

SPEC.NO. TCE-6015A-C-510-001	TATA CONSULTING ENGINEERS LIMITED		TCE.6015A-C-510-00-ELEC-SHEET 1 OF 19
	ALFA INFRAPROP PRIVATE LIMITED 2X660 MW, SUPERCRITICAL TPP, PHASE I, KOMARADA VILLEGE, VIZIANAGARAM DIST. A.P. INDIA		
AMMENDMENT TO TECHNICAL SPECIFICATION FOR STEAM GENERATORS AND AUXILIARIES : ELECTRICAL			

I. AMMENDMENT TO SCOPE OF WORKS, TERMINAL POINTS, EXCLUSIONS ETC.

SL. NO.	SPECIFICATION CLAUSE REFERENCE	SUBJECT/ SPECIFIED REQUIREMENT	AMMENDMENT																																																														
1.0	SPECIFICATION VOLUME II, SECTION C1, CLAUSE NO: 1.3.1.1 (g)	Scope of works for Electrical System..... LV Switchgears:	The scope of LV Switchgears for SG, SG auxiliaries and ESP system shall include supply, erection, testing and commissioning, performance testing of the following:																																																														
			<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th rowspan="2">Sl. No.</th> <th rowspan="2">Designation</th> <th colspan="2">Busbar Details</th> <th rowspan="2">Single/ Double Front</th> <th rowspan="2">Fully Draw out/ Fixed</th> <th colspan="2">Control Location (Local / Remote - DCS/DCS)</th> </tr> <tr> <th>Amps (#)</th> <th>TP/DP</th> <th>SF/DF</th> <th>FD/F</th> <th>Incomer/ Buscoupler/ Outgoing Breaker Feeder</th> <th>Motor Feeder</th> </tr> </thead> <tbody> <tr> <td colspan="8" style="text-align: center;">LV SWITCHGREAS FOR EACH UNIT SG AND ESP SYSTEMS</td> </tr> <tr> <td>1.</td> <td>BOILER VALVE DISTRIBUTION BOARD</td> <td>*</td> <td>TP</td> <td>DF</td> <td>FD</td> <td>DCS</td> <td>DCS</td> </tr> <tr> <td>2.</td> <td>BOILER MCC</td> <td>*</td> <td>TP</td> <td>DF</td> <td>FD</td> <td>DCS</td> <td>DCS</td> </tr> <tr> <td>3.</td> <td>SOOT BLOWER MCC</td> <td>*</td> <td>TP</td> <td>DF/ SF</td> <td>FD</td> <td>DCS</td> <td>DCS</td> </tr> <tr> <td>4.</td> <td>220V DC SUB DISTRIBUTION BOARD FOR SG</td> <td>*</td> <td>DP</td> <td>*</td> <td>FD</td> <td>LOCAL</td> <td>---</td> </tr> <tr> <td>5.</td> <td>240V AC UPS SUB DISTRIBUTION BOARD FOR</td> <td>*</td> <td>DP</td> <td>*</td> <td>FD</td> <td>LOCAL</td> <td>---</td> </tr> </tbody> </table>	Sl. No.	Designation	Busbar Details		Single/ Double Front	Fully Draw out/ Fixed	Control Location (Local / Remote - DCS/DCS)		Amps (#)	TP/DP	SF/DF	FD/F	Incomer/ Buscoupler/ Outgoing Breaker Feeder	Motor Feeder	LV SWITCHGREAS FOR EACH UNIT SG AND ESP SYSTEMS								1.	BOILER VALVE DISTRIBUTION BOARD	*	TP	DF	FD	DCS	DCS	2.	BOILER MCC	*	TP	DF	FD	DCS	DCS	3.	SOOT BLOWER MCC	*	TP	DF/ SF	FD	DCS	DCS	4.	220V DC SUB DISTRIBUTION BOARD FOR SG	*	DP	*	FD	LOCAL	---	5.	240V AC UPS SUB DISTRIBUTION BOARD FOR	*	DP	*	FD	LOCAL	---
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AMMENDMENT TO TECHNICAL SPECIFICATION FOR STEAM GENERATORS AND AUXILIARIES : ELECTRICAL			

SL. NO.	SPECIFICATION CLAUSE REFERENCE	SUBJECT/ SPECIFIED REQUIREMENT	AMMENDMENT							
				SG						
			6.	ESP PMCC	*	TP	DF	FD	DCS	DCS
			7.	LDB WITH LIGHTING TRANSFORMERS	*	TPN	SF	F	LOCAL	---
			8.	1 φ LIGHTING PANELS (* NOS)	*	SP	SF	F	LOCAL	---
			9.	ELDB WITH LIGHTING TRANSFORMERS	*	TPN	SF	F	LOCAL	---
			10.	1 φ EMERGENCY LIGHTING PANELS (* NOS)	*	SP	SF	F	LOCAL	---
			11.	SMALL POWER ACDB WITH UR TRANSFORMER (For Space Heaters, Single phase loads etc).	*	TPN	SF	F	LOCAL	---
			12.	RECEPTACLE DB WITH UR TRANSFORMER (For Space Heaters, Single phase loads etc).	*	TPN	SF	F	LOCAL	---
			All the LV switchgears listed above, except 1 φ Lighting Panel, Small Power ACDB and Receptacle DB) shall have 2 X 100% Incomers and a Bus coupler.							
			(*) To be furnished by the Bidder in accordance with specified requirements elsewhere in specification.							
2.0	SPECIFICATION	Scope of works for	Bidder shall include Supply, installation, testing and commissioning of following cables in the scope:							

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SL. NO.	SPECIFICATION CLAUSE REFERENCE	SUBJECT/ SPECIFIED REQUIREMENT	AMMENDMENT
	VOLUME II, SECTION C1, CLAUSE NO: 1.3.1.1 (j)	Electrical System..... Cabling:	<ol style="list-style-type: none"> 1. HT power cables: <ol style="list-style-type: none"> a. Incoming 11 kV power cables for ESP Service transformers. b. Cables for 3.3 kV and 11 kV motors. 2. LT power cables: <ol style="list-style-type: none"> a. Incomer cables of LV Switchgears and DBs listed above in Sl. No. 1 b. Cables for AC/DC motor and non motor loads of SG system. 3. Cabling between Bidder's supplied equipments. 4. All I&C application purpose cables scope shall be as per Volume V, section D 3.2 of specification. List of above switchgears/ MCC shall be considered for C&I cable scope. 5. Both side glanding and terminations of all the above cables. <p>Other cabling requirement specified in various chapters of specification (like lighting system etc) shall remain unchanged.</p>
3.0	SPECIFICATION VOLUME II, SECTION C1, CLAUSE NO: 1.3.1.1 (n)	Scope of works for Electrical System: Earthing system.	<p>Add: Earthing grid with necessary earth mesh, pits, all equipment interconnection etc complete in all respects for entire SG structure (all elevations), SG Auxiliary Areas, ESP structure, ESP control Room, Elevators, coal mills, Bunkers etc as specified in volume VI of the specification shall be in the scope of the Bidder.</p> <p>Neutral earthing as per prevailing practices for various equipments in the above areas/system like Service transformer etc equipment shall be in the scope of Bidder.</p>
4.0	SPECIFICATION VOLUME II, SECTION C1, CLAUSE NO: 1.3.1.1 (v)	Scope of works for Electrical System	<p>Add: Complete installation accessories for cables, lighting, earthing, lightning protection including all structures, supports, cable trays, conduits, MBs, JBs, TBs, hardware, consumables, etc.shall be in the scope of the Bidder.</p>

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5.0	SPECIFICATION VOLUME II, SECTION C1, CLAUSE NO: 1.3.1.1 (w)	Scope of works for Electrical System	Add: Bidder shall include all mounting and foundation accessories and hardware for all electrical equipment. Also all civil works associated with electrical installation like embedment, chipping, punching, making holes, openings, pipe sleeves, sealing and water proofing, etc. in the scope.
6.0	SPECIFICATION VOLUME II, SECTION C1, CLAUSE NO: 1.3.1.1 (x)	Scope of works for Electrical System	Add: Bidder shall include Fire proof sealing system material such as fire stops and fire breaks etc in the scope.
7.0	SPECIFICATION VOLUME II, SECTION C1, CLAUSE NO: 1.3.1.1 (y)	Scope of works for Electrical System: Cable Schedule and Interconnection Schedule (power, control & Instrumentation) as supplied by the bidders.	Add: Bidder shall prepare and submit sizing calculation, interconnection schedule, routing and cable schedule for all cables included in the scope for the SG, SG Auxiliaries, coal mill, Bunker and ESP system for Purchaser's approval.
8.0	SPECIFICATION VOLUME II, SECTION C1, CLAUSE NO: 1.3.1.1 (z)	Scope of works for Electrical System	Add: All necessary sizing calculations for equipment/ systems shall be in the Bidder's scope of work. Bidder shall furnish sizing of equipment/ system for purchaser's approval before initiating procurement.
9.0	SPECIFICATION VOLUME II, SECTION C1, CLAUSE NO: 1.8.2	Terminal Points Cabling system:	Existing specification clause is amended by following terminal points of cabling system: <ol style="list-style-type: none"> Purchaser's 11 kV Unit Switchgear shall be the terminal point for Bidder's 11 kV HV cables for motors and 2X100% ESP Service Transformers. Purchaser's 3.3 kV Unit Auxiliary Switchgear shall be the terminal point for Bidder's 3.3 kV HV cables. Purchaser's 415 V BPMCC shall be the terminal point for Bidder's 2 x 100 % incomer cables of BVDB and BMCC

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SL. NO.	SPECIFICATION CLAUSE REFERENCE	SUBJECT/ SPECIFIED REQUIREMENT	AMMENDMENT
			<p>4. Purchaser's 415 V Station Service Switchgear shall be the terminal point for Bidder's 1 x 100 % incomer cable for Small power ACDB and Welding Receptacle DB.</p> <p>5. Purchaser's 415 V Station Service Switchgear shall be the terminal point for Bidder's 2 x 100 % incomer cables of LDB/s.</p> <p>6. Purchaser's 240 V UPS DB shall be the terminal point for Bidder's 2 x 100 % incomer cables of UPS SUB DB/s.</p> <p>7. Purchaser's 220 V DCDB shall be the terminal point for Bidder's 2 x 100 % incomer cables of DC SUB DB/s.</p> <p>8. Purchaser's 415 V Normal Emergency PMCC shall be the terminal point for Bidder's cable for essential (EDG) loads.</p> <p>9. Purchaser's 415 V Normal Emergency PMCC shall be the terminal point for Bidder's 2 x 100 % incomer cables of ELDB.</p> <p>10. Purchaser's Fire Detection and Alarm panel for C&I cables emanating from Bidder's Elevators.</p> <p>11. Purchaser's Main cable raceway proposed on Pipe cum Cable rack located between Boiler structure and TG building shall be terminal point for Bidder's trays.</p> <p>Bidder shall note that Purchaser's switchgears, FDA panel etc listed above will be located in TG building.</p>
10.0	SPECIFICATION VOLUME II, SECTION C1, CLAUSE NO: 1.8.2	Terminal Points Earthing and lightning protection system:	<p>Earthing of SG, SG Auxiliaries, coal mill, Bunker and ESP system provided by bidder shall be fully self contained as specified in section I, Sl. No 3 and Section II sl. No 32, 33 and 34.</p> <p>Further interconnection of the Bidder's earthing grid with Overall Plant earthing (provided by others) will be carried by the Electrical Installation contractor.</p> <p>However, bidder has to provide necessary number of risers as required at locations to be decided during detail</p>

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SL. NO.	SPECIFICATION CLAUSE REFERENCE	SUBJECT/ SPECIFIED REQUIREMENT	AMMENDMENT
			engineering for the purpose of the above mentioned interconnection.
11.0	SPECIFICATION VOLUME II, SECTION C1, CLAUSE NO: 1.9.2	Exclusions: LT Switchgear....other than....	Switchgears in bidder's amended scope shall be as per Sl. No. 1 above.
12.0	SPECIFICATION VOLUME II, SECTION C1, CLAUSE NO: 1.9.2	Exclusion of works for Electrical System: Cable carrier system in all areas except for ESP.....	Bidder shall include cable trays, accessories and carrier system for all the cables in the scope of bidder as described above in sl no 2.0. Purchaser's Main cable raceway proposed on Pipe cum Cable rack located between Boiler structure and TG building shall be terminal point for Bidder's trays.
13.0	SPECIFICATION VOLUME II, SECTION C1, CLAUSE NO: 1.9.2	Exclusion of works for Electrical System:	Following exclusion points are added to the Existing specification clause: 1. 11 kV HV Switchgear. 2. 3.3 kV MV Switchgear. 3. Fire Detection and Alarm System. 4. Plant Communication System.

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II. AMMENDMENT TO ELECTRICAL DESIGN REQUIREMENTS.

SL. NO.	SPECIFICATION CLAUSE REFERENCE	SUBJECT/ SPECIFIED REQUIREMENT	AMMENDMENT
1.0	SPECIFICATION VOLUME IV, SECTION D 2.0, CLAUSE NO: 4.0	ESP Switchgears.....	Scope of LV Switchgears is amended as listed in Section I Sl. No. 1 above.
2.0	SPECIFICATION VOLUME IV, SECTION D 2.0, CLAUSE NO: 6.0	Cabling.....	Scope of Cabling system is amended as per Section I Sl. No. 2, 6 and 8 above.
3.0	SPECIFICATION VOLUME IV, SECTION D 2.0, CLAUSE NO: 7.1	ESP Control Room..... 2X36W T5 Fluorescent LAMPS.....	Bidder shall provide 2X36 W CFL recess mounted mirror optic decorative lighting fixtures along with 1x18 W CFL Down lights to achieve uniform lighting flux distribution in control room and also in the areas where false ceiling is provided. Bidder shall make maximum use of CF lamps and electronic ballasts for energy saving.
4.0	SPECIFICATION VOLUME IV, SECTION D 2.1, CLAUSE NO: 3.0 (i)	OTI/WTI/PRD/MOG etc....	Remote DCS monitoring contacts shall be provided for mechanical protective devices mounted on transformer. Necessary cabling shall be provided as specified in Volume V, section D 3.2, Sl. No. 21.5 (b) for DCS interface.
5.0	SPECIFICATION VOLUME IV, SECTION D 2.2, CLAUSE NO: 1.0	POWER SOURCES FOR 415V SWITCHGEAR (Soot Blower and ESP MCC only)/ Distribution boards (Power receptacle/ Welding receptacle DB)	Scope of LV Switchgears is amended as listed in Section I Sl. No. 1 above.
6.0	SPECIFICATION VOLUME IV, SECTION	Supply to changeover switch for common	Redundant MCC space heater supply shall be arranged from Small power ACDB. Supply changeover scheme shall be provided for the same.

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SL. NO.	SPECIFICATION CLAUSE REFERENCE	SUBJECT/ SPECIFIED REQUIREMENT	AMMENDMENT
	D 2.2, CLAUSE NO: 2.2 (g)	maintenance distribution board	
7.0	SPECIFICATION VOLUME IV, SECTION D 2.2, CLAUSE NO: 2.2 (i)	Essential / critical loads to receive supply from the Normal-Emergency Switchgear and 220V DCDB.	Kindly refer amended Scope of LV Switchgears and terminal points in Section I, Sl. No 1 and Sl. No. 8 above.
8.0	SPECIFICATION VOLUME IV, SECTION D 2.2, CLAUSE NO: 6.1, 8.2 (c),	MCCB or Isolators SFU	Isolator and SFU shall not be applicable. Bidder shall provide MPCB/MCCB/ACB as specified elsewhere in the specification.
9.0	SPECIFICATION VOLUME IV, SECTION D 2.2, CLAUSE NO: 6.1	Incomers<400A shall be MCCB, . > 400A ACB.....	Shall be applicable for non motorised Feeders and tie modules also.
10.0	SPECIFICATION VOLUME IV, SECTION D 2.2, CLAUSE NO: 10.1	ESP Switchgear.... Local Control	Scope of LV Switchgears is amended as listed in Section I Sl. No. 1 above. Bidder shall comply following Control and monitoring requirements in addition: <ol style="list-style-type: none"> 1.0 Normal operation of Switchgear shall be with bus coupler breaker open and incomers feeding respective buses. 2.0 Control requirements from local/ remote DCS for various switchgears shall be as per Section I Sl. No. 1 above. 3.0 Closing (after synchronism check) of both switchgear Incomers and BC CBs shall be only from DCS. Opening of incomers and tie feeders of switchgears shall be possible from local as well as DCS.

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SL. NO.	SPECIFICATION CLAUSE REFERENCE	SUBJECT/ SPECIFIED REQUIREMENT	AMMENDMENT
			4.0 Closing and opening of outgoing/ motor feeders shall be shall be as per Section I Sl. No. 1 above. 5.0 Inter Posing Relays (IPRs) shall be provided by bidder for all feeders controlled from DCS. 6.0 Synchronizing check relay for switchgear incomers and bus coupler modules shall be mounted on respective breaker modules (applicable for BMCC, BVDB & ESP PMCC). 7.0 The switchgears shall be provided with manual live changeover facility for planned changeover of supply from respective incomers to Bus couplers and vice versa. Incomer or bus coupler shall be closed against synchronizing permissive. After changeover there should be facility of 3 position trip selector switch on switchgear for tripping the selected breaker automatically. If the selected breaker does not trip due to whatever reason, within a reasonable time frame, there should be facility for tripping the last closed breaker. There shall also be provision for Dead Bus Closing for the Incomers / Bus couplers (applicable for BMCC, BVDB & ESP PMCC).. 8.0 There shall be provision for automatic closing of bus coupler, in case of failure of supply from one of the incomers and the other incomer healthy. Necessary circuitry for facilitating this shall be provided in the switchgear. The closing of bus coupler shall be blocked in case the incomer has tripped on a bus fault (applicable for BMCC, BVDB & ESP PMCC). Necessary circuitry and devices shall be provided for automatic live changeover and planned manual synchronizing purpose as described above.
11.0	SPECIFICATION VOLUME IV, SECTION D 2.2, CLAUSE NO: 10.		Following protections shall be provided for LV switchgears: I. Tie Feeder/ Non motorized loads: For MCCB modules protection shall be achieved through integral Overcurrent (50/51) and Short circuit release of MCCB.
12.0	SPECIFICATION	Modbus/IEC61850	All the Protective relays shall be numerical type and suitable for communication protocol IEC 61850.

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	VOLUME IV, SECTION D 2.2, CLAUSE NO: 6.22	Protocol is to be used for communication.					
13.0	SPECIFICATION VOLUME IV, SECTION D 2.2, CLAUSE NO: 8.4	Protections	MoV Shall be provided with MPCB module at BVDB end. Integral actuators shall contain SFU+Contactor+Bimetallic protection relay.				
14.0	SPECIFICATION VOLUME IV, SECTION D 2.2, CLAUSE NO: 10.3	Alarms in CRT, Status indications in CRT.	Bidder shall provide DCS interface requirement of various LV switchgear modules shall be as follows:				
			Equipment/ Sub System	Metering DCS	Control DCS	Indications DCS	Alarm DCS
			Incomer	Current (all three phase) KW Voltage	On command. Off Command.	Breaker On. Breaker Off. Master Trip Operated. Breaker in service Remote selected Spring charged Trip circuit unhealthy. Line under / no voltage relays operated	Breaker On. Breaker Off. Master Trip Operated. Breaker in service Remote selected Spring charged Trip circuit unhealthy.
			Bus Coupler	Current (all three phase) Bus Voltage	On command. Off Command.	Breaker On. Breaker Off. Master Trip Operated. Breaker in service Remote selected Spring charged	Breaker On. Breaker Off. Master Trip Operated. Breaker in service

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				A/ B			
						Trip circuit unhealthy. Bus under / no voltage relays operated	Remote selected Spring charged Trip circuit unhealthy.
			Motor Module	Current (all three phase) For drives 30 kW and above	Start command for Unidirectional drives. Stop command for Unidirectional drives. Forward/ Reverse commands for reversible modules	Motor Running. Motor Stopped. Master Trip Operated. Trip coil healthy. Ready to Start. -Trip supervision operated. -Control Supply Healthy. -Spring charged. -Breaker in service	Motor Running. Motor Stopped. Protection Trip Operated. Trip coil healthy. Ready to Start. -Trip supervision operated. -Control Supply Healthy. -Spring charged..
			List of LV Switchgears controlled and monitored from DCS shall be as per section I, Sl. No. 1 above.				
15.0	SPECIFICATION VOLUME IV, SECTION	Sheet Steel Thickness	Metal-clad unit shall be precision manufactured and shall comprise rigid welded structural frame enclosed completely by sheet steel - minimum 2.5 mm thick (hot rolled) or 2.0 mm thick (cold rolled), smooth finished, levelled				

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	D 2.2, CLAUSE NO: 5.7, Data sheet Sl. No 14.0		and free from flaws. The thickness of non-load bearing sheets may be 1.6 mm (cold rolled).
16.0	SPECIFICATION VOLUME IV, SECTION D 2.2, CLAUSE NO: --	DC Switchgear	The Constructional features of DCDB shall be similar to the 415V Switchgear described in the specification except that the DCDB may be of fixed type. Components of DCDB shall be suitable for DC duty. Incomers and outgoing modules of DCDB shall be non Motorised MCCB controlled with inbuilt over current and short circuit protections.
17.0	SPECIFICATION VOLUME IV, SECTION D 2.3, CLAUSE NO: 1.5	Motors shall withstand for 1 second the voltage and torque stresses developed due to the vector difference between the motor residual voltage and the incoming supply voltage equal to 200% of the rated voltage during fast change over of buses	Motors shall withstand for 1 second the voltage and torque stresses developed due to the vector difference between the motor residual voltage and the incoming supply voltage equal to 150% of the rated voltage during fast change over of buses.
18.0	SPECIFICATION VOLUME IV, SECTION D 2.3, CLAUSE NO: --		CACW motor shall be provided with 20% additional cooler tubes to take care of cooler pipe blockage.
19.0	SPECIFICATION VOLUME IV, SECTION D 2.4, Data Sheet CLAUSE NO: 20.5	Creepage Distance : 34.1 mm/ kV	Creepage distance for NSPBD insulators shall be 31 mm/ kV.
20.0	SPECIFICATION VOLUME IV, SECTION	Material of Insulators: Porcelain	Bus support insulators for 415 V Bus duct will be interchangeable, high strength, wet process, Epoxy type.

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	D 2.4, Data Sheet CLAUSE NO: 20.6		
21.0	SPECIFICATION VOLUME IV, SECTION D 2.5, CLAUSE NO: --	--	<p>Industrial type 63A, 3 phase, 5 pin receptacles with interlocked switches, scrapping earth connection, male and female units and weatherproof cover shall be provided.</p> <p>Receptacles shall be provided in sufficient number to facilitate extension of power supply to various machine tools, welding sets etc, in all the floors and areas of SG, SG auxiliary and ESP system. The exact locations shall be indicated during detailed engineering.</p> <p>Switch socket outlets shall be provided at every 30m distance on each elevation. Generally the socket outlets shall be provided in such a manner so that using 30m flexible cable, total SG area can be covered.</p> <p>The Receptacle switch units shall be fed from dedicated Receptacle DB. Maximum three switch socket outlets can be looped per feeder circuit.</p>
22.0	SPECIFICATION VOLUME IV, SECTION D 2.6 CLAUSE --	--	<p>Add: Scope of cabling works as per Section I Sl. No. 2.0, 5.0, 6.0 above.</p>
23.0	SPECIFICATION VOLUME IV, SECTION D 2.6 CLAUSE --	--	<p>Add: Terminal Points for cabling works as per Section I Sl. No. 8.0 above.</p>
24.0	SPECIFICATION VOLUME IV, SECTION D 2.6 CLAUSE 3.1.3	Motors protected by fuses	Shall be as per Sl. No. 11 above.
25.0	SPECIFICATION VOLUME IV, SECTION D 2.6 CLAUSE 3.1.5	Voltage drop	<p>Add: Voltage drop in Incomer cables to DCDB shall be limited to 3%. Voltage drop in DCDB feeder cables upto load terminal shall be limited to 2%.</p>

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SL. NO.	SPECIFICATION CLAUSE REFERENCE	SUBJECT/ SPECIFIED REQUIREMENT	AMMENDMENT
28.0	SPECIFICATION VOLUME IV, SECTION D 2.6 CLAUSE 7.6	Cable Carrier System	<p>Add: Cable/Cable tray supports:</p> <p>Cable tray supports shall be fabricated from standard steel structures of different sizes and shall be supported on Boiler superstructures. The sizes selected shall be adequate for the weight of cables/trays encountered. Vertical raceways shall be formed by either structural members and slotted angles or by running the prefabricated trays vertically.</p> <p>The steel members shall be cleaned thoroughly for rust and painted as follows.</p> <p style="padding-left: 40px;">For indoor - One shop coat of red oxide zinc chromate primer and two side coats of aluminium alkyd paint. For outdoor & corrosive areas like battery room - Hot dip galvanised.</p>
29.0	SPECIFICATION VOLUME IV, SECTION D 2.6 CLAUSE 7.7	Cable Carrier Installation practice	<p>Add:</p> <ol style="list-style-type: none"> a. Minimum level difference between two tiers of horizontal cable trays in building, trenches shall be 275 mm. In vertical race ways with multi-tiers the tiers shall be located atleast with 400 mm intervals. b. In trenches width of the cable tray shall be limited to 600 mm. c. Communication links wherever redundant shall be run in different conduits and in separate trays. d. Cable trays shall be supported at every 1000 mm interval. e. Cable trays shall be welded to the mounting/carrier structures. f. Each continuous laid out length of cable tray shall be earthed at minimum two places by MS flats of minimum size 25mm x 6mm, the distance between earthing points shall not exceed 10 metres. g. At least 300mm clearance shall be maintained between the top tray and beams, piping or other obstacles to facilitate installation of cables in the tray. A working space of not less than 600mm shall be maintained on atleast on one side of each tray. h. No cable trays shall be mounted near hot zones like hot flue gas duct, steam pipe, etc.
30.0	SPECIFICATION	Cable Installation	Add:

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	VOLUME IV, SECTION D 2.6 CLAUSE 8.8	practice	<p>a. Cables to each circuit shall be laid in one continuous length. Cable jointing shall be avoided. Jointing will be allowed only for the cases where the route length is more than the maximum possible drum length.</p> <p>b. Buried installation of cables shall be avoided.</p> <p>c. Where cables cross roads and water, oil, gas or sewage pipes, the cables shall be laid in RCC hume . For road crossings, the pipe for the cable shall be buried at not less than 600 mm. HDPE pipes shall be preferred where Road crossing is not involved and no of cables are few.</p> <p>d. The cables shall be tied to tray rungs by means of 3 mm dia. nylon cord at an interval of 5000 mm and also at bends.</p> <p>e. Different voltage grade cables shall be laid in separate trays. When trays are arranged in tiers, HV cables shall be laid in top trays and cables of subsequent voltage grades in lower tiers of trays.</p> <p>f. Single core power cables for 3 phase AC circuits laid in trays/racks/ trenches in trefoil groups shall be held in trefoil clamps placed at an interval of 3 m. The trefoil groups of cables shall be additionally tied by means of 3 mm dia. nylon cord as follows.</p> <p style="padding-left: 40px;">i) At an interval of 1m when laid in cable trays/racks.</p> <p style="padding-left: 40px;">ii) At an interval of 750 mm when laid in trenches without cable trays.</p> <p>g. The bending radii for various types of cables shall not be less than those values specified by the cable manufacturer.</p> <p>h. Metallic sheaths, screens and armour of all multicore cables shall be earthed at both equipment and switchgear end.</p> <p>i. Sheath and armour of single core power cables shall be earthed at switchgear end only. For long lengths of cables multiple earthing may have to be adopted to safeguard against the presence of standing voltages under normal as well as fault conditions.</p> <p>j. Minor civil / structural works required for the entire installation work also shall be included in the scope of BIDDER.</p> <p>k. The following items for fire sealing are included but not limited to.</p> <p style="padding-left: 40px;">i) Fire stops in walls/floors.</p> <p style="padding-left: 40px;">ii) Fire stops below switchgear / MCC / switchboards, junction boxes/panels/cabinets, etc. which are floor</p>

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SL. NO.	SPECIFICATION CLAUSE REFERENCE	SUBJECT/ SPECIFIED REQUIREMENT	AMMENDMENT																												
			<p>(a) Main Earthing Conductors</p> <p>The earthing conductor sizes shall be calculated based on IS 3043 and the earthing system shall comply with Indian Electricity Rules and IEEE-80/ IEE 665.</p> <p>The calculated size shall be suitably (depending on the resistivity of soil) increased as per table below to account for the loss of material (steel) due to corrosion in soil. The calculation for the earthing conductor size and step & touch potential shall be submitted for PURCHASER's / ENGINEER's approval.</p> <table border="1" data-bbox="972 659 1980 1064"> <thead> <tr> <th colspan="2" data-bbox="972 659 1415 762">Resistivity of soil (ohm– metre)</th> <th colspan="2" data-bbox="1415 659 1980 762">Increase in thickness/diameter of earthing conductor (mm).</th> </tr> </thead> <tbody> <tr> <td data-bbox="972 762 1176 810"></td> <td data-bbox="1176 762 1415 810" style="text-align: center;"><10</td> <td data-bbox="1415 762 1762 810" style="text-align: center;">8.0</td> <td data-bbox="1762 762 1980 810"></td> </tr> <tr> <td data-bbox="972 810 1176 858" style="text-align: center;">>10</td> <td data-bbox="1176 810 1415 858" style="text-align: center;"><25</td> <td data-bbox="1415 810 1762 858" style="text-align: center;">7.0</td> <td data-bbox="1762 810 1980 858"></td> </tr> <tr> <td data-bbox="972 858 1176 906" style="text-align: center;">>25</td> <td data-bbox="1176 858 1415 906" style="text-align: center;"><50</td> <td data-bbox="1415 858 1762 906" style="text-align: center;">5.5</td> <td data-bbox="1762 858 1980 906"></td> </tr> <tr> <td data-bbox="972 906 1176 954" style="text-align: center;">>50</td> <td data-bbox="1176 906 1415 954" style="text-align: center;"><75</td> <td data-bbox="1415 906 1762 954" style="text-align: center;">4.5</td> <td data-bbox="1762 906 1980 954"></td> </tr> <tr> <td data-bbox="972 954 1176 1002" style="text-align: center;">>75</td> <td data-bbox="1176 954 1415 1002" style="text-align: center;"><100</td> <td data-bbox="1415 954 1762 1002" style="text-align: center;">3.0</td> <td data-bbox="1762 954 1980 1002"></td> </tr> <tr> <td data-bbox="972 1002 1176 1064" style="text-align: center;">>100</td> <td data-bbox="1176 1002 1415 1064"></td> <td data-bbox="1415 1002 1762 1064" style="text-align: center;">1.5</td> <td data-bbox="1762 1002 1980 1064"></td> </tr> </tbody> </table> <p>(b) Rod Electrodes</p> <p>Galvanised steel rod electrodes of suitable diameter and length shall be used as per the recommendation of IS-3043. For test pits, electrodes shall be heavy duty type (Class – C) GI pipe of suitable diameter with perforations. Electrodes installed in the test pits will have disconnecting facilities.</p> <p>(c) Equipment Earthing Leads</p> <p>The size of the earthing leads shall be decided based on the type of equipment and structure to be</p>	Resistivity of soil (ohm– metre)		Increase in thickness/diameter of earthing conductor (mm).			<10	8.0		>10	<25	7.0		>25	<50	5.5		>50	<75	4.5		>75	<100	3.0		>100		1.5	
Resistivity of soil (ohm– metre)		Increase in thickness/diameter of earthing conductor (mm).																													
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			earthed and shall be provided generally as per IS-3043. Number of sizes shall be standardised to simplify procurement. Each equipment except fractional HP motors and small enclosures shall be provided with redundant earthing leads.
34.0	SPECIFICATION VOLUME IV, SECTION D 2.9, CLAUSE NO: 8.0	--	<p>Add: SPECIFIC REQUIREMENTS:</p> <p>a. The earthing system design and installation shall comply with IS-3043, IEEE-80, IEEE-665 and Indian Electricity Rules. Earthing system shall be designed in a manner that provides a means to safely discharge lightning strokes to earth, reduce step and touch potential to safe level and confine dangerous soil currents. The BIDDER shall submit supporting calculations along with layout as per methods described in above referred standards. The BIDDER shall also submit the earthing layouts to electrical Inspector for his approval. Necessary modification wherever required shall be carried out by the contractor and got approved by the Inspector at no extra cost to the Purchaser.</p> <p>b. After installation, the resistance of the ground grid shall be tested in presence of PURCHASER as per IE rules. If the resistance is observed to be not less than 1 ohm, the Contractor shall derive additional earth pits such that resistance is less than 1 ohm. After the test, report shall be submitted to Electrical Inspector for approval. The submission of Earthing layouts, drawings and obtaining final clearances & approval from Electrical Inspectorate shall be within the scope of the BIDDER.</p> <p>c. DESIGN CRITERIA FOR EARTHING Average soil resistivity shall be calculated based on soil investigation report which shall be furnished by the BIDDER during detailed engineering stage.</p> <p>Earthing conductor shall be designed to carry maximum earth fault current and hence 50 kA shall be considered for the design of entire earthing system for 1 Sec duration withstand time.</p>