD DRAWING FOR CHP PMCC-01	
121	-	PE-V0-512-506-E354	GA & SLD DRAWING FOR CHP PMCC-02	
122	-	PE-V0-512-506-E355	GA & SLD DRAWING FOR CHP PMCC-03	
123	-	PE-V0-512-506-E356	GA & SLD DRAWING FOR 220V CHP MCC-2 DCDB	
124	-	PE-V0-512-506-E357	GA & SLD DRAWING FOR 220V CHP MCC-3 DCDB	
125	-	PE-V0-512-506-E358	GA & SLD DRAWING FOR SWYD ACDB	

ANNEXURE-7

DOCUMENTS TO BE SUBMITTED

S.No.	NTPC Drawing No.	BHEL Drawing No.	Drawing Title	Remarks
126	-	PE-V0-512-506-E359	GA & SLD DRAWING FOR 220V SWYD DCDB	
127	-	PE-V0-512-506-E360	GA & SLD DRAWING FOR 48V SWYD DCDB	
128	-	PE-V0-512-506-E361	GA & SLD DRAWING FOR SWITCHYARD EMERGENCY POWER DB	
129	-	PE-V0-512-506-E362	GA & SLD DRAWING FOR SWITCHYARD AC MCC	
130	-	PE-V0-512-506-E363	GA & SLD DRAWING FOR SWITCHYARD VENTILATION MCC	
131	-	PE-V0-512-506-E364	GA & SLD DRAWING FOR SWITCHYARD OIL FILTRATION BOARD	
132	-	PE-V0-512-506-E501	BILL OF MATERIAL FOR MODULE DAET (I/C)	
133	-	PE-V0-512-506-E502	BILL OF MATERIAL FOR MODULE DAE (I/C)	
134	-	PE-V0-512-506-E503	BILL OF MATERIAL FOR MODULE DAET/DAE (B/C)	
135	-	PE-V0-512-506-E504	BILL OF MATERIAL FOR MODULE DG (I/C)	
136	-	PE-V0-512-506-E505	BILL OF MATERIAL FOR MODULE DAE(O/G)/DAE-TIE	
137	-	PE-V0-512-506-E506	BILL OF MATERIAL FOR MODULE DM/PM/AM	
138	-	PE-V0-512-506-E507	BILL OF MATERIAL FOR MODULE G1	
139	-	PE-V0-512-506-E512	BILL OF MATERIAL FOR MODULE G2	
140	-	PE-V0-512-506-E509	BILL OF MATERIAL FOR MODULE VM	
141	-	PE-V0-512-506-E510	BILL OF MATERIAL FOR MODULE CS	
142	-	PE-V0-512-506-E511	BILL OF MATERIAL FOR MODULE DB/DC/CH/HD	
143	-	PE-V0-512-506-E512	BILL OF MATERIAL FOR MODULE S	
144	-	PE-V0-512-506-E513	BILL OF MATERIAL FOR MODULE X	
145	-	PE-V0-512-506-E514	BILL OF MATERIAL FOR MODULE CC	
146	-	PE-V0-512-506-E515	BILL OF MATERIAL FOR MODULE E3 (I/C)	
147	-	PE-V0-512-506-E516	BILL OF MATERIAL FOR MODULE E3 (B/C)	
148	-	PE-V0-512-506-E517	BILL OF MATERIAL FOR MODULE E3 & E3-TP	
149	-	PE-V0-512-506-E518	BILL OF MATERIAL FOR MODULE E2	
150	-	PE-V0-512-506-E519	BILL OF MATERIAL FOR MODULE E1	
151	-	PE-V0-512-506-E520	BILL OF MATERIAL FOR MODULE ES3	
152	-	PE-V0-512-506-E521	BILL OF MATERIAL FOR MODULE DK2/PK2/AK2	
153	-	PE-V0-512-506-E522	BILL OF MATERIAL FOR MODULE DK21/PK21/ AK21	
154	-	PE-V0-512-506-E523	BILL OF MATERIAL FOR MODULE DK2E/PK2E/AK2E	
155	-	PE-V0-512-506-E524	BILL OF MATERIAL FOR MODULE DK21E/PK21E/ AK21E	
156	-	PE-V0-512-506-E525	BILL OF MATERIAL FOR MODULE K2	
157	-	PE-V0-512-506-E526	BILL OF MATERIAL FOR MODULE K21	
158	-	PE-V0-512-506-E527	BILL OF MATERIAL FOR MODULE K3	
159	-	PE-V0-512-506-E528	BILL OF MATERIAL FOR MODULE K31	
160	-	PE-V0-512-506-E529	BILL OF MATERIAL FOR MODULE DN1	
161		PE-V0-512-506-E530	BILL OF MATERIAL FOR MODULE DN11	
162	-	PE-V0-512-506-E531	BILL OF MATERIAL FOR MODULE EA3	
163	-	PE-V0-512-506-E532	BILL OF MATERIAL FOR MODULE EA1	
164	-	PE-V0-512-506-E533	BILL OF MATERIAL FOR MODULE SHS	
165	-	PE-V0-512-506-E534	BILL OF MATERIAL FOR MODULE PNL SP HTR	
166	-	PE-V0-512-506-E535	BILL OF MATERIAL FOR MODULE RM1	
167	-	PE-V0-512-506-E536	BILL OF MATERIAL FOR MODULE RM2	
168	-	PE-V0-512-506-E537	BILL OF MATERIAL FOR MODULE DDM	
169	-	PE-V0-512-506-E538	BILL OF MATERIAL FOR MODULE HH	
170	-	PE-V0-512-506-E539	BILL OF MATERIAL FOR MODULE HS	

ANNEXURE-7

DOCUMENTS TO BE SUBMITTED

S.No.	NTPC Drawing No.	BHEL Drawing No.	Drawing Title	Remarks
171	-	PE-V0-512-506-E540	BILL OF MATERIAL FOR MODULE HI	
172	-	PE-V0-512-506-E541	BILL OF MATERIAL FOR MODULE ALI (H)	
173	-	PE-V0-512-506-E542	BILL OF MATERIAL FOR MODULE ALI (L)	
174	-	PE-V0-512-506-E543	BILL OF MATERIAL FOR MODULE ARECA	
175	-	PE-V0-512-506-E544	BILL OF MATERIAL FOR MODULE WLT	
176	-	PE-V0-512-506-E545	BILL OF MATERIAL FOR MODULE MM	
177	-	PE-V0-512-506-E546	BILL OF MATERIAL FOR MODULE WB	
178	-	PE-V0-512-506-E547	BILL OF MATERIAL FOR MODULE LR	
179	-	PE-V0-512-506-E548	BILL OF MATERIAL FOR MODULE AH	
180	-	PE-V0-512-506-E549	BILL OF MATERIAL FOR MODULE WT1, WT2 & WT3	
181	-	PE-V0-512-506-E550	BILL OF MATERIAL FOR MODULE ALARM MODULE	
182	-	PE-V0-512-506-E551	BILL OF MATERIAL FOR MODULE ET3	
183	-	PE-V0-512-506-E902	MQP FOR LT SWITCHGEAR PANEL ALONGWITH MAKE OF COMPONENTS & EQUIPMENTS AND FAT PROCEDURE OF NUMERICAL RELAYS	

COMPLIANCE CERTIFICATE	
1	It is hereby confirm that the technical specification (sheet 1 to 182) has been read and we confirm compliance to the tender specification including any clarification and amendments without any deviation.
2	It is hereby declared that any technical submittals which was not specifically asked for in NIT shall stand withdrawn.

Signature of Authorized Representative

Name and Designation :

Name & Address of the Bidder

Date

UNPRICED SCHEDULE

BOQ-CUM-PRICE SCHEDULE FOR LT SWITCHGEAR

S.No.	ITEM NO.	ITEM NAME	UOM	TOTAL QTY.	RATING (A)	BOARD NO.	UNIT PRICE (Ex-WORKS) Rs.	TOTAL PRICE (Ex-WORKS) Rs.	NO. OF PCC / ACB PANEL	NO. OF MCC / ACDB / DCDB PANEL	BOARD NAME PLATE, DESCRIPTION & RATING
1	506-0110316-00-A	UNIT EMERGENCY SWBD-1	NOS.	1	3000	8DG					U#8 EMERGENCY MCC 8DG, 3000A
2	506-0110040-00-A	220V MAIN DCDB-1	NOS.	1	1600	8FA					U#8 220V MAIN DCDB 8FA, 1600A
3	506-0110382-00-A	Unit Boiler PMCC-1	NOS.	1	4000	8DA					U#8 BOILER SERVICE PMCC 8DA, 4000A
4	506-0110107-00-A	BOILER V&D ACDB-1	NOS.	1	250	8HA					U#8 BOILER VALVE & DAMPER ACDB 8HA, 250A
5	506-0110092-00-A	BOILER ACDB-1	NOS.	1	630	8HB					U#8 BOILER ACDB 8HB, 630A
6	506-0110419-00-A	SOOT BLOWER MCC-1	NOS.	1	63						U#8 SOOT BLOWER MCC, 63A
7	506-0110387-00-A	Unit Turbine PMCC-1	NOS.	1	4000	8DB					U#8 TURBINE SERVICE PMCC 8DB, 4000A
8	506-0110321-00-A	UNIT SERVICE ACDB-1	NOS.	1	630	8QA					U#8 UNIT SERVICE ACDB 8QA, 630A
9	506-0110300-00-A	TURBINE VALVE ACDB-1	NOS.	1	250	8KA					U#8 TURBINE VALVE DB 8KA, 250A
10	506-0110317-00-A	UNIT EMERGENCY SWBD-2	NOS.	1	3000	9DG					U#9 EMERGENCY MCC 9DG, 3000A
11	506-0110041-00-A	220V MAIN DCDB-2	NOS.	1	1600	9FA					U#9 220V MAIN DCDB 9FA, 1600A
12	506-0110383-00-A	Unit Boiler PMCC-2	NOS.	1	4000	9DA					U#9 BOILER SERVICE PMCC 9DA, 4000A
13	506-0110108-00-A	BOILER V&D ACDB-2	NOS.	1	250	9HA					U#9 BOILER VALVE & DAMPER ACDB 9HA, 250A
14	506-0110093-00-A	BOILER ACDB-2	NOS.	1	630	9HB					U#9 BOILER ACDB 9HB, 630A
15	506-0110420-00-A	SOOT BLOWER MCC-2	NOS.	1	63						U#9 SOOT BLOWER MCC, 63A
16	506-0110388-00-A	Unit Turbine PMCC-2	NOS.	1	4000	9DB					U#9 TURBINE SERVICE PMCC 9DB, 4000A
17	506-0110322-00-A	UNIT SERVICE ACDB-2	NOS.	1	630	9QA					U#9 UNIT SERVICE ACDB 9QA, 630A
18	506-0110301-00-A	TURBINE VALVE ACDB-2	NOS.	1	250	9KA					U#9 TURBINE VALVE DB 9KA, 250A
19	506-0110179-00-A	ESP SWBD	NOS.	12	3000	8DD, 8DE, 8DF, 8DC, 8DH, 8DJ, 9DD, 9DE, 9DF, 9DC, 9DH, 9DJ					U#8 & U#9 ESP PMCC's, 3000A
20	506-0110180-00-A	ESP SWBD-1	NOS.	1	4000	8DL					U#8 ESP STANDBY PMCC 8DL, 4000A
21	506-0110181-00-A	ESP SWBD-2	NOS.	1	4000	8DM					U#8 ESP STANDBY PMCC 8DM, 4000A
22	506-0110182-00-A	ESP SWBD-3	NOS.	1	4000	9DL					U#9 ESP STANDBY PMCC 9DL, 4000A
23	506-0110183-00-A	ESP SWBD-4	NOS.	1	4000	9DM					U#9 ESP STANDBY PMCC 9DM, 4000A
24	506-0110170-00-A	ESP A/C & VENT MCC-1	NOS.	1	630	8TB					U#8 ESP HVAC MCC 8TB, 630A
25	506-0110165-00-A	ESP & ID FAN AREA MCC-1	NOS.	1	400	8HD					U#8 ESP & ID FAN AREA MCC 8HD, 400A
26	506-0110171-00-A	ESP A/C & VENT MCC-2	NOS.	1	400	9TB					U#9 ESP HVAC MCC 9TB, 400A
27	506-0110166-00-A	ESP & ID FAN AREA MCC-2	NOS.	1	400	9HD					U#9 ESP & ID FAN AREA MCC 9HD, 400A
28	506-0110264-00-A	STATION SERVICE SWBD.-1	NOS.	1	4000	0DA					U#8 STATION SERVICE PMCC 0DA, 4000A
29	506-0110077-00-A	AIR CONDITIONING MCC	NOS.	1	1250	0TA					U#8 & 9 AIR CONDITIONING MCC 0TA, 1250A
30	506-0110331-00-A	VENTILATION MCC-1	NOS.	1	1000	8TA					U#8 VENTILATION MCC 8TA, 1000A
31	506-0110241-00-A	MISC. SERVICE MCC-1	NOS.	1	630	0QA					U#8 MISC. SERVICES MCC 0QA, 630A
32	506-0110079-00-A	AIR WASHER MCC-1	NOS.	1	800	0SA					U#8 AIR WASHER MCC 0SA, 800A
33	506-0110983-00-A	OUTDOOR SWGR # 1	NOS.	1	400						U#8 TRF AREA OUTDOOR SWGR, 400A
34	506-0110265-00-A	STATION SERVICE SWBD.-2	NOS.	1	4000	0DB					U#9 STATION SERVICE PMCC 0DB, 4000A
35	506-0110332-00-A	VENTILATION MCC-2	NOS.	1	1000	9TA					U#9 VENTILATION MCC 9TA, 1000A
36	506-0110242-00-A	MISC. SERVICE MCC-2	NOS.	1	630	0QB					U#9 MISC. SERVICES MCC 0QB, 630A
37	506-0110080-00-A	AIR WASHER MCC-2	NOS.	1	800	0SB					U#9 AIR WASHER MCC 0SB, 800A
38	506-0110984-00-A	OUTDOOR SWGR # 2	NOS.	1	400						U#9 TRF AREA OUTDOOR SWGR, 400A
39	506-0110162-00-A	DM PLANT SWBD.	NOS.	1	4000	0DE					DM/ CPU/ SERVICE PMCC 0DE, 4000A
40	506-0110142-00-A	CPU MCC	NOS.	1	630	0WA					CPU MCC 0WA, 630A
41	506-0110259-00-A	SERVICE BLDG. MCC	NOS.	1	1000	0WB					SERVICE BUILDING MCC 0WB, 1000A
42	506-0110339-00-A	WORKSHOP SWBD	NOS.	1	2500	0DF					WORKSHOP/ ETP ACDB 0DF, 2500A
43	506-0110184-00-A	ETP MCC	NOS.	1	400	0DI					ETP MCC 0DI, 400A
44	506-0110254-00-A	RAW WATER SWBD.	NOS.	1	3000	0DM					RWPH/ AUX CT/ O&M STORE PMCC 0DM, 3000A
45	506-0111020-00-A	AUX CT SWBD	NOS.	1	400	0DK					AUX CT MCC 0DK, 400A
46	506-0111019-00-A	O&M STORE SWBD	NOS.	1	400	0WE					O&M STORE ACDB 0WE, 400A

47	506-0111032-00-A	CLARIFIER WATER P/H SWBD	NOS.	1	2500	0DD					SW/ CLW/ PTP PMCC 0DD, 2500A
48	506-0110251-00-A	PRE-TREATMENT PLANT MCC	NOS.	1	1000	0WC					PTP MCC 0WC, 1000A
49	506-0110044-00-A	220V OFFSITE DCDB	NOS.	1	125	0FA					220V AUX CT & RW PH DCDB 0FA, 125A
50	506-0111033-00-A	CHLORINATION PLANT SWBD	NOS.	1	1000	0DC					FIRE WATER/CW/CLO2/CWTP PMCC 0DC, 1000A
51	506-0111035-00-A	CSSP SWBD	NOS.	1	2500	0DH					CSSP PMCC 0DH, 2500A
52	506-0110190-00-A	FUEL OIL P/H SWBD.	NOS.	1	2500	0DN					FOPH PMCC 0DN, 2500A
53	506-0111024-00-A	CHP SWBD-1	NOS.	1	4000	0DR					CHP PMCC-01 0DR, 4000A
54	506-0111025-00-A	CHP SWBD-2	NOS.	1	4000	0DS					CHP PMCC-02 0DS, 4000A
55	506-0111026-00-A	CHP SWBD-3	NOS.	1	4000	0DU					CHP PMCC-03 0DU, 4000A
56	506-0111021-00-A	220V CHP DCDB-1	NOS.	1	150	0FC					220V CHP MCC-2 DCDB 0FC, 150A
57	506-0111022-00-A	220V CHP DCDB-2	NOS.	1	125	0FC1					220V CHP MCC-3 DCDB 0FC1, 125A
58	506-0111034-00-A	SWITCHYARD SERVICE SWBD	NOS.	1	1000	0DJ					SWYD ACDB 0DJ, 1000A
59	506-0110977-00-A	220V SWITCHYARD DCDB 1	NOS.	1	125	0FD					220V SWYD DCDB 0FD, 125A
60	506-0110404-00-A	48V SWITCHYARD DCDB	NOS.	1	125						48V SWYD DCDB, 125A
61	506-0110411-00-A	SWITCHYARD EMERGENCY DB	NOS.	1	250						SWITCHYARD EMERGENCY POWER DB, 250A
62	506-0111030-00-A	SWITCHYARD AC SWBD	NOS.	1	250						SWITCHYARD AC MCC, 250A
63	506-0111031-00-A	SWITCHYARD VENTILATION SWBD	NOS.	1	250						SWITCHYARD VENTILATION MCC, 250A
64	506-0110412-00-A	SWITCHYARD OIL FILTRATION SWBD	NOS.	1	400						SWITCHYARD OIL FILTRATION BOARD, 400A
65	506-0110985-00-A	AC MCCB BOX	NOS.	125	63						
66	506-0110986-00-A	DC MCCB BOX	NOS.	25	63						
67	506-0110417-00-A	HMI SYSTEM	NOS.	1							AS PER ANNEXURE-A
68	506-0111006-00-A	NUMERICAL RELAY, IMCC AND WIRELESS TEMP MONITORING SYSTEM- NETWORKING HARDWARE	LOTS	1							AS PER ANNEXURE-B1 & B3
69	506-0110991-00-A	AMC FOR NUMERICAL RELAY	LOTS	1							AS PER ANNEXURE-B2
70	506-0111007-00-C	NUMERICAL RELAY, IMCC AND WIRELESS TEMP MONITORING SYSTEM- COMMISSIONING	SET	1							AS PER ANNEXURE-C_NUMERICAL RELAY, IMCC, WIRELESS TEMP MONITORING & HMI SYSTEM- COMMISSIONING
71	506-0110282-00-A	TOOLS & TACKLE	SET	1							AS PER ANNEXURE-D
72	506-0110991-00-A	SITE MODIFICATION	LOTS	1							AS PER ANNEXURE-E
73	506-0110989-00-A	E & C SPARES	LOTS	1							AS PER ANNEXURE-F
74	506-0110000-00-B	MANDATORY SPARES	SET	1							AS PER ANNEXURE-G

NOTES:

1	TO CALCULATE THE SWITCHBOARD PRICES, REFER DETAILED BOARD WISE BOM AND MODULE WISE BOM, ANNEXURE-A.1 AND ANNEXURE-A.2 OF TECHNICAL DATA PART-A OF TECHNICAL SPECIFICATION (PE-TS-512-506-E002) RESPECTIVELY.
2	BIDDER HAS TO QUOTE FOR THE FOLLOWING ALONG WITH THE BID:
i)	HMI SYSTEM: AS PER LIST IN ANNEXURE–A
ii)	NETWORKING HARDWARE FOR NUMERICAL RELAYS, IMC AS PER LIST IN ANNEXURE-B1 & FOR WIRELESS TEMPERATURE MONITORING SYSTEM AS PER LIST IN ANNEXURE-B3
iii)	AMC FOR NUMERICAL RELAYS AS PER ANNEXURE-B2
iv)	NUMERICAL RELAY, IMCC, WIRELESS TEMPERATURE MONITORING & HMI SYSTEM COMMISSIONING: AS PER ANNEXURE-C
v)	TOOLS & TACKLES: AS PER ANNEXURE-D
vi)	SITE MODIFICATION CHARGES: AS PER ANNEXURE-E
vii)	E & C SPARES: AS PER ANNEXURE-F
viii)	MANDATORY SPARE: AS PER LIST IN ANNEXURE–G
ix)	BIDDER TO PROVIDE A SCHEDULE OF UNIT PRICES IN ACCORDANCE WITH THE LIST PROVIDED IN ANNEXURE-H
3	BIDDER TO ENSURE THAT SUMMATION OF PRICES (AS PER ANNEXURE-H) OF APPLICABLE MODULES (AS PER ANNEXURE A.1-BOARDWISE BOM) AND APPLICABLE PANELS (MENTIONED ABOVE BY THE BIDDER) OF A BOARD SHALL BE EQUIVALENT TO BOARD PRICE QUOTED ABOVE FOR THAT BOARD. VARIATION OF +/- 5% IS ACCEPTABLE IN THE DERIVED PRICE FROM THE BOARD PRICE QUOTED ABOVE.
4	ADDITION/ DELETION OF QUANTITIES SHALL BE APPLICALBE AT THE QUOTED PRICES. ALLOWABLE VARIATION IN QUANTITY AND PRICE SHALL BE AS PER NIT.
5	ALL LT PCC/ PMCC/MCC/ DBs SHALL BE SUPPLIED ALONGWITH THE INTEGRAL BASE FRAMES, FOUNDATION BOLTS, CABLE GLANDS & LUGS. PRICES FOR THE SAME SHALL BE BUILT IN THE SWITCHBOARD PRICE.
6	BIDDER IS REQUIRED TO PROVIDE THE QUANTITY OF PANELS CORRESPONDING TO EACH BOARD IN THE TABLE ABOVE WHEN SUBMITTING THEIR TECHNO-COMMERCIAL PROPOSAL.
7	IN CASE MODULE DOORS ARE PART OF MODULES, 2 NOS OF DUMMY MODULES OF EACH SIZE TO FILL IN MODULE BEING TAKEN OUT FOR MAINTENANCE PURPOSE SHALL BE PROVIDED IN EACH SWITCHGEAR ROOM (REFER ANNEXURE-3_TENTATIVE SWITCHGEAR LOCATION OF TECHNICAL SPECIFICATION PE-TS-512-506-E002), THESE DUMMY MODULES SHALL BE FITTED IN SWITCHBOARD AS VACANT MODULES HAVING NO CUT OUT ON BACK SIDE AND CABLE ALLEY SIDE. IN CASE DOOR IS HINGED TO THE PANEL, 2 NOS OF BLANKING PLATES OF EACH SIZE NEED TO BE PROVIDED. PRICES FOR THE SAME SHALL BE BUILT IN THE SWITCHBOARD PRICE.
8	NO ADDITIONAL PRICES SHALL BE PAID FOR PROTOTYPE PANELS, PRICES QUOTED ABOVE INCLUDES COST OF PROTOTYPE PANELS ALSO.
9	PVC SHALL BE APPLICABLE FOR THIS ENQUIRY FOR PMCC / PCC / MCC / ACBD / DCDB ONLY) AS PER IEEMA CIRCULAR (https://ieema.org/wp-content/uploads/2020/07/lvswgr-jan-2019.pdf) .PRICE VARIATION IS NOT APPLICABLE FOR AC MCCB BOX; DC MCCB BOX; HMI SYSTEM; NUMERICAL RELAY, IMCC AND WIRELESS TEMP MONITORING SYSTEM- NETWORKING HARDWARE; AMC FOR NUMERICAL RELAY; NUMERICAL RELAY, IMCC, WIRELESS TEMP MONITORING AND HMI SYSTEM- COMMISSIONING; TOOLS & TACKLE; SITE MODIFICATION; E & C SPARES & MANDATORY SPARES.
10	IN UNIT ADDITION-DELETION PRICES (ANNEXURE-H), PRICES QUOTED FOR COMPONENTS SHALL BE REASONABLE AND AS PER LIST PRICE OF CONCERNED MANUFACTURERS.

ANNEXURE-A

HMI SYSTEM

S. No.	Item Description	Quantity	Unit	Unit Price (Ex- Works) Rs.	Total Price (Ex- Works) Rs.	Remarks
	COMPLETE DESIGN, ENGINEERING & SUPPLY OF THE FOLLOWING ITEMS :					
1	HMI (EWS)	4	NOS.			
2	CONSOLE FOR HMI	4	NOS.			REFER NOTE- 2 & 3
3	LASER PRINTER (A4 SIZE)	4	NOS.			
4	TABLE FOR PRINTER	4	NOS.			REFER NOTE- 3
				TOTAL =		

NOTE:

1	REFER ANNEXURE-1_TYPICAL SWITCHGEAR RELAY NETWORK ARCHITECTURE.
2	INDUSTRIAL MODULAR DESIGN CONSOLE (FURNITURE I.E. TABLE WITH DRAWER & SWIVEL COMPUTER CHAIR) SHALL BE PROVIDED. EACH CONSOLE SHALL HAVE SPACE FOR KEEPING AN ADDITIONAL PC.
3	MAKE AND COLOR SHADE OF FURNITURE SHALL BE DECIDED DURING DETAIL ENGINEERING. FURNITURE COLOR SHADE SHOULD MATCH WITH CONTROL ROOM FURNITURE.
4	BHEL WILL PROVIDE UPS REDUNDANT FEEDER AT ONE LOCATION NEAR TO EWS LOCATION. FURTHER DISTRIBUTION OF UPS SUPPLY (FOR HMI, NETWORK SWITCH ETC.) ALONG WITH UPS DB SHALL BE IN THE SCOPE OF BIDDER.
5	FOR TESTING AND ERECTION & COMMISSIONING CHARGES FOR HMI- ITEMS, KINDLY REFER S.No.4 OF ANNEXURE-C.

ANNEXURE-B1

NETWORKING HARDWARE FOR NUMERICAL RELAY & IMCC

S. No.	Item Description	Quantity	Unit	Unit Price (Ex- Works) Rs.	Total Price (Ex- Works) Rs.	Remarks
1	ETHERNET SWITCH WITH IEC-61850 PROTOCOL					IT SHALL BE PART OF SWITCHBOARD
2	NETWORK LEVEL ETHERNET SWITCH (OF ADEQUATE PORTS)	2	SET			NEAR DDCMIS END, INCLUDING COMPLETE DESIGN, ENGINEERING, SUPPLY, TESTING AND ERECTION & COMMISSIONING. EACH SET SHALL BE SUITABLE FOR RECEIVING SIGNALS FROM EACH SWITCHGEAR LEVEL NETWORK/RING OF ETHERNET SWITCH's. BOTH SET OF NETWORK LEVEL ETHERNET SWITCH SHALL BE MOUNTED IN ETHERNET SWITCH BOX.
3	CAT5e/CAT6 or Better Ethernet CABLE	5000	METERS			
4	SIMPLEX FIBER OPTICAL CABLE FOR COMMUNICATION BETWEEN SWGR LEVEL ETHERNET SWITCH's (& THEIR RINGS) & NETWORK LEVEL ETHERNET SWITCH	40000	METERS			
5	HDPE CONDUIT (RODENT FREE)	SAME AS FO CABLE	METERS			USED FOR FIBER OPTICAL CABLE AT S.NO. 4
6	FO TERMINATION ACCESSORIES AT BIDDER'S SUPPLIED EQUIPMENT END UNDER THIS PACKAGE	1	SET			ANNEXURE-1_TYPICAL SWITCHGEAR RELAY NETWORK ARCHITECTURE FOR SCOPE AND TERMINAL POINT
7	LAPTOP PC WITH LICENCED VERSION SOFTWARE, HARDWARE FOR RELAY, IMC PARAMETERISATION	5	NOS.			
8	INTERFACE CABLE WITH SUITABLE CONNECTING PORT AT BOTH END FOR CONNECTION OF NUMERICAL RELAY FRONT PORT TO THE LAPTOP	55	NOS.			EACH CABLE OF LENGTH ATLEAST 5M
9	INTERFACE CABLE WITH SUITABLE CONNECTING PORT AT BOTH END FOR CONNECTION OF IMCC FRONT PORT TO THE LAPTOP	20	NOS.			EACH CABLE OF LENGTH ATLEAST 5M
				TOTAL =		

NOTES:

1	REFER ANNEXURE- 3_TENTATIVE SWITCHBOARD LOCATION DETAIL FOR DISTANCE BETWEEN SWITCHGEAR AND NETWORK LEVEL ETHERNET SWITCH IN MAIN CONTROL ROOM.
2	REFER ANNEXURE- 1_TYPICAL SWITCHGEAR RELAY NETWORK ARCHITECTURE FOR HMI REQUIREMENT.
3	BIDDER TO PROVIDE ONE NO. OF EACH TYPE OF IMCC MODULE ALONG WITH Y-LINK TO BHEL ON RETURNABLE BASIS & COORDINATE WITH BHEL FOR CONDUCTING FAT FOR IMCC AS PER CUSTOMER SATISFACTION.

ANNEXURE-B2

AMC FOR NUMERICAL RELAY

S. No.	Item Description	Quantity	Unit	Unit Price (Ex- Works) Rs.	Total Price (Ex- Works) Rs.	Remarks
1	AMC for 3 years for following : - Numerical Relays (with IEC 61850) in all LV Switchgears - IEC 61850 Ethernet switches in Switchgear panels - Cat5e Ethernet cable / FO cable/ Optical Fibre Cable with fire retardant outer sheath - Optical fibre cable termination equipment such as LIU, patch cord etc. for complete network - Laptops - HMI stations (Engineering Work Stations and printers) - All other equipment required to meet the intended specification				-	AMC START DATE: REFER NOTE-1
1.1	1st year	1	Lot			
1.2	2nd year	1	Lot			
1.3	3rd year	1	Lot			
				TOTAL =		

NOTES:

1	THE COMMENCEMENT DATE FOR AMC WILL BE FROM THE DATE OF TAKEOVER BY THE END CUSTOMER. HOWEVER, TENTATIVE DATE OF AMC COMMENCEMENT SHALL BE 05.05.2028.

ANNEXURE-B3

NETWORKING HARDWARE FOR WIRELESS TEMPERATURE MONITORING SENSOR

S. No.	Item Description	Quantity	Unit	Unit Price (Ex- Works) Rs.	Total Price (Ex- Works) Rs.	Remarks
1.A	COMPLETE NETWORKING HARDWARE(EXCEPT CABLE & TERMINATION ACCESSORIES) NEAR SWITCHGEAR END FOR COMMUNICATION BETWEEN WIRELESS TEMPERATURE RECEIVER END & DDCMIS/HMI FOR TEMPERATURE MONITORING SYSTEM :- FOR TWO SET OF SWITCHBOARDS- a. FIRST SET- 8DA, 8DB & 8DG b. SECOND SET- 9DA, 9DB & 9DG	2	SET			INCLUDING COMPLETE DESIGN, ENGINEERING AND SUPPLY. 1 SET IS FOR EACH UNIT (CONSISTS OF 3 SWITCHBOARDS)
1.B	SPECIAL CABLE(TWISTED PAIR/CAT/OPTICAL FIBRE CABLE OR AS APPLICABLE) INCLUDING TERMINATION ACCESSORIES FOR COMMUNICATION BETWEEN SWITCHGEAR & DDCMIS/HMI FOR TEMPERATURE MONITORING SYSTEM :- FOR TWO SET OF SWITCHBOARDS- a. FIRST SET- 8DA, 8DB & 8DG b. SECOND SET- 9DA, 9DB & 9DG	2	SET			INCLUDING COMPLETE DESIGN, ENGINEERING AND SUPPLY. 1 SET IS FOR EACH UNIT (CONSISTS OF 3 SWITCHBOARDS)
2.A	COMPLETE NETWORKING HARDWARE(EXCEPT CABLE & TERMINATION ACCESSORIES) NEAR SWITCHGEAR END FOR COMMUNICATION BETWEEN WIRELESS TEMPERATURE RECEIVER END & DDCMIS/HMI FOR TEMPERATURE MONITORING SYSTEM :- FOR TWO SET OF SWITCHBOARDS- a. FIRST SET- 0DA b. SECOND SET- 0DB	2	SET			INCLUDING COMPLETE DESIGN, ENGINEERING AND SUPPLY. 1 SET IS FOR EACH UNIT (CONSISTS OF 1 SWITCHBOARD)
2.B	SPECIAL CABLE(TWISTED PAIR/CAT/OPTICAL FIBRE CABLE OR AS APPLICABLE) INCLUDING TERMINATION ACCESSORIES FOR COMMUNICATION BETWEEN SWITCHGEAR & DDCMIS/HMI FOR TEMPERATURE MONITORING SYSTEM :- FOR TWO SET OF SWITCHBOARDS- a. FIRST SET- 0DA b. SECOND SET- 0DB	2	SET			INCLUDING COMPLETE DESIGN, ENGINEERING AND SUPPLY. 1 SET IS FOR EACH UNIT (CONSISTS OF 1 SWITCHBOARD)
				TOTAL =		

NOTES:

1	REFER ANNEXURE- 3_TENTATIVE SWITCHBOARD LOACTION DETAIL FOR DISTANCE BETWEEN SWITCHGEAR AND MAIN CONTROL ROOM.
2	FOR ABOVE ITEMS LISTED AT S.NO.1.A AND 1.B, BMCC(8DA), TMCC (8DB) and EMCC(8DG) OF ONE UNIT IS CONSIDERED AS 1 SET

ANNEXURE-C

NUMERICAL RELAY, IMCC, WIRELESS TEMPERATURE MONITORING & HMI SYSTEMS - COMMISSIONING CHARGES

S. No.	Item Description	Quantity	Unit	Unit Price (Ex- Works) Rs.	Total Price (Ex- Works) Rs.	Remarks
1	LUMP SUM ALL INCLUSIVE CHARGES PER NUMERICAL RELAY COMMISSIONING (INCLUDING CONVEYANCE TO SITE, BOARDING AND LODGING)	410	NOS.			
2	LUMP SUM ALL INCLUSIVE CHARGES PER IMC COMMISSIONING (INCLUDING CONVEYANCE TO SITE, BOARDING AND LODGING)	3000	NOS.			
3.A	LUMP SUM ALL INCLUSIVE CHARGES FOR WIRELESS TEMPERATURE MONITORING SYSTEM COMMISSIONING. FOR TWO LOT OF SWITCHBOARDS- a. FIRST LOT- 8DA, 8DB & 8DG SWITCHBOARDS b. SECOND LOT- 9DA, 9DB & 9DG SWITCHBOARDS	2	LOT			1 LOT IS FOR EACH UNIT (CONSISTS OF 3 SWITCHBOARD). REFER NOTE NO.3A & 4A
3.B	LUMP SUM ALL INCLUSIVE CHARGES FOR WIRELESS TEMPERATURE MONITORING SYSTEM COMMISSIONING. FOR TWO LOT OF SWITCHBOARDS- a. FIRST LOT- 0DA SWITCHBOARD b. SECOND LOT- 0DB SWITCHBOARD	2	LOT			1 LOT IS FOR EACH UNIT (CONSISTS OF 1 SWITCHBOARD). REFER NOTE NO.3B & 4B
4	TESTING AND ERECTION & COMMISSIONING CHARGES FOR HMI- ITEMS AT SL. NO. 1-4 OF ANNEXURE-A	4	NOS.			1 NO. SHALL CONSIST OF TESTING AND ERECTION & COMMISSIONING OF ONE ITEM EACH OF SL.NO. 1-4 OF ANNEXURE-A
				TOTAL =		

NOTES:

1	AMOUNT PAYABLE FOR NUMERICAL RELAY COMMISSIONING = UNIT PRICE FOR COMMISSIONING CHARGES AS PER SL.NO.1 ABOVE x NO. OF RELAYS COMMISSIONED (SAME TO BE CERTIFIED BY BHEL).
2	AMOUNT PAYABLE FOR IMCC COMMISSIONING = UNIT PRICE FOR COMMISSIONING CHARGES AS PER SL.NO.2 ABOVE x NO. OF IMCC COMMISSIONED (SAME TO BE CERTIFIED BY BHEL).
3.A	AMOUNT PAYABLE FOR WIRELESS TEMPERATURE MONITORING SYSTEM COMMISSIONING FOR EACH UNIT (BMCC, TMCC and EMCC) = UNIT PRICE FOR COMMISSIONING CHARGES AS PER SL.NO.3.A ABOVE (SAME TO BE CERTIFIED BY BHEL).
3.B	AMOUNT PAYABLE FOR WIRELESS TEMPERATURE MONITORING SYSTEM COMMISSIONING FOR EACH UNIT (STATION SERVICE SWITCHBOARD) = UNIT PRICE FOR COMMISSIONING CHARGES AS PER SL.NO.3.B ABOVE (SAME TO BE CERTIFIED BY BHEL).
4.A	FOR LINE ITEM 3.A, TESTING AND COMMISSIONING OF WIRELESS TEMPERATURE MONITORING SYSTEM FOR BMCC(8DA), TMCC (8DB) and EMCC(8DG) OF ONE UNIT IS CONSIDERED AS 1 LOT, SIMILARLY 3 BOARDS OF ANOTHER UNIT FOR 2ND LOT.
4.B	FOR LINE ITEM 3.B, TESTING AND COMMISSIONING OF WIRELESS TEMPERATURE MONITORING SYSTEM FOR STATION SERVICE SWITCHBOARD (0DA) OF ONE UNIT IS CONSIDERED AS 1 LOT, SIMILARLY 1 BOARD OF ANOTHER UNIT FOR 2ND LOT.
5	APPROXIMATELY 15 NOs. OF NUMERICAL RELAYS AND/OR 50 NOs. OF IMCS CAN BE CONSIDERED BY BIDDER FOR COMMISSIONING IN EACH VISIT.
6	FOR LINE ITEM 1, 2, 3.A & 3.B, BIDDER TO NOTE THAT TESTING, CONFIGURATION AND NETWORKING SETUP OF RELAY, IMC & TEMPERATURE MONITORING SYSTEM SHALL BE THE BIDDER'S RESPONSIBILITY COMPLETELY.
7	FOR LINE ITEM 4, BIDDER TO NOTE THAT ERECTION & COMMISSIONING, TESTING, CONFIGURATION AND NETWORKING SETUP OF HMI SYSTEM SHALL BE THE BIDDER'S RESPONSIBILITY COMPLETELY.
8	BIDDER TO COORDINATE WITH DCS SUPPPLIER (BHEL EDN) TO ENSURE SMOOTH AND EFFECTIVE COMMUNICATION BETWEEN NUMERICAL RELAY/ Y-LINK AND DCS, AS WELL AS BETWEEN TEMPERATURE MONITORING SYSTEM AND DCS/HMI.
9	FOR LINE ITEMS 1 TO 4, BIDDER TO DEPUTE ITS MANPOWER WITHIN 15 DAYS FROM THE DATE OF INTIMATION BY BHEL.

ANNEXURE-D

TOOLS & TACKLES

S. No.	Item Description	Quantity (In Nos.)	Unit Price (Ex- Works) Rs.	Total Price (Ex- Works) Rs.	Remarks
1	ACB RACKING HANDLE	30			
2	TELESCOPIC TROLLY (TROLLEY FOR ACB HANDLING)	20			
3	DOOR KEY	100			
4	RELAY TEST EQUIPMENT	2			
5	MODULE RACKING HANDLE	30			
			TOTAL =		

NOTES:

1	BIDDER HAS TO QUOTE FOR TOOLS AND TACKLES MENTIONED ABOVE. HOWEVER, BIDDER HAS TO INDICATE ANY SPECIAL TOOLS (IF REQUIRED).

ANNEXURE-E

SITE MODIFICATION CHARGES

S. No.	Item Description	Quantity	Unit Price Rs.	Total Price Rs.
1	LUMP SUM ALL INCLUSIVE CHARGES PER VISIT FOR SKILLED TECHNICIAN (EXCEPT DAILY CHARGES)	15 VISITS		
2	LUMP SUM ALL INCLUSIVE DAILY CHARGES FOR SKILLED TECHNICIAN	60 DAYS		
3	LUMP SUM ALL INCLUSIVE CHARGES PER VISIT FOR SERVICE ENGINEER (EXCEPT DAILY CHARGES)	15 VISITS		
4	LUMP SUM ALL INCLUSIVE DAILY CHARGES FOR SERVICE ENGINEER	60 DAYS		
5	SITE MODIFICATION MATERIAL @ 1% OF TOTAL BOARD COST (i.e. SUMMATION OF S.NO. 1 TO S.NO. 64 OF BOQ CUM PRICE SCHEDULE)	1 SET		
			TOTAL =	

NOTES:

1	AMOUNT PAYABLE FOR SKILLED TECHNICIAN PER VISIT TO SITE = VISIT CHARGES AS PER SL. NO. 1 ABOVE + (DAILY CHARGES AS PER SL. NO. 2 ABOVE X NO. OF DAYS AT SITE) (TO BE CERTIFIED BY BHEL SITE)
2	AMOUNT PAYABLE FOR SERVICE ENGINEER PER VISIT TO SITE = VISIT CHARGES AS PER SL. NO. 3 ABOVE + (DAILY CHARGES AS PER SL. NO. 4 ABOVE X NO. OF DAYS AT SITE) (TO BE CERTIFIED BY BHEL SITE)
3	AMOUNT PAYABLE FOR SITE MODIFICATION MATERIAL SHALL BE BASED ON THE ACTUAL COST OF THE MATERIALS UTILIZED. (TO BE CERTIFIED BY BHEL SITE). THE COST OF THE ACTUAL MATERIALS USED WILL BE DETERMINED USING THE UNIT RATE PROVIDED BY THE BIDDER IN THE ANNEXURE-H.
4	FOR LINE ITEMS 1 TO 4, BIDDER TO DEPUTE ITS MANPOWER WITHIN 15 DAYS FROM THE DATE OF INTIMATION BY BHEL.

ANNEXURE-F

E&C SPARES

S. No.	Item / Component	Unit	Quantity	Unit Price (Ex-Works) Rs.	Total Price (Ex- Works) Rs.
1	**FACTORY BUILT ASSEMBLIES (PCC/MCC/DB)**				
1.1	Busbar supports (Horizontal)	1 set of 3	1		
1.2	Primary isolating contacts (Bus side) of each rating	1 set of 3	1		
1.3	Primary isolating contacts (Load side) of each rating	1 set of 3	1		
1.4	Secondary isolating contacts of each rating	1 set of 3	1		
1.5	Gaskets (each size)	Meter	10		
1.6	Fixed Terminal (1way)	Nos.	20		
1.7	Shrouds (for outgoing modules)	Nos.	one for each physical size of module		
1.8	Wire (for secondary wiring)				
a.	2.5 mm^2	Metres	100		
b.	1.5mm^2	Metres	100		
1.9	Lugs (for secondary wiring)	Nos.	100		
2	**AIR CIRCUIT BREAKER (FOR EACH RATING)**				
2.1	Shunt trip coil	Nos.	5		
2.2	spring charging motor	Nos.	1 motor of each rating		
2.3	closing coil	Nos.	5		
2.4	Auxiliary switch	Nos.	1		
3	**ISOLATING SWITCH**				
3.1	Main contact kit for each rating	1 set of 3 poles	1		
4	**POWER CONTACTORS**				
4.1	Contactor coil of each rating	Nos.	1		
4.2	Contacts kit (main) for each rating	1 set of 3 poles	1		
5	**AUXILIARY CONTACTORS**				
5.1	Complete unit with 2NO + 2NC contacts	Nos.	1 no. of each rating/type		
5.2	Contactor coils				
a.	AC for each rating	Set	1		
b.	DC for each rating	Set	1		
6	MCCB	Nos.	1 no. of each rating/type		
7	MPCB	Nos.	1 no. of each rating/type		
8	MCB	Nos.	1 no. of each rating/type		
7	**PUSH BUTTONS**				
6.1	Actuator contacts	Nos.	5		
6.2	Element	Nos.	5		
8	**INDICATING LAMPS**				
8.1	Complete unit	Nos.	10		
8.2	Lens (assorted)	Nos.	10		
9	**OTHERS**				
9.1	Selector & control switch (each type)	Nos.	1		
9.2	Connecting cable between CT and IMCC of appropriate length	Nos.	50		
9.3	Connecting cable between VT and IMCC of appropriate length	Nos.	50		
9.4	IMC Display HMI cable of Appropriate length	Nos.	50		
				TOTAL =	

ANNEXURE-G

MANDATORY SPARES

S.no.	Item Description	Unit	Quantity	Unit Price Rs.	Total Price Rs.
1	Complete breaker of each rating	Nos.	10		
2	Numerical Relays of each type	Nos.	5		
3	Auxiliary Relays of each type	Nos.	10		
4	Horizontal busbar support Insulators	Nos.	12		
5	Vertical busbar dropper support insulators	Nos.	12		
6	Current transformer of each type & ratio	Nos.	3		
7	Voltage transformer of each type & ratio	Nos.	3		
8	Control supply transformer of each type & rating	Nos.	3		
9	Power Contactor of each type and rating	Nos.	10		
10	Coil for above contactor for each type and rating	Nos.	10		
11	MCCBs (equally divided for all ratings)	Nos.	40		
12	MPCBs (equally divided for all ratings)	Nos.	40		
13	Closing coil of each type of each rating	Nos.	10		
14	Trip coil of each type of each rating	Nos.	10		
15	Aux contact set of each type and Rating	Sets.	6		
16	Fixed contact set of each type & rating	Sets.	3		
17	Moving contact set of each type & rating	Sets.	3		
18	Maintenance tools and accessories for maintenance of LT MCC	Nos.	2		
				TOTAL =	

ANNEXURE-H

MODULE UNIT PRICE

S.No.	Item Description	Quantity	Unit Price (INR)	Remarks
1	**INCOMING FEEDER UNIT**			
a)	ACB Incomer to PCC/PMCC from Trafo. - Module Type DAET (I/C)			
	1000A	1		
	1600A	1		
	2000A	1		
	2500A	1		
	3000A	1		
	4000A	1		
b)	ACB Incomer to MCC - Module Type DAE (I/C)			
	630A	1		
	800A	1		
	1000A	1		
	1250A	1		
	1600A	1		
	2000A	1		
	2500A	1		
	3000A	1		
	4000A	1		
c)	ACB Incomer to Emergency Board - Module Type DG(I/C)			
	800A	1		
	1000A	1		
	1250A	1		
	1600A	1		
	2000A	1		
	2500A	1		
	3000A	1		
	4000A	1		
d)	MCCB Incomer for MCC / ACDB – Module Type E3 (I/C)			
	63A – Fixed Type	1		
	125A – Fixed Type	1		
	160A – Fixed Type	1		
	200A – Fixed Type	1		
	250A – Fixed Type	1		
	300A – Fixed Type	1		
	400A – Fixed Type	1		
	63A – Drawout Type	1		
	125A – Drawout Type	1		
	160A – Drawout Type	1		
	200A – Drawout Type	1		
	250A – Drawout Type	1		
	300A – Drawout Type	1		
	400A – Drawout Type	1		
e)	MCCB Incomer with contactor changeover – Module Type CC			
	16A – Fixed Type	1		
	32A – Fixed Type	1		
	63A – Fixed Type	1		
	125A – Fixed Type	1		
	200A – Fixed Type	1		
	250A – Fixed Type	1		
	300A – Fixed Type	1		
	400A – Fixed Type	1		
	16A – Drawout Type	1		
	32A – Drawout Type	1		
	63A – Drawout Type	1		
	125A – Drawout Type	1		
	200A – Drawout Type	1		
	250A – Drawout Type	1		
	300A – Drawout Type	1		
	400A – Drawout Type	1		

ANNEXURE-H

MODULE UNIT PRICE

f)	220V DCDB Incomer from charger - Module type CH (I/C)			
	50A – CH Fixed Type	1		
	100A – CH Fixed Type	1		
	125A – CH Fixed Type	1		
	150A – CH Fixed Type	1		
	200A – CH Fixed Type	1		
	300A – CH Fixed Type	1		
	400A – CH Fixed Type	1		
	450A – CH Fixed Type	1		
	500A – CH Fixed Type	1		
	630A – CH Fixed Type	1		
	800A – CH Fixed Type	1		
	1000A – CH Fixed Type	1		
	1250A – CH Fixed Type	1		
	1600A – CH Fixed Type	1		
	50A – CH Drawout Type	1		
	100A – CH Drawout Type	1		
	125A – CH Drawout Type	1		
	150A – CH Drawout Type	1		
	200A – CH Drawout Type	1		
	300A – CH Drawout Type	1		
	400A – CH Drawout Type	1		
	450A – CH Drawout Type	1		
	500A – CH Drawout Type	1		
	630A – CH Drawout Type	1		
	800A – CH Drawout Type	1		
	1000A – CH Drawout Type	1		
	1250A – CH Drawout Type	1		
	1600A – CH Drawout Type	1		
g)	220V DCDB Incomer from battery - Module type DB (I/C)			
	50A – DB Fixed Type	1		
	100A – DB Fixed Type	1		
	125A – DB Fixed Type	1		
	150A – DB Fixed Type	1		
	200A – DB Fixed Type	1		
	300A – DB Fixed Type	1		
	400A – DB Fixed Type	1		
	450A – DB Fixed Type	1		
	500A – DB Fixed Type	1		
	630A – DB Fixed Type	1		
	800A – DB Fixed Type	1		
	1000A – DB Fixed Type	1		
	1250A – DB Fixed Type	1		
	1600A – DB Fixed Type	1		
	50A – DB Drawout Type	1		
	100A – DB Drawout Type	1		
	125A – DB Drawout Type	1		
	150A – DB Drawout Type	1		
	200A – DB Drawout Type	1		
	300A – DB Drawout Type	1		
	400A – DB Drawout Type	1		
	450A – DB Drawout Type	1		
	500A – DB Drawout Type	1		
	630A – DB Drawout Type	1		
	800A – DB Drawout Type	1		
	1000A – DB Drawout Type	1		
	1250A – DB Drawout Type	1		
	1600A – DB Drawout Type	1		
2	**BUSCOUPLER UNIT**			
a)	ACB Buscoupler to PCC/PMCC/MCC - Module Type DAET/ DAE (B/C)			
	630A	1		

ANNEXURE-H

MODULE UNIT PRICE

	800A	1		
	1000A	1		
	1250A	1		
	1600A	1		
	2000A	1		
	2500A	1		
	3000A	1		
	4000A	1		
b)	MCCB Buscoupler for MCC / ACDB – Module Type E3 (B/C)			
	63A – Fixed Type	1		
	125A – Fixed Type	1		
	160A – Fixed Type	1		
	200A – Fixed Type	1		
	250A – Fixed Type	1		
	300A – Fixed Type	1		
	400A – Fixed Type	1		
	63A – Drawout Type	1		
	125A – Drawout Type	1		
	160A – Drawout Type	1		
	200A – Drawout Type	1		
	250A – Drawout Type	1		
	300A – Drawout Type	1		
	400A – Drawout Type	1		
c)	220V DCDB buscoupler - Module Type - DC			
	50A – DC Fixed Type	1		
	100A – DC Fixed Type	1		
	125A – DC Fixed Type	1		
	150A – DC Fixed Type	1		
	200A – DC Fixed Type	1		
	300A – DC Fixed Type	1		
	400A – DC Fixed Type	1		
	450A – DC Fixed Type	1		
	500A – DC Fixed Type	1		
	630A – DC Fixed Type	1		
	800A – DC Fixed Type	1		
	1000A – DC Fixed Type	1		
	1250A – DC Fixed Type	1		
	1600A – DC Fixed Type	1		
	50A – DC Drawout Type	1		
	100A – DC Drawout Type	1		
	125A – DC Drawout Type	1		
	150A – DC Drawout Type	1		
	200A – DC Drawout Type	1		
	300A – DC Drawout Type	1		
	400A – DC Drawout Type	1		
	450A – DC Drawout Type	1		
	500A – DC Drawout Type	1		
	630A – DC Drawout Type	1		
	800A – DC Drawout Type	1		
	1000A – DC Drawout Type	1		
	1250A – DC Drawout Type	1		
	1600A – DC Drawout Type	1		
d)	220V DCDB TIE - Module Type - HD			
	50A – HD Fixed Type	1		
	100A – HD Fixed Type	1		
	125A – HD Fixed Type	1		
	150A – HD Fixed Type	1		
	200A – HD Fixed Type	1		
	300A – HD Fixed Type	1		
	400A – HD Fixed Type	1		
	450A – HD Fixed Type	1		
	500A – HD Fixed Type	1		

ANNEXURE-H

MODULE UNIT PRICE

	630A – HD Fixed Type	1		
	800A – HD Fixed Type	1		
	1000A – HD Fixed Type	1		
	1250A – HD Fixed Type	1		
	1600A – HD Fixed Type	1		
	50A – HD Drawout Type	1		
	100A – HD Drawout Type	1		
	125A – HD Drawout Type	1		
	150A – HD Drawout Type	1		
	200A – HD Drawout Type	1		
	300A – HD Drawout Type	1		
	400A – HD Drawout Type	1		
	450A – HD Drawout Type	1		
	500A – HD Drawout Type	1		
	630A – HD Drawout Type	1		
	800A – HD Drawout Type	1		
	1000A – HD Drawout Type	1		
	1250A – HD Drawout Type	1		
	1600A – HD Drawout Type	1		
3	**ACB outgoing supply feeder - Module Type DAE (O/G)/DAE-TIE**			
	630A	1		
	800A	1		
	1000A	1		
	1250A	1		
	1600A	1		
	2000A	1		
	2500A	1		
	3000A	1		
	4000A	1		
4	**ACB outgoing motor feeder - Module Type DM/PM/AM (controlled from DDCMIS/PLC/ATRS)**			
	90- 200KW	1		
5	**MCCB outgoing supply feeders**			
a)	Module Type E3(O/G)			
	16A - Fixed type	1		
	32A - Fixed type	1		
	63A - Fixed type	1		
	100A - Fixed type	1		
	125A - Fixed type	1		
	160A - Fixed type	1		
	200A - Fixed type	1		
	250A - Fixed type	1		
	300A - Fixed type	1		
	400A - Fixed type	1		
	16A - Drawout Type	1		
	32A - Drawout Type	1		
	63A - Drawout Type	1		
	100A - Drawout Type	1		
	125A - Drawout Type	1		
	160A - Drawout Type	1		
	200A - Drawout Type	1		
	250A - Drawout Type	1		
	300A - Drawout Type	1		
	400A - Drawout Type	1		
b)	Module Type E3-TP (O/G)			
	16A - Fixed type	1		
	32A - Fixed type	1		
	63A - Fixed type	1		
	100A - Fixed type	1		
	125A - Fixed type	1		
	160A - Fixed type	1		
	200A - Fixed type	1		

ANNEXURE-H

MODULE UNIT PRICE

	250A - Fixed type	1		
	300A - Fixed type	1		
	400A - Fixed type	1		
	16A - Drawout Type	1		
	32A - Drawout Type	1		
	63A - Drawout Type	1		
	100A - Drawout Type	1		
	125A - Drawout Type	1		
	160A - Drawout Type	1		
	200A - Drawout Type	1		
	250A - Drawout Type	1		
	300A - Drawout Type	1		
	400A - Drawout Type	1		
c)	Module Type ES3 (O/G)			
	63A - Fixed type	1		
	100A - Fixed type	1		
	125A - Fixed type	1		
	160A - Fixed type	1		
	200A - Fixed type	1		
	250A - Fixed type	1		
	400A - Fixed type	1		
	63A - Drawout Type	1		
	100A - Drawout Type	1		
	125A - Drawout Type	1		
	160A - Drawout Type	1		
	200A - Drawout Type	1		
	250A - Drawout Type	1		
	400A - Drawout Type	1		
d)	2-ph feeder Module Type E2(O/G)			
	100A - Fixed type	1		
	160A - Fixed type	1		
	200A - Fixed type	1		
	250A - Fixed type	1		
	300A - Fixed type	1		
	400A - Fixed type	1		
	100A - Drawout Type	1		
	160A - Drawout Type	1		
	200A - Drawout Type	1		
	250A - Drawout Type	1		
	300A - Drawout Type	1		
	400A - Drawout Type	1		
e)	Double pole 1-ph feeder Module Type E1(O/G)			
	16A - Fixed type	1		
	32A - Fixed type	1		
	63A - Fixed type	1		
	100A - Fixed type	1		
	125A - Fixed type	1		
	16A - Drawout Type	1		
	32A - Drawout Type	1		
	63A - Drawout Type	1		
	100A - Drawout Type	1		
	125A - Drawout Type	1		
f)	3-Ph MCCB controlled outgoing contactor feeder with IMC Module Type EA3(O/G)			
	16A - Fixed type	1		
	32A - Fixed type	1		
	63A - Fixed type	1		
	100A - Fixed type	1		
	125A - Fixed type	1		
	200A - Fixed type	1		
	250A - Fixed type	1		
	400A - Fixed type	1		
	16A - Drawout Type	1		
	32A - Drawout Type	1		
	63A - Drawout Type	1		

ANNEXURE-H

MODULE UNIT PRICE

	100A - Drawout Type	1		
	125A - Drawout Type	1		
	200A - Drawout Type	1		
	250A - Drawout Type	1		
	400A - Drawout Type	1		
g)	3-Ph MCCB controlled outgoing contactor feeder without IMC Module Type ET3(O/G)			
	16A - Fixed type	1		
	32A - Fixed type	1		
	63A - Fixed type	1		
	100A - Fixed type	1		
	125A - Fixed type	1		
	200A - Fixed type	1		
	250A - Fixed type	1		
	400A - Fixed type	1		
	16A - Drawout Type	1		
	32A - Drawout Type	1		
	63A - Drawout Type	1		
	100A - Drawout Type	1		
	125A - Drawout Type	1		
	200A - Drawout Type	1		
	250A - Drawout Type	1		
	400A - Drawout Type	1		
h)	1-Ph MCCB controlled outgoing contactor feeder Module Type EA1(O/G)			
	16A - Fixed type	1		
	32A - Fixed type	1		
	63A - Fixed type	1		
	16A - Drawout Type	1		
	32A - Drawout Type	1		
	63A - Drawout Type	1		
i)	220V DC Outgoing MCCB Type (X) Feeder			
	16A - Fixed type	1		
	32A - Fixed type	1		
	63A - Fixed type	1		
	100A - Fixed type	1		
	125A - Fixed type	1		
	200A - Fixed type	1		
	250A - Fixed type	1		
	300A - Fixed type	1		
	400A - Fixed type	1		
	600A - Fixed type	1		
	800A - Fixed type	1		
	16A - Drawout Type	1		
	32A - Drawout Type	1		
	63A - Drawout Type	1		
	100A - Drawout Type	1		
	125A - Drawout Type	1		
	200A - Drawout Type	1		
	250A - Drawout Type	1		
	300A - Drawout Type	1		
	400A - Drawout Type	1		
	600A - Drawout Type	1		
	800A - Drawout Type	1		
6	**DOL Motor Starter - Unidirectional Drive - Drawout Type**			
a)	Module Type DK2 / PK2 / AK2 (controlled from DDCMIS/PLC/ATRS)			
	Upto 5.5KW	1		
	5.6 - 7.0KW	1		
	7.1 - 13KW	1		
	13.1 - 24KW	1		
	24.1 - 29.9KW	1		
b)	Module Type DK21 / PK21 / AK21 (controlled from DDCMIS/PLC/ATRS)			
	30.0 - 37.0KW	1		
	37.1 - 55KW	1		

ANNEXURE-H

MODULE UNIT PRICE

	55.1 - 80.0KW	1		
	80.1 - 89.9KW	1		
c)	Module Type DK2E/PK2E/AK2E (Reacceleration) (controlled from DDCMIS/PLC/ATRS)			
	Upto 5.5KW	1		
	5.6 - 7.0KW	1		
	7.1 - 13KW	1		
	13.1 - 24KW	1		
	24.1 – 29.9KW	1		
d)	Module Type DK21E/PK21E/AK21E (Reacceleration) (controlled from DDCMIS/PLC/ATRS)			
	30.0 - 37.0KW	1		
	37.1 - 55KW	1		
	55.1 - 80.0KW	1		
	80.1 - 89.9KW	1		
e)	Module Type K2 (Controlled from LCP)			
	Upto 5.5KW	1		
	5.6 - 7.0KW	1		
	7.1 - 13KW	1		
	13.1 - 24KW	1		
	24.1 - 29.9KW	1		
f)	Module Type K21 (Controlled from LCP)			
	30.0 - 37.0KW	1		
	37.1 - 55KW	1		
	55.1 - 80.0KW	1		
	80.1 - 89.9KW	1		
g)	Module Type K3 (Controlled from LPBS)			
	Upto 5.5KW	1		
	5.6 - 7.0KW	1		
	7.1 - 13KW	1		
	13.1 - 24KW	1		
	24.1 - 29.9KW	1		
h)	Module Type K31 (Controlled from LPBS)			
	30.0 - 37.0KW	1		
	37.1 - 55KW	1		
	55.1 - 80.0KW	1		
	80.1 - 89.9KW	1		
7	**RDOL Motor Starter - Bidirectional Drive - Drawout Type**			
a)	Module Type DN1/ PN1/ AN1 (controlled from DDCMIS/PLC/ATRS)			
	Upto 5.5KW	1		
	5.6 - 7.0KW	1		
	7.1 - 13KW	1		
	13.1 - 24KW	1		
	24.1 – 29.9KW	1		
	30.0 - 37.0KW	1		
	37.1 - 55KW	1		
	55.1 - 80.0KW	1		
	80.1 - 89.9KW	1		
8.1	Rapping Motor (RM1) Module with IMC	1		
8.2	Rapping Motor (RM2) Module with OLR	1		
9	DUST DENSITY MONITOR (DDM) Module	1		
10	HOPPER HEATER (HH) Module	1		
11	SUPPORT INSULATOR HEATER (HI) Module	1		
12	SHAFT INSULATOR HEATER (HS) Module	1		
13	Ash Level Indicator (ALI) Module	1		

ANNEXURE-H

MODULE UNIT PRICE

14	ARECA MARSHALING (ARECA) Module	1		
15	WAVE LEVEL TRANSMITTER (WLT) Module	1		
16	MARSHALING MODULE FOR SSPB OF RAPPING MOTOR AND HOPPER HEATER FEEDBACK (MM)	1		
17	WALL BLOWER Module	1		
18	LR BLOWER Module	1		
19	AH BLOWER Module	1		
20	JAMMING RELAY Module	1		
21	Wireless Temperature Sensor (WTS1) Module (In one ACB/PCC panel with single ACB)	1		
22	Wireless Temperature Sensor (WTS2) Module (In one ACB panel with double ACB)	1		
23	Wireless Temperature Sensor (WTS3) Module (In one Double front MCC panel)	1		
24	**Common Auxiliary Module**			
a)	PT module			
i	Bus PT module for PCC/PMCC - G1 Type	1		
ii	Bus PT module for Emergency MCC - G2 Type	1		
iii	Bus PT module for MCC/ACDB - VM Type	1		
iv	Bus PT DCDB - S Type	1		
b.1)	110V AC control supply module – Type CS (consisting of 415/110V control Trafo.)			
	1KVA	1		
	2KVA	1		
	2.5KVA	1		
	3KVA	1		
	5KVA	1		
	7.5KVA	1		
	10KVA	1		
b.2)	240 V AC control supply module – type CS (consisting of 415/240V control Trafo.)			
	1KVA	1		
	2KVA	1		
	2.5KVA	1		
	3KVA	1		
	5KVA	1		
	7.5KVA	1		
	10KVA	1		
b.3)	24V AC control supply module – Type CS (consisting of 415/24V control Trafo.)			
	250VA	1		
	500VA	1		
	1KVA	1		
	2KVA	1		
	2.5KVA	1		
	3KVA	1		
	5KVA	1		
	7.5KVA	1		
	10KVA	1		
c)	240V AC motor space heater module	1		
d)	220V DC supply module (for receiving 220V DC supply)	1		
e)	24V DC supply module	1		
f)	24 V winding heating module	1		
g)	Alarm module	1		
h)	Test supply module	1		
i)	240 V AC Panel Space heating supply module – type SH (consisting of 415/240V control Trafo.)			
	1KVA	1		
	2KVA	1		
	2.5KVA	1		
	3KVA	1		
	5KVA	1		
	7.5KVA	1		
	10KVA	1		
i)	240V AC SPACE HEATER SUPPLY MODULE- SHS	1		
j)	Y-Link	1		

ANNEXURE-H

MODULE UNIT PRICE

25	**Empty Panel with Horizontal & Vertical Busbar, Support & Auxiliary Busbar (4 Wire System)**			
a)	PCC Panel (Single Front Drawout Type) Without Temperature Sensor			
	630 / 630A	1		
	1000 / 1000A	1		
	1250 / 1250A	1		
	1600 / 1600A	1		
	2000 / 2000A	1		
	2500 / 2500A	1		
	3000 / 3000A	1		
	4000 / 4000A	1		
b)	MCC Panel (Single Front Fixed Type)			
	63 / 63A	1		
	250 / 250A	1		
	400 / 400A	1		
	630 / 630A	1		
	800 / 630A	1		
	1000 / 630A	1		
	1250 / 630A	1		
	1600 / 630A	1		
	2000 / 630A	1		
	2500 / 630A	1		
	3000 / 630A	1		
	4000 / 630A	1		
c)	MCC Panel (Single Front Drawout Type)			
	63 / 63A	1		
	250 / 250A	1		
	400 / 400A	1		
	630 / 630A	1		
	800 / 630A	1		
	1000 / 630A	1		
	1250 / 630A	1		
	1600 / 630A	1		
	2000 / 630A	1		
	2500 / 630A	1		
	3000 / 630A	1		
	4000 / 630A	1		
d)	MCC Panel (Double Front Drawout Type)			
	63 / 63A	1		
	250 / 250A	1		
	400 / 400A	1		
	630 / 630A	1		
	800 / 630A	1		
	1000 / 630A	1		
	1250 / 630A	1		
	1600 / 630A	1		
	2000 / 630A	1		
	2500 / 630A	1		
	3000 / 630A	1		
	4000 / 630A	1		
e)	ACDB Panel (Double Front Fixed Type)			
	250 / 250A	1		
	400 / 400A	1		
	630 / 250A	1		
	630 / 630A	1		
f)	220V DCDB Panel (Single Front Fixed type) with 20kA, 1 second fault Level			
	UPTO 125A (with 125A VBB)	1		
	UPTO 630A (with 630A VBB)	1		
	1000A (with 630A VBB)	1		
	1600A (with 630A VBB)	1		
g)	220V DCDB Panel (Single Front Fixed type) with 40kA, 1 second fault Level			
	UPTO 125A (with 125A VBB)	1		
	UPTO 630A (with 630A VBB)	1		

ANNEXURE-H

MODULE UNIT PRICE

	1000A (with 630A VBB)	1		
	1600A (with 630A VBB)	1		
h)	220V DCDB Panel (Double Front Fixed type) with 20kA, 1 second fault Level			
	UPTO 125A (with 125A VBB)	1		
	UPTO 630A (with 630A VBB)	1		
	1000A (with 630A VBB)	1		
	1250A (with 630A VBB)	1		
	1600A (with 630A VBB)	1		
i)	220V DCDB Panel (Double Front Fixed type) with 40kA, 1 second fault Level			
	UPTO 125A (with 125A VBB)	1		
	UPTO 630A (with 630A VBB)	1		
	1000A (with 630A VBB)	1		
	1250A (with 630A VBB)	1		
	1600A (with 630A VBB)	1		
j)	48V DCDB Panel (Single Front Fixed type)			
	UPTO 125A (with 125A VBB)	1		
	UPTO 200A (with 200A VBB)	1		
	UPTO 630A (with 630A VBB)	1		
k)	48V DCDB Panel (Double Front Fixed type)			
	UPTO 125A (with 125A VBB)	1		
	UPTO 200A (with 200A VBB)	1		
	UPTO 630A (with 630A VBB)	1		
l)	Empty ACB Panel with Horizontal & Vertical Busbar, Support & Auxiliary Busbar			
	630 / 630A	1		
	800 / 630A	1		
	800 / 800A	1		
	1000 / 630A	1		
	1000 / 800A	1		
	1000 / 1000A	1		
	1250 / 630A	1		
	1250 / 800A	1		
	1250 / 1000A	1		
	1250 / 1250A	1		
	1600 / 630A	1		
	1600 / 800A	1		
	1600 / 1000A	1		
	1600 / 1250A	1		
	1600 / 1600A	1		
	2000 / 630A	1		
	2000 / 800A	1		
	2000 / 1000A	1		
	2000 / 1250A	1		
	2000 / 1600A	1		
	2000 / 2000A	1		
	2500 / 630A	1		
	2500 / 800A	1		
	2500 / 1000A	1		
	2500 / 1250A	1		
	2500 / 1600A	1		
	2500 / 2000A	1		
	2500 / 2500A	1		
	3000 / 630A	1		
	3000 / 800A	1		
	3000 / 1000A	1		
	3000 / 1250A	1		
	3000 / 1600A	1		
	3000 / 2000A	1		
	3000 / 2500A	1		
	3000 / 3000A	1		
	4000 / 630A	1		

ANNEXURE-H

MODULE UNIT PRICE

	4000 / 800A	1		
	4000 / 1000A	1		
	4000 / 1250A	1		
	4000 / 1600A	1		
	4000 / 2000A	1		
	4000 / 2500A	1		
	4000 / 3000A	1		
	4000 / 4000A	1		
26	**Empty Panel with Horizontal & Vertical Busbar, Support & Auxiliary Busbar (3 Wire System)**			
a)	PCC Panel (Single Front Drawout Type) Without Temperature Sensor			
	2000 / 2000A	1		
	3000 / 3000A	1		
b)	MCC Panel (Double Front Drawout Type)			
	2000 / 630A	1		
	3000 / 630A	1		
c)	ACDB Panel (Double Front Fixed Type)			
	250 / 250A	1		
	400 / 400A	1		
d)	Empty ACB Panel with Horizontal & Vertical Busbar, Support & Auxiliary Busbar			
	2000 / 630A	1		
	2000 / 800A	1		
	2000 / 1000A	1		
	2000 / 1250A	1		
	2000 / 1600A	1		
	2000 / 2000A	1		
	3000 / 630A	1		
	3000 / 800A	1		
	3000 / 1000A	1		
	3000 / 1250A	1		
	3000 / 1600A	1		
	3000 / 2000A	1		
	3000 / 2500A	1		
	3000 / 3000A	1		
27	**Dummy Panel**			
	UPTO 630A	1		
	800A	1		
	1000A	1		
	1250A	1		
	1600A	1		
	2000A	1		
	2500A	1		
	3000A	1		
	4000A	1		
28	**Unit Prices For Circuit Components**			
a)	Air Circuit Breaker without releases			
	630A ACB, 4P, EDO, AC	1		
	800A ACB, 4P, EDO, AC	1		
	1000A ACB, 4P, EDO, AC	1		
	1250A ACB, 4P, EDO, AC	1		
	1600A ACB, 4P, EDO, AC	1		
	2000A ACB, 4P, EDO, AC	1		
	2500A ACB, 4P, EDO, AC	1		
	3000A ACB, 4P, EDO, AC	1		
	4000A ACB, 4P, EDO, AC	1		
	630A ACB, 3P, EDO, AC	1		
	800A ACB, 3P, EDO, AC	1		
	1000A ACB, 3P, EDO, AC	1		
	1250A ACB, 3P, EDO, AC	1		
	1600A ACB, 3P, EDO, AC	1		
	2000A ACB, 3P, EDO, AC	1		

ANNEXURE-H

MODULE UNIT PRICE

	2500A ACB, 3P, EDO, AC	1		
	3000A ACB, 3P, EDO, AC	1		
	4000A ACB, 3P, EDO, AC	1		
	800A ACB, 2P, MDO, DC	1		
	1000A ACB, 2P, MDO, DC	1		
	1250A ACB, 2P, MDO, DC	1		
	1600A ACB, 2P, MDO, DC	1		
b)	MPCB, Short-Circuit Release			
	16A	1		
	25A	1		
	32A	1		
	63A	1		
	80A	1		
	115A	1		
	150A	1		
c)	**TP** MCCB, 2NO+2NC AUX, FSC **& O/L RELEASE**			
	16A	1		
	25A	1		
	32A	1		
	63A	1		
	100A	1		
	125A	1		
	160A	1		
	200A	1		
	250A	1		
	315A	1		
	400A	1		
d)	**TP** MCCB, 2NO+2NC AUX, **ADJ S/C & O/L RELEASE**			
	16A	1		
	25A	1		
	32A	1		
	63A	1		
	100A	1		
	125A	1		
	160A	1		
	200A	1		
	250A	1		
	315A	1		
	400A	1		
e)	**TP** MCCB with LSIG release			
	200A	1		
	250A	1		
	300A	1		
	350A	1		
	400A	1		
f)	**TP** MCCB - Motorized with LSIG release			
	200A	1		
	250A	1		
	300A	1		
	350A	1		
	400A	1		
g)	Power contactor (AC) (With 2NO & 2NC Minimum)			
	16A	1		
	25A	1		
	32A	1		
	63A	1		
	80A	1		
	115A	1		
	150A	1		
	185A	1		
	265A	1		

ANNEXURE-H

MODULE UNIT PRICE

	315A	1		
	400A	1		
h)	Power contactor (DC) (With 2NO & 2NC Minimum)			
	16A	1		
	25A	1		
	32A	1		
	63A	1		
	80A	1		
	115A	1		
	150A	1		
	185A	1		
	265A	1		
	400A	1		
i)	AC Aux. contactor With			
	2NO + 2NC	1		
	3NO + 3NC	1		
	4NO + 4NC	1		
	6NO + 6NC	1		
j)	DC Aux. contactor With			
	2NO + 2NC	1		
	3NO + 3NC	1		
	4NO + 4NC	1		
	6NO + 6NC	1		
k)	Protection Relay			
	VAGM 23	1		
	CTU 12	1		
	CTU 32	1		
	VTT 11	1		
	VAG 11	1		
	VAA 11	1		
	VAJHM 13	1		
	VAJHM 23	1		
	CDGM-12	1		
	CAG 12	1		
	CAG 34	1		
	CCUM 21	1		
	CDG 11	1		
	CDG 31	1		
	CDG 61	1		
	VDG 14	1		
	CDV 62	1		
	CAG 14	1		
	VAX 31	1		
	CAG 37	1		
	CAEM-21	1		
	VAG-21	1		
	VAJC-11	1		
	CTMM-501	1		
	MOTPRO	1		
	VAA21	1		
	VTT12	1		
	VTIG	1		
	VTU21	1		

ANNEXURE-H

MODULE UNIT PRICE

	Numerical Relay for PHASE OVER CURRENT PROTECTION (50/51), EARTH FAULT PROTECTION (50N/51N), STAND BY EARTH FAULT PROTECTION (51NS), RESTRICTED EARTH FAULT PROTECTION (64R), BUS NO VOLT, FAULT LOCKOUT FUNCTION (86), UNDER VOLTAGE WITH TIMER (27M), SYNCHRONISING CHECK FUNCTION (25, CIRCUIT BREAKER FAILURE (50BF), RELAY SELF SUPERVISION, CIRCUIT BREAKER CONDITION MONITORING, TRIP CIRCUIT SUPERVISION (95), CURRENT TRANFORMER SUPERVISION, VOLTAGE TRANFORMER SUPERVISION, BREAKER CONTROL with I/L, DISTURBANCE RECORDING, FAULT RECORDING, EVENT RECORDING, MEASUREMENT FUNCTIONS (3I, Io, 3U, Uo, Hz, P, Q, E, PF)	1		
	SEF NUMERICAL RELAY	1		
	Numerical Relay for PHASE OVER CURRENT PROTECTION (50/51), EARTH FAULT PROTECTION (50N/51N), STAND BY EARTH FAULT PROTECTION (51NS), RESTRICTED EARTH FAULT PROTECTION (64R), BUS NO VOLT, FAULT LOCKOUT FUNCTION (86), UNDER VOLTAGE WITH TIMER (27M), SYNCHRONISING CHECK FUNCTION (25, CIRCUIT BREAKER FAILURE (50BF), RELAY SELF SUPERVISION, CIRCUIT BREAKER CONDITION MONITORING, TRIP CIRCUIT SUPERVISION (95), CURRENT TRANFORMER SUPERVISION, VOLTAGE TRANFORMER SUPERVISION, BREAKER CONTROL with I/L, DISTURBANCE RECORDING, FAULT RECORDING, EVENT RECORDING, MEASUREMENT FUNCTIONS (3I, Io, 3U, Uo, Hz, P, Q, E, PF), MEASUREMENT AND DISPLAY OF HARMONIC CONTECT OF VOLTAGE & CURRENT	1		
	Numerical Relay for PHASE OVER CURRENT PROTECTION (50/51), EARTH FAULT PROTECTION (50N/51N), BUS NO VOLT, FAULT LOCKOUT FUNCTION (86), UNDER VOLTAGE WITH TIMER (27M), SYNCHRONISING CHECK FUNCTION (25, CIRCUIT BREAKER FAILURE (50BF), RELAY SELF SUPERVISION, CIRCUIT BREAKER CONDITION MONITORING, TRIP CIRCUIT SUPERVISION (95), CURRENT TRANFORMER SUPERVISION, VOLTAGE TRANFORMER SUPERVISION, BREAKER CONTROL with I/L, DISTURBANCE RECORDING, FAULT RECORDING, EVENT RECORDING, MEASUREMENT FUNCTIONS (3I, Io, 3U, Uo, Hz, P, Q, E, PF)	1		
	Numerical Relay for PHASE OVER CURRENT PROTECTION (50/51), EARTH FAULT PROTECTION (50N/51N), RESTRICTED EARTH FAULT PROTECTION (64R), BUS NO VOLT, FAULT LOCKOUT FUNCTION (86), UNDER VOLTAGE WITH TIMER (27M), SYNCHRONISING CHECK FUNCTION (25, CIRCUIT BREAKER FAILURE (50BF), DIFFERENTIAL PROTECTION (87) (HIGH IMPEDANCE), REVERSE POWER PROTECTION, DG NEUTRAL DISPLACEMENT (59), DG MONITORING, RELAY SELF SUPERVISION, CIRCUIT BREAKER CONDITION MONITORING, TRIP CIRCUIT SUPERVISION (95), CURRENT TRANFORMER SUPERVISION, VOLTAGE TRANFORMER SUPERVISION, BREAKER CONTROL with I/L, DISTURBANCE RECORDING, FAULT RECORDING, EVENT RECORDING, MEASUREMENT FUNCTIONS (3I, Io, 3U, Uo, Hz, P, Q, E, PF)	1		
	Numerical Relay for PHASE OVER CURRENT PROTECTION (50/51), EARTH FAULT PROTECTION (50N/51N), STALLING/ LOCKED ROTOR PROTECTION (50L/R), THERMAL OVERLAOD PROTECTION (49), NEGATIVE PHASE SEQUENCE PROTECTION (46), BUS NO VOLT, REPETATIVE START PROTECTION (66), FAULT LOCKOUT FUNCTION (86), UNDER VOLTAGE WITH TIMER (27M), MOTOR DIFFERENTIAL PROTECTION (87M), CIRCUIT BREAKER FAILURE (50BF), PHASE REVERSAL PROTECTION (46R), CURRENT UNBALANCE PROTECTION, RELAY SELF SUPERVISION, CIRCUIT BREAKER CONDITION MONITORING, TRIP CIRCUIT SUPERVISION (95), CURRENT TRANFORMER SUPERVISION, VOLTAGE TRANFORMER SUPERVISION, BREAKER CONTROL with I/L, DISTURBANCE RECORDING, FAULT RECORDING, EVENT RECORDING, MEASUREMENT FUNCTIONS (3I, Io, 3U, Uo, Hz, P, Q, E, PF)	1		
	Numerical Check synchronising Relay	1		
	Check synchronising Relay Type-SKE11 or better	1		
	Guard Relay	1		

ANNEXURE-H

MODULE UNIT PRICE

	BATTERY EARTH FAULT RELAY, 1-7mA, NOMINAL VOLTAGE-220V DC, 1DV, 2NO S/R, FLUSH	1		
	OVERLOAD RELAY, NOMINAL VOLTAGE-220V DC, O/V VLTAGE SETTING-110%, 1/4NV, 1NO+1NC S/R	1		
	UNDER VOLTAGE RELAY, NOMINAL VOLTAGE-220V DC, U/V SETTING-80%, AUX..-240V AC, 1/2NH, 1NO+2NC S/R	1		
	BATTERY EARTH FAULT RELAY, 1-7mA, NOMINAL VOLTAGE-48V DC, 1DV, 2NO S/R, FLUSH	1		
	OVERLOAD RELAY, NOMINAL VOLTAGE-48V DC, O/V VLTAGE SETTING-110%, 1/4NV, 1NO+1NC S/R	1		
	UNDER VOLTAGE RELAY, NOMINAL VOLTAGE-48V DC, U/V SETTING-80%, AUX..-240V AC, 1/2NH, 1NO+2NC S/R	1		
	JAMMING RELAY	1		
	ELECTRONIC TYPE JAMMING RELAY	1		
l)	**IMC & its modules for Unidirectional Drive**			
1.1	IMC Upto 5.5KW	1		
1.2	Current Sensing Module for above (if not Integral in IMC Module)	1		
2.1	IMC for 5.6 - 7.0KW	1		
2.2	Current Sensing Module for above (if not Integral in IMC Module)	1		
3.1	IMC for 7.1 - 13KW	1		
3.2	Current Sensing Module for above (if not Integral in IMC Module)	1		
4.1	IMC for 13.1 - 24KW	1		
4.2	Current Sensing Module for above (if not Integral in IMC Module)	1		
5.1	IMC for 24.1 - 29.9KW	1		
5.2	Current Sensing Module for above (if not Integral in IMC Module)	1		
6.1	IMC for 30.0 - 37.0KW	1		
6.2	Current Sensing Module for above (if not Integral in IMC Module)	1		
6.3	Voltage Sensing Module for above (if not Integral in IMC Module)	1		
7.1	IMC for 37.1 - 55KW	1		
7.2	Current Sensing Module for above (if not Integral in IMC Module)	1		
7.3	Voltage Sensing Module for above (if not Integral in IMC Module)	1		
8.1	IMC for 55.1 - 80.0KW	1		
8.2	Current Sensing Module for above (if not Integral in IMC Module)	1		
8.3	Voltage Sensing Module for above (if not Integral in IMC Module)	1		
9.1	IMC for 80.1 - 89.9KW	1		
9.2	Current Sensing Module for above (if not Integral in IMC Module)	1		
9.3	Voltage Sensing Module for above (if not Integral in IMC Module)	1		
10	Expansion Module for IMC	1		
m)	**Timer (DC)**			
	ON DELAY TIMER, 0.5-5SEC., 220V DC, 2NO+2NC	1		
	ON DELAY TIMER, 1.0-10SEC. 220V DC, 2NO+2NC	1		
	240VAC MTR RESTART CONTROL TIMER (.2-60SECS)	1		
	240VAC ON DELAY TIMER(1-10SECNS)WITH 1NO	1		
	220VDC ON DELAY TIMER(.5-5SECS) WITH 1NO	1		
	220VDC 0N DELAY TIMER(0.5-5SECS)WITH 3NO	1		
	220VDC ON DELAY TIMER(1-10SECS) WITH 3NO	1		
n)	**Meter**			
	AC ammeter (Digital)	1		
	AC ammeter (Analog) linear scale	1		
	AC ammeter (Analog) compressed scale	1		
	DC ammeter (Digital)	1		
	DC ammeter (Analog)	1		
	DC ammeter with shunt and center zero	1		
	AC voltmeter (Digital)	1		
	DC voltmeter (Analog)	1		
	Wattmeter (3 Phase)	1		
	Wattmeter (1 Phase)	1		
	TVM meter	1		
	DIGITAL ENERGY METER	1		
	Frequency meter	1		
	Synchroscope	1		
	Differential Voltmeter	1		
	Differential Frequency meter	1		
	Multifunction digital Energy meter with RS485 Port (0.2 Acc. Class)	1		

ANNEXURE-H

MODULE UNIT PRICE

	Multifunction digital Energy meter with RS485 Port (0.5 Acc. Class)	1		
	Multifunction digital Energy meter with RS485 Port (1.0 Acc. Class)	1		
o)	**Single Phase Preventor Relay**	1		
p)	**MCB**			
	6A, 4P 415V AC	1		
	10A, 4P 415V AC	1		
	16A, 4P 415V AC	1		
	6A DP, 240V AC	1		
	10A DP, 240V AC	1		
	16A DP, 240V AC	1		
	32A DP, 240V AC	1		
	6A DP, 110V AC	1		
	10A DP, 110V AC	1		
	16A DP, 110V AC	1		
	32A DP, 110V AC	1		
	6A DP, 220V DC	1		
	10A DP, 220V DC	1		
	16A DP, 220V DC	1		
	6A SP, 240V AC	1		
	10A SP, 240V AC	1		
	16A SP, 240V AC	1		
	32A SP, 240V AC	1		
	6A SP, 110V AC	1		
	10A SP, 110V AC	1		
	16A SP, 110V AC	1		
	32A SP, 110V AC	1		
	6A SP, 220V DC	1		
	10A SP, 220V DC	1		
	16A SP, 220V DC	1		
q)	**SWITCH & PUSH BUTTON**			
	BREAKER CONTROL SWITCH, 16A,220V DC, 2CLOSE+2TRIP	1		
	DC ISOLATING SWITCH 16A,220V DC, DP, BASE MTG.	1		
	16A, 240V AC SELECTOR SWITCH 3WAY, 4POLE, FLUSH MTG	1		
	25A, 240V AC SELECTOR SWITCH 3WAY, 4POLE, FLUSH MTG	1		
	16A, 240V AC SELECTOR SWITCH 2WAY, 2POLE, FLUSH MTG	1		
	NORMAL/ TRIAL SEL. SWITCH, 2POLE , 2WAY, 10A 240V AC, FLUSH MTG,	1		
	MCC/ NORMAL/ TRIAL SEL. SWITCH, 2POLE ,3WAY, 10A 240V AC, FLUSH MTG	1		
	SWGR/ REMOTE SEL. SWITCH 3POLE 2WAY,16A 220V DC, FLUSH MTG	1		
	SWGR/ NORMAL/ TRIAL SEL. SWITCH, 3POLE, 3WAY, 16A 220V DC, FLUSH MTG.	1		
	NORMAL/ TRIAL SEL. SWITCH, 2POLE , 2WAY, 10A 240V AC, FLUSH MTG, LOCKABEL TYPE	1		
	MCC/ NORMAL/ TRIAL SEL. SWITCH, 2POLE ,3WAY, 10A 240V AC, FLUSH MTG, LOCKABEL TYPE	1		
	SWGR/ REMOTE SEL. SWITCH 3POLE 2WAY,16A 220V DC, FLUSH MTG.LOCKABLE TYPE	1		
	SWGR/ NORMAL/ TRIAL SEL. SWITCH, 3POLE, 3WAY, 16A 220V DC, FLUSH MTG., LOCKABLE TYPE	1		
	AMMETER SELECTOR SWITCH	1		
	VOLTMETER SELECTOR SWITCH	1		
	TOGGLE SWITCH 5A, 240V AC	1		
	AC SWITCH SPST-5A,240V AC	1		
	10A, 220V DC SWITCH	1		
	Door Limit switch	1		
	Ammeter selector switch	1		
	Voltmeter selector switch	1		
	Synchronisation selector switch	1		
	Trip selector switch	1		
	Push Button	1		
	2NO + 2NC Shrouded	1		
	1NO + 1NC Shrouded	1		

ANNEXURE-H

MODULE UNIT PRICE

	2NO + 2NC Mushroom head stayput	1		
	2NO + 2NC Lockable type	1		
r)	**Indicating Lamp Assembly (LED Type)**			
	240V AC-GREEN	1		
	240V AC-RED	1		
	240V AC- AMBER	1		
	110V AC-GREEN	1		
	110V AC-RED	1		
	110V AC- AMBER	1		
	220V DC-WHITE	1		
	220V DC-RED	1		
	220V DC-GREEN	1		
	220V DC-BLUE	1		
	220V DC- AMBER	1		
	63.5V AC-RED	1		
	63.5V AC-YELLOW	1		
	63.5V AC-BLUE	1		
s)	**CT**			
i)	Metering CT			
	Upto 75/1A	1		
	100/1A	1		
	125/1A	1		
	150/1A	1		
	200/1A	1		
	250/1A	1		
	300/1A	1		
	400/1A	1		
	500/1A	1		
	630/1A	1		
	800/1A	1		
	1000/1A	1		
	1250/1A	1		
	1600/1A	1		
	2000/1A	1		
	2500/1A	1		
	3000/1A	1		
	4000/1A	1		
ii)	Protection CT (5P20)			
	Upto 75/1A	1		
	100/1A	1		
	125/1A	1		
	150/1A	1		
	200/1A	1		
	250/1A	1		
	300/1A	1		
	400/1A	1		
	500/1A	1		
	630/1A	1		
	800/1A	1		
	1000/1A	1		
	1250/1A	1		
	1600/1A	1		
	2000/1A	1		
	2500/1A	1		
	3000/1A	1		
	4000/1A	1		
	630/5A	1		
	800/5A	1		
	1000/5A	1		
	1250/5A	1		
	1600/5A	1		

ANNEXURE-H

MODULE UNIT PRICE

	2000/5A	1		
	2500/5A	1		
	3000/5A	1		
	4000/5A	1		
iii)	PS Class CT			
	1000/1A	1		
	1600/1A	1		
	2000/1A	1		
	2500/1A	1		
	3000/1A	1		
	4000/1A	1		
	1000/5A	1		
	1600/5A	1		
	2000/5A	1		
	2500/5A	1		
	3000/5A	1		
	4000/5A	1		
t)	**Voltage Transformer**			
	415/√3 : 110/√ 3V, 50VA	1		
	415/√3 : 110/√3 V, 100VA	1		
	415/√3 : 240/√3 V, 50VA	1		
	415/√3 : 240/√3 V, 100VA	1		
	415 : 110V, 50VA	1		
	415 : 110V, 100VA	1		
	415 : 240V, 50VA	1		
	415 : 240V, 100VA	1		
u)	**Toggle switch (16A)**	1		
v)	**Secondary Isolating Contact Block**	1		
w)	**Control Terminal (Fixed)**	1		
x)	**Control Terminal (Drawout)**	1		
y)	**Thermostat, Dial type**	1		
z)	**CONTROL TRANSFORMER**			
	415/240V,CL-B, 1 KVA	1		
	415/240V,CL-B, 2KVA	1		
	415/240V,CL-B, 2.5KVA	1		
	415/240V,CL-B, 3KVA	1		
	415/240V,CL-B, 5KVA	1		
	415/240V,CL-B, 7.5KVA	1		
	415/240V,CL-B, 10KVA	1		
	415/110V,CL-B, 1 KVA	1		
	415/110V,CL-B, 2KVA	1		
	415/110V,CL-B, 2.5KVA	1		
	415/110V,CL-B, 3KVA	1		
	415/110V,CL-B, 5KVA	1		
	415/110V,CL-B, 7.5KVA	1		
	415/110V,CL-B, 10KVA	1		
aa)	415/110V,CL-B, 10KVA			
	4-20mA Dual o/p, Aux sup 220V DC, 1A, Current Transducer	1		
	4-20mA Dual o/p, Aux sup 240V AC, 1A, Current Transducer	1		
	4-20mA Dual o/p, Aux sup 110V AC, 1A, Current Transducer	1		
	4-20mA Dual o/p, Aux sup 220V DC, VoltageTransducer, PTR 415/110V	1		
	4-20mA Dual o/p, Aux sup 240V AC, VoltageTransducer, PTR 415/110V	1		
	4-20mA Dual o/p, Aux sup 110V AC, VoltageTransducer, PTR 415/110V	1		
	4-20mA Dual o/p, Aux sup 220V DC, FrequencyTransducer, PTR 415/110V	1		
	4-20mA Dual o/p, Aux sup 220V DC, Input 0-75mV DC, Current Transducer-DC	1		
	4-20mA Dual o/p, Aux sup 240V AC, Input Voltage 0-220V DC, Voltage Transducer-DC	1		
	4-20mA Dual Output kW transducer	1		

ANNEXURE-H

MODULE UNIT PRICE

	4-20mA Dual Output kVA transducer	1		
	4-20mA Dual Output PF transducer	1		
	4-20mA Dual Output Frequency transducer	1		
ab)	**Interposing relay RE 302 or Eqvt with freewheeling diode & LED**	1		
ac)	**3 PIN SOCKET - 5A, 110V AC, 3PIN**	1		
ad)	**SPACE HEATER**	1		
ae)	**NEUTRAL LINK WITH MOUNTING ASSEMBLY**			
	20A FOR CONTROL CKT. & POWER CKT. UPTO 25A MCCB RATING	1		
	32A FOR 50A MCCB RATING	1		
	63A FOR 100A & 125A MCCB RATING	1		
	125A FOR 250A MCCB RATING	1		
	250A FOR 400A & 500A MCCB RATING	1		
af)	**CASTLE KEY INTERLOCK FOR MCCB - 3LOCK+2KEY**	1		
ag)	**MECHANICAL INTERLOCK FOR POWER CONTACTOR**			
	16A	1		
	25A	1		
	32A	1		
	63A	1		
	80A	1		
	115A	1		
	150A	1		
	185A	1		
	265A	1		
	315A	1		
	400A	1		
ah)	**ADDON BLOCK FOR CONTACTOR**			
	2NO+2NC	1		
	3NO+1NC	1		
	1NO + 1NC	1		
	1NO	1		
	1NC	1		
ai)	**ISOLATING TRANSFORMER**			
	ISOLATING TRANSFORMER-15kVA	1		
	ISOLATING TRANSFORMER-20kVA	1		
	ISOLATING TRANSFORMER-25kVA	1		
	ISOLATING TRANSFORMER-30kVA	1		
aj)	**ISOLATOR WITH HANDLE**			
	16A	1		
	32A	1		
29	**Foundation Frame**			
a)	MCC panel			
	upto 1600A (SF)	1		
	2500A (SF)	1		
	3000A (SF)	1		
	4000A (SF)	1		
	upto 1600A (DF)	1		
	2500A (DF)	1		
	3000A (DF)	1		
	4000A (DF)	1		
b)	220V DCDB panel			
	SF	1		
	DF	1		
c)	PCC / PMCC panel			
	upto 1600A	1		
	2000A	1		
	2500A	1		
	3000A	1		
	4000A	1		
30	**Connection from PMCC/MCC panel to PMCC/MCC panel**			
	250A	1		
	400A	1		

ANNEXURE-H

MODULE UNIT PRICE

	630A	1		
	800A	1		
	1000A	1		
	1200A	1		
	1600A	1		
	2000A	1		
	2500A	1		
	3000A	1		
	4000A	1		
31	**Cable Glands & Lugs:**			
a)	**Single Compression Cable Glands for cable sizes:**			
	2C X 2.5 Sq. mm.	1		
	3C X 2.5 Sq. mm.	1		
	5C X 2.5 Sq. mm.	1		
	7C X 2.5 Sq. mm.	1		
	10C X 2.5 Sq. mm.	1		
	14C X 2.5 Sq. mm.	1		
	2C X 10 Sq. mm.	1		
	2C X 16 Sq. mm.	1		
	2C X 25 Sq. mm.	1		
	2C X 35 Sq. mm.	1		
	2C X 50 Sq. mm.	1		
	2C X 70 Sq. mm.	1		
	2C X 95 Sq. mm.	1		
	3C X 2.5 Sq. mm.	1		
	3C X 10 Sq. mm.	1		
	3C X 16 Sq. mm.	1		
	3C X 25 Sq. mm.	1		
	3C X 35 Sq. mm.	1		
	3C X 50 Sq. mm.	1		
	3C X 70 Sq. mm.	1		
	3C X 95 Sq. mm.	1		
	3C X 150 Sq. mm.	1		
	3C X 240 Sq. mm.	1		
	3C X 300 Sq. mm.	1		
	3.5C X 25 Sq. mm.	1		
	3.5C X 50 Sq. mm.	1		
	3.5C X 70 Sq. mm.	1		
	3.5C X 95 Sq. mm.	1		
	3.5C X 240 Sq. mm.	1		
	3.5C X 300 Sq. mm.	1		
	4C X 16 Sq. mm.	1		
	4C X 35 Sq. mm.	1		
	1C X 300 Sq. mm.	1		
	1C X 630 Sq. mm.	1		
b)	**Double Compression Cable Glands for cable sizes:**			
	2C X 2.5 Sq. mm.	1		
	3C X 2.5 Sq. mm.	1		
	5C X 2.5 Sq. mm.	1		
	7C X 2.5 Sq. mm.	1		
	12C X 2.5 Sq. mm.	1		
	16C X 2.5 Sq. mm.	1		
	2C X 10 Sq. mm.	1		
	2C X 16 Sq. mm.	1		
	2C X 25 Sq. mm.	1		
	2C X 35 Sq. mm.	1		
	2C X 50 Sq. mm.	1		
	2C X 70 Sq. mm.	1		
	2C X 95 Sq. mm.	1		
	3C X 2.5 Sq. mm.	1		
	3C X 10 Sq. mm.	1		

ANNEXURE-H

MODULE UNIT PRICE

	3C X 16 Sq. mm.	1		
	3C X 25 Sq. mm.	1		
	3C X 35 Sq. mm.	1		
	3C X 50 Sq. mm.	1		
	3C X 70 Sq. mm.	1		
	3C X 95 Sq. mm.	1		
	3C X 150 Sq. mm.	1		
	3C X 240 Sq. mm.	1		
	3C X 300 Sq. mm.	1		
	3.5C X 25 Sq. mm.	1		
	3.5C X 50 Sq. mm.	1		
	3.5C X 70 Sq. mm.	1		
	3.5C X 95 Sq. mm.	1		
	3.5C X 240 Sq. mm.	1		
	3.5C X 300 Sq. mm.	1		
	4C X 16 Sq. mm.	1		
	4C X 35 Sq. mm.	1		
	1C X 300 Sq. mm.	1		
	1C X 630 Sq. mm.	1		
c)	**Cable Lugs for sizes:**			
	1.5 Sq. mm.	1		
	2.5 Sq. mm.	1		
	10 Sq. mm.	1		
	16 Sq. mm.	1		
	25 Sq. mm.	1		
	35 Sq. mm.	1		
	50 Sq. mm.	1		
	70 Sq. mm.	1		
	95 Sq. mm.	1		
	120 Sq. mm.	1		
	150 Sq. mm.	1		
	185 Sq. mm.	1		
	240 Sq. mm.	1		
	300 Sq. mm.	1		
	630 Sq. mm.	1		
32.1	**Thermal O/L relay with SPP - OLR**			
	Upto 5.5KW	1		
	5.6 to 7.0KW	1		
	7.1 to 13KW	1		
	13.1 to 24KW	1		
	24.1 to 29.9KW	1		
	30.0 to 37.0KW	1		
	37.1 to 55.0KW	1		
	55.1 to 80.0KW	1		
	80.1 to 89.9KW	1		
32.2	**Heavy Duty Thermal O/L relay with SPP - OLR**			
	Upto 5.5KW	1		
	5.6 to 7.0KW	1		
	7.1 to 13KW	1		
	13.1 to 24KW	1		
	24.1 to 29.9KW	1		
	30.0 to 37.0KW	1		
	37.1 to 55.0KW	1		
	55.1 to 80.0KW	1		
	80.1 to 89.9KW	1		
33	**Daily 8 hour rate deployed at site:**			
	Engineer : (per day)	1		
34	**Module Name plate**	1		
35	**Wires for Secondary wiring:**			
a)	1.5 Sq. mm. per meter	1		
b)	2.5 Sq. mm. per meter	1		

ANNEXURE-H

MODULE UNIT PRICE

	c)	4.0 Sq. mm. per meter	1		
36		**Control Terminal for Secondary wiring suitable for cable size:**			
	1)	0.5 Sq. mm.	1		
	2)	1.5 Sq. mm.	1		
	3)	2.5 Sq. mm.	1		
37		**Electrical Junction Boxes (for termination of 0.5 sqmm screened control cables)**			
	a)	48 ways	1		
	b)	64 ways	1		
	c)	72 ways	1		
	a)	96 ways	1		
38		**ISMC channels**			
	a)	ISMC 75 channel per meter	1		
	b)	ISMC 100 channel per meter	1		
39		**Temperature Sensor for WIRELESS TEMPERATURE MONITORING SENSOR**	1		
40		**Wireless Transmitter for WIRELESS TEMPERATURE MONITORING SENSOR**	1		
41		**Wireless Receiver for WIRELESS TEMPERATURE MONITORING SENSOR**	1		
42		**Additional components (except networking hardware mentioned in Annexure B3) required for completeness of WIRELESS TEMPERATURE MONITORING SENSOR**	1		
43		**DP MCCB, ADJ. SC & O/L Release:**			
		16A	1		
		25A	1		
		32A	1		
		63A	1		
		100A	1		
		125A	1		
		160A	1		
		200A	1		
44		**TP MCCB motor duty type with S/C release:**			
		16A	1		
		25A	1		
		32A	1		
		63A	1		
		100A	1		
		125A	1		
		160A	1		
		200A	1		
		250A	1		
		400A	1		
45		**TP MCCB ADJ S/C , O/L, E/F release:**			
		16A	1		
		25A	1		
		32A	1		
		63A	1		
		80A	1		
		100A	1		
		125A	1		
		160A	1		
		200A	1		
		250A	1		
		400A	1		
46		**DC MCCB**			
		16A	1		
		25A	1		
		32A	1		
		63A	1		
		80A	1		
		115A	1		
		150A	1		
		185A	1		
		265A	1		
		315A	1		

ANNEXURE-H

MODULE UNIT PRICE

	400A	1		
47	**SWITCH FUSE UNIT (DC) - DP along with fuse, link etc complete (suitable for 40kA fault current)**			
	16A	1		
	32A	1		
	63A	1		
	100A	1		
	125A	1		
	200A	1		
	250A	1		
	300A	1		
	400A	1		
	600A	1		
	800A	1		
48	**SWITCH FUSE UNIT (AC) - TP along with fuse, link etc complete**			
	16A	1		
	32A	1		
	63A	1		
	100A	1		
	125A	1		
	200A	1		
	250A	1		
	300A	1		
	400A	1		
	600A	1		
	800A	1		
49	**OLM, Profibus DP connector along with accessories (at Y-link end) for interface of Y-Link with DDCMIS.**	1		
50	**SP ON/ OFF SWITCH FOR MOTOR SPACE HEATER OF BREAKER MOTOR FDR, 10A, 240V AC**	1		
51	**4 POLE, 2 POSI., SELECTOR SWITCH FOR CONTROL TRF., 110V AC**	1		
52	***EXTENDED ROTORY HANDLE***	1		
53	**AUXILIARY CONTACT FOR MCCB 1C/O**	1		
54	**TRIP CONTACT FOR MCCB 1C/O**	1		
55	**CONTROL TERMINALS (DRAWOUT)**	1		
56	**3 PIN INDUSTRIAL SOCKET & PLUG**	1		
57	**ROTARY ON/OFF SWITCH**	1		
58	**TIMER WITH 2C/O**	1		
59	**CONTROL TRANSFORMER, DRY TYPE, CAST RESIN, 415/24V, INS. CL-B OR BETTER**	1		
60	***RECTIFIER***	1		
61	***LIMIT SWITCH (BREAKER)***	1		
62	**Ethernet Switch with 16 Copper Ports & 4 FO ports**	1		
63	**Ethernet Switch with 08 Copper Ports & 4 FO ports**	1		
64	**Cat5e/ Cat6 Ethernet Cable**	1		
65	**Fibre Optic Patch Cord (minimum length - 10metres)**	1		
66	**9 WINDOWS ALARM ANNUNCIATION -1**	1		
67	**ELECTRONIC HOOTER (96SQMM)**	1		
68	**Class 0.2s accuracy energy meters suitable for ABT requirement (Specification in Annexure-I)**	**1**		
NOTE:	**The bidder should list the unit price for any additional modules, components, or items that are not mentioned in the above specifications but may be necessary to fulfill the customer's requirements.**			

ANNEXURE-I

Specification for ABT Metering system

A. The ABT metering system shall have following features:

i. ABT meters shall have provision for downloading of data through an optical port and /or through RS 232/485/ Ethernet port.

ii. All these meters shall be networked using Modbus protocol and connected to the Metering Master Station (MMS), provided for the ABT meters.

B. Technical Requirements of Energy Meters for ABT Requirement

i. Shall be microprocessor-based conforming to IEC 62052-11, IEC 62053-22, IS 14697

ii. Shall carry out measurement of active energy (both import and export) and reactive energy (both import and export) by 3-phase, 4 wire principle suitable for balanced/ unbalanced 3 phase loads.

iii. Shall have an accuracy of energy measurement of at least Class 0.2S for active energy and at least Class 0.5 for reactive energy.

iv. The active and reactive energy shall be directly computed in CT & VT primary ratings.

v. The reactive energy shall be recorded for each metering interval in four different registers as MVARh (lag) when active export, MVARh (Lag) when active import, MVARh (lead) when active export, MVARh (Lead) when active import.

vi. Two separate registers shall be provided to record MVARH when system voltage is >103% and when system voltage is < 97%.

vii. Shall compute the net MWh and MVARh during each successive 5 minute and 15-minute block metering interval along with a plus/minus sign, instantaneous MWh, instantaneous MVARh, average frequency of each 5 minute and 15 minutes, net active energy at midnight, net reactive energy for voltage low and high conditions at each midnight.

viii. Each energy meter shall have a display unit. It shall display the net MWh and MVARh with a plus/minus sign and average frequency during the previous metering interval; peak MWh demand since the last demand reset; accumulated total (instantaneous) MWh and MVARh with a plus/minus sign, date, and time; and instantaneous current and voltage on each phase.

ix. All the registers shall be stored in a non-volatile memory. Meter registers for each metering interval, as well as accumulated totals, shall be downloadable. All the net active/reactive energy values displayed or stored shall be with a plus /minus sign for export/import.

x. At least the following data shall be stored before being over-written for the following

parameters:-

Parameters Details Min No. of days

	Parameters	Details	Min No. of days
1	Net MWH	5 min and 15 min block	40 days in meter
2	Aver Freq	5 min and 15 min block	40 days in meter
3	Net MVARH for V>103%	5 min and 15 min block	40 days in meter
4	Net MVARH for V<97%	5 min and 15 min block	40 days in meter

5	Cumulative Net MWH at every midnight	5 min and 15 min block	10 days in meter/ 40 days in PC
6	Cumulative Net MVARH for V>103% at every midnight		10 days in meter/ 40 days in PC
7	Cumulative Net MVARH for V<97% at every midnight		10 days in meter/ 40 days in PC
8	Date and time blocks of VT failure on any phase		

xi. Shall have a built-in clock and calendar with an accuracy of less than 15 seconds per month drift without assistance of external time synchronizing pulse.

xii. Date/time shall be displayed on demand. The clock shall be synchronized by GPS time synchronization equipment being supplied by the contractor.

xiii. The voltage monitoring shall be inbuilt feature provided to signal failures to the Substation Automation System, the meter shall be suitable to operate with power drawn from the VT supplies.

xiv. The power supply to the meter shall be healthy even with a single-phase VT supply. An automatic backup, in the event of non-availability of voltage in all the phases, shall be provided by a built-in long-life battery and shall not need replacement for at least 10 years with a continuous VT interruption of at least 2 years. Even under absence of VT input, energy meter display shall be available, and it shall be possible to download data from the energy meter. In case data downloading is not possible in absence of VT supply, meter with provision of 220V DC auxiliary supply shall be provided. Date and time of VT interruption and restoration shall be automatically stored in a non-volatile memory.

xv. Shall have an optical port on the front of the meter for data collection from either a handheld meter reading instrument (MRI) having a display for energy readings or from a notebook computer with suitable software. The contractor shall supply the MRI and/or notebook complete with all optical interface unit required.

xvi. Meters must also comply with any other additional/latest requirements as notified by CEA/CERC even if not specified in relevant clauses.

xvii. The meter shall have means to test MWh and MVARh accuracy and calibration at site in situ and test terminal blocks shall be provided for the same.

xviii. Each meter shall have a unique identification code provided by the Owner and shall be permanently marked on the front of the meter and stored in the non-volatile memory of the meter.

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IEEMA/PVC/LVSWGR/2019 (R-2) **Effective from: 1st January 2019**

PRICE VARIATION CLAUSE FOR LV SWITCHGEAR AND CONTROLGEAR (up to & including 1100 V)

The price quoted/confirmed is based on the input cost of raw materials/components and labour cost as on the date of quotation and the same is deemed to be related to prices of raw materials and all India average consumer price index number for industrial workers as specified in the price variation clause given below. In case of any variation in these prices and index numbers, the price payable shall be subject to adjustment, up or down in accordance with the following formula:

$$P = \frac{P0}{100}\left(21 + 19\,\frac{IS}{IS0} + 21\,\frac{C}{C0} + 12\,\frac{AL}{AL0} + 15\,\frac{In}{In0} + 12\,\frac{W}{W0}\right)$$

Wherein,

P = Price payable as adjusted in accordance with the above formula.

P_0 = Price quoted/confirmed. (Exclusive of all taxes & duties)

IS_0 = Wholesale price index number for 'Manufacture of Basic Metals' (Base: 2011-12=100)(refer notes)
This index number is as applicable for the month, **THREE** month prior to the date of tendering.

C_0 = Average LME settlement price of copper wire bars (refer notes)
This price is as applicable for the month, **ONE** month prior to the date of tendering.

Al_0 = Price of busbar grade aluminium (refer notes).
This price is as applicable on the 1st working day of the month, **ONE** month prior to the date of tendering

In_0 = Price of phenolic moulding powder
This price is as applicable on the 1st working day of the month, **ONE** month prior to the date of tendering.

W_0 = All India average consumer price index number for industrial workers, as published by the Labour Bureau, Ministry of Labour, Govt. of India (Base: 2001 = 100)
This index number is as applicable for the month, **Four** months prior to the date of tendering.

For example, if date of tendering falls in April 2019, applicable prices of Copper (C_0), Aluminium Busbar (Al_0) and Insulating Material (In_0) should be as on 1st March 2019 and Wholesale price index number for 'Manufacture of Basic Metals' (IS_0) and all India average consumer price index no. (W_0) should be for the month of January 2019.

The above prices and indices are as published by IEEMA vide circular reference number IEEMA(PVC)/SWGR(R-1)/_/_ **ONE** month prior to the date of tendering.

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IS = Wholesale price index number for 'Manufacture of Basic Metals' (Base: 2011-12=100) (refer notes)
This index number is as applicable for the month, **FOUR** month prior to the date of delivery.

C = Average LME settlement price of copper wire bars (refer notes)
This price is as applicable for the month, **TWO** month prior to the date of delivery.

Al = Price of busbar grade aluminium (refer notes).
This price is as applicable on the 1st working day of the month, **TWO** month prior to the date of delivery.

In = Price of phenolic moulding powder
This price is as applicable on the 1st working day of the month, **TWO** month prior to the date of delivery.

W = All India average consumer price index number for industrial workers, as published by the Labour Bureau, Ministry of Labour, Govt. of India (Base: 2001 = 100)
This index number is as applicable for the month, **FIVE** months prior to the date of delivery.

For example, if date of delivery in terms of clause given below falls in June 2019, applicable prices of Copper (C_0), Aluminium Busbar (Al_0) and Insulating Material (In_0) should be as on 1st April 2019 and Wholesale price index number for 'Manufacture of Basic Metals' (S_0) and all India average consumer price index no. (W_0) should be for the month of February 2019.

The date of delivery is the date on which the product is notified as being ready for inspection/despatch (in the absence of such notification, the date of manufacturer's despatch note is to be considered as the date of delivery) or the contracted delivery date (including any agreed extension thereto), whichever is earlier.

Notes

a) All prices of raw materials are exclusive of modvatable GST/CV duty amount and exclusive of any other central, state or local taxes, octroi etc.

b) The details of prices are as under:

1. The wholesale price index number for 'Manufacture of Basic Metals' is as published by the Office of Economic Advisor, Ministry of commerce & Industry, Govt. of India, New Delhi with base 2011-12 = 100

2. The LME price of Copper Wire Bars (in Rs./MT) is the LME average settlement price of Copper Wire Bars converted into Indian Rupees with applicable average exchange rate of SBI of the month. This price is the landed cost, inclusive of applicable customs duty only but exclusive of countervailing duty

3. The price of busbar grade aluminium (in Rs/MT) is the average of ex-works price as quoted by the two primary producers for the busbar size 152.4 x 6.35 mm flat approximately, grade equivalent to E91 E as per IS 5082-1998 (or the latest).

4. The price of insulating material (in Rs/Kg) is the average price of phenolic moulding powder quoted by three manufacturers applicable for Switchgear and Controlgear of medium/lower voltage up to 1100 volts

Senior Director

PRE QUALIFICATION REQUIREMENT (TECHNICAL)

SCOPE: Supply: YES; **Erection & Commissioning**: NO;

Route 1

a) Bidder should have manufactured and supplied at least a total of four hundred & fifty (450) numbers of draw out type Air Circuit Breaker Panels and / or draw out type Motor Control Centre Panels with fault rating of at least 45kA for one (1) second and 105kA peak under a single order and these panels should have been in successful operation for at least two (2) years.

And

b) Bidder should have manufactured and supplied at least one hundred & fifty (150) numbers of Air Circuit Breakers having fault rating of at least 45kA rms BREAKING, 105kA peak MAKING and 45kA withstand for one (1) second, and their associated draw out type Air circuit breaker panels having fault rating of at least 45kA for one (1) second and 105kA peak, which should have been in successful operation for at least two (2) years.

Route 2

a) Bidder should have manufactured and supplied at least a total of two hundred & twenty-five (225) numbers of draw out type Air Circuit Breaker Panels and / or draw out type Motor Control Centre Panels with fault rating of at least 45kA for one (1) second and 105kA peak under a single order and these panels should have been in successful operation for at least two (2) years.

And

b) Bidder should have manufactured and supplied at least seventy-five (75) numbers of draw out type Air Circuit Breaker panels having fault rating of at least 45kA for one (1) second and 105kA peak, which should have been in successful operation for at least two (2) years.

And

c) Bidder shall be considered qualified provided its Associate or Collaborator or Technology Provider or Licensor meets the requirement stipulated in Route-1 for sourcing of Air Circuit Breakers. The Associate or Collaborator or Technology Provider or Licensor shall provide a letter of technical support for successful performance of the Air Circuit Breakers, as per the format, given in the bidding document. This letter of technical support should be submitted at the time of placement of order on the bidder.

And

d) Bidder should have established manufacturing facility for draw out type Air Circuit Breaker Panels and draw out type Motor Control Centre Panels in India. Further, all the panels for this project shall be manufactured and supplied from the Indian manufacturing facility.

NOTES:

1. Each Single Front Panel shall be counted as one (1) Panel, Double Front Panel as one (1) Panel and Air Circuit Breaker Panel as one (1) Panel.

2. For the purpose of qualification of Bidders, experience shall be reckoned as on 05.03.2024.

3. The above PQR points are as per customer specific requirements.

4. Consideration of Bidder's offer is subject to BHEL/ BHEL Customer's approval.

5. Bidder to submit all supporting documents in English. If documents submitted by Bidder are in language other than English, a self-attested English translated document should also be submitted.

6. Notwithstanding anything stated above, BHEL reserves the right to assess the capabilities and capacity of the Bidder/collaborators to perform the contract, should the circumstances warrant such assessment in the overall interest of BHEL.

7. After satisfactory fulfillment of all the above criterion requirement, offer shall be considered for further evaluation as per NIT and all the other terms of the tender.

8. Attached annexure (Annexure-I) to be filled by the bidder on quality & general terms. Requisite Documents (like factory registration certificate, R&D set-up details etc.) asked in Annexure-I, shall also be attached as Annexure F2.1 to F2.17 along with the filled response in the Annexure-I.

Annexure-I

i.	*Item/Scope of Sub-contracting*			
ii.	*Address of the registered office*	*Details of Contact Person (Name, Designation, Mobile, Email)*		
iii.	*Name and Address of the proposed Sub-vendor's works where item is being manufactured*	*Details of Contact Person: (Name, Designation, Mobile, Email)*		
iv.	*Annual Production Capacity for proposed item/scope of sub-contracting*			
v.	*Annual production for last 3 years for proposed item/scope of sub-contracting*			
vi.	***Details of proposed works***			
1.	*Year of establishment of present works*			
2.	*Year of commencement of manufacturing at above works*			
3.	*Details of change in Works address in past (if any)*			
4.	*Total Area*			
	Covered Area			
5.	*Factory Registration Certificate*	*Details attached at Annexure – F2.1*		
6.	*Design/ Research & development set-up (No. of manpower, their qualification, machines & tools employed etc.)*	*Applicable / Not applicable if manufacturing is as per Main Contractor/purchaser design) Details attached at Annexure – F2.2 (if applicable)*		
7.	*Overall organization Chart with Manpower Details (Design/Manufacturing/Quality etc.)*	*Details attached at Annexure – F2.3*		
8.	*After sales service set up in India, in case of foreign sub-vendor (Location, Contact Person, Contact details etc.)*	*Applicable / Not applicable Details attached at Annexure – F2.4*		
9.	*Manufacturing process execution plan with flow chart indicating various stages of manufacturing from raw material to finished product including outsourced process, if any*	*Details attached at Annexure – F2.5*		
10.	*Sources of Raw Material/Major Bought Out Item*	*Details attached at Annexure – F2.6*		
11.	*Quality Control exercised during receipt of raw material/BOI, in-process, Final Testing, packing*	*Details attached at Annexure – F2.7*		

12.	*Manufacturing facilities* *(List of machines, special process facilities, material handling etc.)*	*Details attached at Annexure – F2.8*
13.	*Testing facilities* *(List of testing equipment)*	*Details attached at Annexure – F2.9*
14.	*If manufacturing process involves fabrication then-* *List of qualified Welders* *List of qualified NDT personnel with area of specialization*	*Applicable / Not applicable* *Details attached at Annexure – F2.10* *(if applicable)*
15.	*List of out-sourced manufacturing processes with Sub-Vendors' names & addresses*	*Applicable / Not applicable* *Details attached at Annexure. –F2.11* *(if applicable)*
16.	*Supply reference list including recent supplies*	*Details attached at Annexure – F2.12* *(as per format given below)*

Project/ package	*Customer Name*	*Supplied Item (Type/Rating/Model /Capacity/Size etc.)*	*PO ref no/date*	*Supplied Quantity*	*Date of Supply*

17.	*Product satisfactory performance feedback letter/certificates/End User Feedback*	*Attached at annexure - F2.13*
18.	*Summary of Type Test Report (Type Test Details, Report No, Agency, Date of testing) for the proposed product (similar or higher rating)* *Note: - Reports need not to be submitted*	*Applicable / Not applicable* *Details attached at Annexure – F2.14* *(if applicable)*
19.	*Statutory / mandatory certification for the proposed product*	*Applicable / Not applicable* *Details attached at Annexure – F2.15* *(if applicable)*
20.	*Copy of ISO 9001 certificate (if available)*	*Attached at Annexure – F2.16*
21.	*Product technical catalogues for proposed item (if available)*	*Details attached at Annexure – F2.17*

Name:		*Desig:*		*Sign:*		*Date:*	

Company's Seal/Stamp: -

Annexure-II (On Company Letter Head)

LETTER OF TECHNICAL SUPPORT FOR SATISFACTORY PERFORMANCE OF AIR CIRCUIT BREAKERS

TO
[EMPLOYER'S NAME & ADDRESS]
Sub: Letter of Support submitted from ..... (name of the Associate*/Collaborator*/Technology provider*/Licensor*) undertaking the responsibility for satisfactory performance of .... (name of the equipment).
Dear Sirs,

1. In accordance with the Award of the Contract by ..... (Name of the Contractor) to M/s. ..... (Name of the sub-vendor), we, the aforesaid Associate*/Collaborator*/Technology provider*/Licensor*, (M/s .....) shall be fully responsible for the satisfactory performance of the ..... (equipment name).

2. Further, the manner of achieving the objective set forth in point 1 above shall be as follows
   For ..... (Equipment name):
   (a) We shall provide manufacturing and assembly drawings of..... (Equipment name). ..... (Equipment name) shall be manufactured and supplied as per above drawings provided by us.
   (b) We shall depute technical experts to Bidder's/sub-vendor's works for supervision during manufacturing, assembly, inspection, as and when required by Employer. We shall participate in site erection, commissioning and final testing (as and when necessary) of the..... (equipment name).
   (c) We shall participate in Technical Co-ordination meetings (TCMs) from time to time, as and when required by Employer.
   (d) We shall promptly carry out all the corrective measures and shall promptly provide corrected design and shall undertake replacements, rectifications or modifications to the equipment as and when required by Employer in case the equipment fails to demonstrate successful performance as per contract at site.

3. We, the Associate*/Collaborator*/Technology provider*/Licensor* do hereby undertake and confirm that this Letter of Support shall be valid till 90(ninety) days after the end of the defect liability period of the contract.

Signature of the Authorised Representative: ...
For M/s .....
(Associate*/Collaborator*/Technology provider*/Licensor*)
Name .....
Designation .....
Date: ...

Common Seal of the Company

***: Strike off whichever is not applicable.**

SUB QUALIFICATION REQUIREMENT (TECHNICAL)

(Common seal).....

Sub QR Data to be filled in to meet the provenness requirements (Refer Clause No. 5.6.0 of Sub-Section-I intent of specification, Part-A, Section-VI. **for LT SWITCHGEAR**

S.No.	Item Description	
1.1	No. of Air circuit breaker panels and/or draw out motor control centre panels manufactured and supplied, under a single order, with fault rating of at least 45kA for one (1) second and 105kA peak which are in successful operation for at least two (2) years. **(under Route 1)**	
1.01.00	Name & address of Manufacturer	
1.02.00	Name of the plant and its location	
1.03.00	Client(s) name and its address, Fax and Tel. No.	
1.04.00	Name and designation of the responsible person in client's organisation	
1.05.00	Contract No. & Date	
1.06.00	Whether manufactured and supplied the referred Air Circuit breaker panels /MCC panels	(YES/NO)
1.07.00	Fault rating KA (rms) Time (Sec.) KA (Peak)	
1.08.00	No. of draw out type MCC panels supplied	
1.09.00	No. of draw out type Air Circuit breaker panels supplied	

Signature of authorized signatory.....

1.10.00	Date of commissioning	
1.11.00	No. of years in Successful operation	
1.12.00	Certificate in support of above stated experience including capacity of Plant, Year & Month of Commissioning of Plant & descriptive scheme of plant for which the data has been indicated and that the above system installed above have caused no serious problem in the past is enclosed at Annexure …….	
1.2	No. of Air circuit breakers having fault rating of at least 45kA rms BREAKING, 105kA peak MAKING and 45kA withstand for one (1) second, and their associated draw out type Air circuit breaker panels having fault rating of at least 45kA for one (1) second and 105kA peak , manufactured and supplied which are in successful operation for at least two (2) years. **(under Route 1)**	
1.01.00	Name & address of Manufacturer	
1.02.00	Name of the stations and its location	
1.03.00	Client(s) name and its address, Fax and Tel. No.	
1.04.00	Name and designation of the responsible person in client's organisation	
1.05.00	Contract No. & Date	
1.06.00	Whether manufactured and supplied the referred Air Circuit Breakers and their associated draw out type Air Circuit Breaker panels	(YES/NO)
1.07.00	Air Circuit Breakers having fault rating: (i) Rated current (A) (ii) Breaking Capacity (KA rms) (iii) Making Capacity (KA peak)	
1.08.00	Draw out type Air Circuit Breaker panels having fault rating: (i) KA (rms) (ii) Time (Sec) (iii) KA (peak)	

Signature of authorized signatory.....

1.09.00 Date of commissioning

1.10.00 No. of years in Successful operation

1.11.00 Certificate in support of above stated experience including capacity of Plant, Year & Month of Commissioning of Plant & descriptive scheme of plant for which the data has been indicated and that the above system installed above have caused no serious problem in the past is enclosed at Annexure …….

Signature of authorized signatory.....

1.3 No. of Air circuit breaker panels and/or draw out motor control centre panels manufactured and supplied, under a single order, with fault rating of at least 45kA for one (1) second and 105kA peak which are in successful operation for at least two (2) years. **(under Route 2)**

1.01.00	Name & address of Manufacturer	
1.02.00	Name of the plant and its location	
1.03.00	Client(s) name and its address, Fax and Tel. No.	
1.04.00	Name and designation of the responsible person in client's organisation	
1.05.00	Contract No. & Date	
1.06.00	Whether manufactured and supplied the referred Air Circuit breaker panels /MCC panels	(YES/NO)
1.07.00	Fault rating	
	KA (rms)	
	Time (Sec.)	
	KA (Peak)	
1.08.00	No. of draw out type MCC panels supplied	
1.09.00	No. of draw out type Air Circuit breaker panels supplied	
1.10.00	Date of commissioning	
1.11.00	No. of years in Successful operation	
1.12.00	Certificate in support of above stated experience including capacity of Plant, Year & Month of Commissioning of Plant & descriptive scheme of plant for which the data has been indicated and that the above system installed above have caused no serious problem in the past is enclosed at Annexure …….	

Signature of authorized signatory.....

S.No.	Item Description	
1.4	No. of draw out type Air circuit breaker panels manufactured and supplied with fault rating of at least 45kA for one (1) second and 105kA peak which are in successful operation for at least two (2) years. **(under Route 2)**	
1.01.00	Name & address of Manufacturer	
1.02.00	Name of the stations and its location	
1.03.00	Client(s) name and its address, Fax and Tel. No.	
1.04.00	Name and designation of the responsible person in client's organisation	
1.05.00	Contract No. & Date	
1.06.00	Whether manufactured and supplied the referred Air Circuit Breaker panels	(YES/NO)
1.07.00	Draw out type Air Circuit Breaker panels having fault rating: (iv) KA (rms) (v) Time (Sec) (vi) KA (peak)	
1.08.00	Date of commissioning	
1.09.00	No. of years in Successful operation	
1.10.00	Certificate in support of above stated experience including capacity of Plant, Year & Month of Commissioning of Plant & descriptive scheme of plant for which the data has been indicated and that the above system installed above have caused no serious problem in the past is enclosed at Annexure ……	
1.5	Bidder's / Sub Vendor's Associate or Collaborator or Technology Provider or Licensor data to meet qualifying requirement stipulated in Route 1. **(under Route-2)**	
1.5.1	No. of Air circuit breaker panels and/or draw out motor control	

centre panels manufactured and supplied, under a single order, with fault rating of at least 45kA for one (1) second and 105kA peak which are in successful operation for at least two (2) years.
(under Route 2)

1.01.00	Name & address of Manufacturer (Associate or Collaborator or Technology Provider or Licensor)	
1.02.00	Name of the plant and its location	
1.03.00	Client(s) name and its address, Fax and Tel. No.	
1.04.00	Name and designation of the responsible person in client's organisation	
1.05.00	Contract No. & Date	
1.06.00	Whether manufactured and supplied the referred Air Circuit breaker panels /MCC panels	(YES/NO)
1.07.00	Fault rating	
	KA (rms)	
	Time (Sec.)	
	KA (Peak)	
1.08.00	No. of draw out type MCC panels supplied	
1.09.00	No. of draw out type Air Circuit breaker panels supplied	
1.10.00	Date of commissioning	
1.11.00	No. of years in Successful operation	
1.12.00	Certificate in support of above stated experience including capacity of Plant, Year & Month of Commissioning of Plant & descriptive scheme of plant for which the data has been indicated and that the above system installed above have caused no serious problem in the past is enclosed at Annexure ……	

1.5.2 No. of Air circuit breakers having fault rating of at least 45kA rms BREAKING, 105kA peak MAKING and 45kA withstand for one (1) second, and their associated draw out type Air circuit breaker panels having fault rating of at least 45kA for one (1) second and 105kA peak , manufactured and supplied which are in successful operation for at least two (2) years.
(under Route 2)

Signature of authorized signatory.....

1.01.00	Name & address of Manufacturer (Associate or Collaborator or Technology Provider or Licensor)	
1.02.00	Name of the stations and its location	
1.03.00	Client(s) name and its address, Fax and Tel. No.	
1.04.00	Name and designation of the responsible person in client's organisation	
1.05.00	Contract No. & Date	
1.06.00	Whether manufactured and supplied the referred Air Circuit Breakers and their associated draw out type Air Circuit Breaker panels	(YES/NO)
1.07.00	Air Circuit Breakers having fault rating: (iv) Rated current (A) (v) Breaking Capacity (KA rms) (vi) Making Capacity (KA peak)	
1.08.00	Draw out type Air Circuit Breaker panels having fault rating: (vii) KA (rms) (viii) Time (Sec) (ix) KA (peak)	
1.09.00	Date of commissioning	
1.10.00	No. of years in Successful operation	
1.11.00	Certificate in support of above stated experience including capacity of Plant, Year & Month of Commissioning of Plant & descriptive scheme of plant for which the data has been indicated and that the above system installed above have caused no serious problem in the past is enclosed at Annexure ……	
1.12	The letter of technical support by Associate/ Collaborator /Technology Provider / Licensor provided **(under Route-2).**	(Yes/No)

Note : 1) Certificates from the client for the successful operation for each of the above shall be Submitted.

2) Supporting documents/ reference data as applicable shall be submitted.

Signature of authorized signatory.....

Date :

Place :

(Signature).....

(Printed Name).....

(Designation).....

(Common seal).....

Signature of authorized signatory.....