BANGLADESH RURAL ELECTRIFICATION BOARD (BREB)

TENDER DOCUMENT
FOR THE

TURNKEY CONTRACT FOR DESIGN, SUPPLY, CONSTRUCTION, INSTALLATION, TESTING & COMMISSIONING WORK FOR RENOVATION AND UP-GRADATION OF EXISTING 10 MVA GANGGADHORPOTTI SUB-STATION UNDER MANIKGANJ PBS

PACKAGE NO: D(N)-MNK-SSU-2017-18-01

VOLUME 2 OF 3

Particular Specification and Drawings

ISSUED TO: M/S……

ON BEHALF OF THE OFFICE OF
Superintending Engineer
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Section 8

Particular Specifications

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SCHEDULE A

INTRODUCTION AND PREAMBLE TO THE PRICE & TECHNICAL SCHEDULES

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INTRODUCTION AND PREAMBLE TO THE PRICE & TECHNICAL SCHEDULES

A1: BRIEF DESCRIPTION OF THE WORKS.

The work comprise of creating facilities for 06 (Six) nos. 33/11kV outgoing feeders through extension of 1 nos. 33 kV Bay-Breaker of existing Gonggadhorpotti sub-station and dismantling of existing 33kV Bus-bar and installation of new Bus-bar & related works for Manikganj PBS at Gonggadhorpotti Grid Sub-Station.

Outdoor switchyard:

The extension of Switchyard shall Comprise of Steel Structures for 04 nos. 33 kV outgoing feeders and space remaining for 01 no. outgoing feeder for future use. The Bus-conductor shall be 2×Martin (2500A). The steel structure columns and electrical equipment shall be installed on steel supports with RCC Foundation.

Civil works:

Complete design, supply materials and construction of all civil items required for extension of 33 kV bay at switchyard for steel structure and Equipment foundation, RCC Internal road, Power and control cable trenches, surface finishing with gravels, switchyard earthings, switchyard lighting, lightning protection. The cable duct constructed by PGCB in the control room building shall be used to run the control/ power cables to switching room for connecting control panel and Energy metering panel to be installed. All control panel, separate energy metering panel, battery chargers and AC/DC panels shall be installed in the existing control room building (if applicable)**.**

33kV Bus- Isolator:

Design, supply, delivery, installation, testing & commissioning of 02 no. 33kV 2500A capacity Bus-isolator without earthling switch for connecting existing and extended 33 kV Bus-bar.

33kV Outgoing Feeders:

Design, supply, delivery, installation, testing & commissioning of 04 nos. of 33kV 1250A capacity vacuum circuit breakers for 04 nos. out going feeders each with one set of CT with ratio 800-400/5-5-5A, one set of isolator of capacity of 1250A without earthing switch for bus side connection, one set of isolator of capacity of 1250A with earthing switch for line side connection and one set of lightning arresters.

33kV Single Phase Current Transformers (Incoming): If Applicable

Design, supply, delivery, installation, testing & commissioning of 2 sets (6 nos) of single phase current transformers will be required for the proposed 2 feeders. The feeder CTs shall have 3 cores, core 1 shall have ratio 2400-1600/5-5-5A, 30VA, M0.2 for indicating meters on control panels, core 2 shall have ratio 2400-1600/5-5-5A, 30VA M0.2

dedicated for the energy meters to be installed in a separate energy metering panel and core 3 shall have ratio 2400-1600/5-5-5A, 30VA, 5P20 for protection. Burden Shall be Calculated as per Field Condition and Resistance of the Instrument Cables.

33kV Single Phase Current Transformers (Outgoing):

Design, supply, delivery, installation, testing & commissioning of 04 sets (12 nos.) of single phase current transformers will be required for the proposed 04 feeders. The feeder CTs shall have 3 cores, core 1 shall have ratio 800-400/5-5-5A, 30VA, M0.2 for indicating meters on control panels, core 2 shall have ratio 800-400/5-5-5A, 30VA M0.2 dedicated for the energy meters to be installed in a separate energy metering panel and core 3 shall have ratio 800-400/5-5-5A, 30VA, 5P20 for protection. Burden shall be Calculated as per Field Condition and Resistance of the Instrument Cables.

33kV Single Phase Voltage Transformers:

Design, supply, delivery, installation, testing & commissioning of one sets (3 nos.) of 33kV single phase voltage transformers to be installed at the two ends of structures in the switchyard for bus VT. For all VTs core 1 of secondary winding of accuracy class 0.2 and capacity 50 VA will be dedicated for energy meters only and core 2 of accuracy class 3P and capacity 50 VA will be used for indicating meters on the control panels.

33kV Control Panels:

Design, supply, delivery, installation, testing & commissioning of control panels for 33kV vacuum circuit breakers for 04 nos. out going feeders including all control cables and AC/DC supplies (if applicable) .

Energy Metering Panel:

Design, supply, delivery, installation, testing & commissioning of one no. energy meter panel having space provision for installation of 06(Six) nos. energy meters (if applicable otherwise not) and 04 nos. energy meters for 04 nos. outgoing feeders. Dedicated supply from both CTs and VTs will be drawn directly to the metering panel.

110V Battery and Battery Chargers:

Existing Battery and Battery charger in control room building shall be replaced by supplying and installation of one set of new batteries and battery charger in the control room including all power and control cables.

LV AC / DC Panels: (If Required)

Design, supply, delivery, installation, testing & commissioning of one set of low voltage AC distribution panel in the control room to provide 415/230V supplies to all equipment being supplied with necessary 3-phase MCCBs and one set of DC distribution panel in the control room to provide 110V DC supplies as required and including all power and control cables .

Earthing System:

Design, supply, delivery, installation of earthing system and lightning protection screen including connections, connectors and clamps to suit the switching station overall arrangement and provide supporting design calculations. However the design and

installation of earthing system done by PGCB/PDB should be followed for the 33kV existing switching station also. Grounding resistance to be maintained less than 0.2 ohm.

Multi core Control / Power cables:

Complete set of multi core low voltage auxiliary power and control cables between all items of equipment required under this contract shall be supplied, installed, landed, terminated and have individual cores identified. The production of the overall switching station cable routing and core schedules shall also be provided. The multi core control cables shall be installed in such a way that those shall enter into the existing control room building through the newly constructed and existing duct and laid on a suitable cable tray as per direction of Engineer-in-charge. All control cable size should be 4/6 rm and above if required.

Building Lighting, Small Power, Air Conditioning and Ventilation : (If Applicable)

Complete design and calculations supply, delivery, installation, testing & commissioning of equipment to provide lighting ,LV power supply and air conditioning system and emergency DC lighting at strategic location for equipment operations and inspections. Approach rood, cable trench etc. to be constructed by the contractor.

Switchyard Lighting: (If Applicable)

Complete design and calculations supply, delivery, installation, testing & commissioning of equipment to provide lighting (sodium light) for security, roadway and switchyard and emergency DC lighting at strategic location for equipment operations and inspections.

Training:

The Contract Price shall include all costs for training of Employer's representatives at site. Four Engineers (Two from REB and two from PBS) nominated by the Employer shall be given on job training at the time of installation as well as testing & commissioning of the switching station.

Limitations:

The Contractor is to carry out the works taking full account of the limitations imposed by the existing sites and the requirement to maintain all existing supplies during the construction works. Any temporary works, structures, connections etc. necessary to achieve this requirement are to be included in the tender price.

The Tenderer shall be deemed to have visited the site, inspected, gathered data and verified details of the as built system in order to design, supply and interface their new equipment. All necessary materials, adjustments dismantling, remedial and tiding-up work in order to complete the work specified shall be included in the contract price. The Contractor is responsible for ensuring that all and/or any item(s) of work required for the

safe, efficient and satisfactory completion and functioning of the works, are included in the bid price whether they be described in the specification or not.

PLANT REQUIREMENTS:

i) Civil works:
ii) 33kV Incoming Feeder
iii) 33kV Outgoing Feeders
iv) 33kV Single Phase Voltage Transformers
v) 33kV Control Panels
vi) 11kV indoor Switchgear VCB (2000Amps) for incoming feeder with inbuilt 11 kV 2500Amps copper Bus-bar.
vii) 11kV indoor Switchgear VCB (2000Amps) for 11 kV Bus-coupler
viii) 11kV indoor Switchgear VCB (630Amps) for 11 kV outgoing feeders.
ix) Energy Metering Panel
x) 110V Battery and Battery Chargers
xi) LV AC / DC Panels
xii) Earthing System
xiii) Multi core Control and Power cables
xiv) Training

TECHNICAL SPECIFICATIONS FOR SWICHING STATION

1. 33KV OUTDOOR TYPE VACUUM CIRCUIT BREAKER (VCB)

Sl. No.	Description	Unit	Requirements
1	System voltage	kV	33
2	Rated voltage	KV	36
3	Rated frequency	HZ	50
4	Rated normal current		
	a) Incoming Feeder	A	N/A
	b) Outgoing Feeder	A	1250
5	Interrupting medium		Vacuum
6	Number of phases		3
7	Rated short-circuit breaking current	KA	31.5
8	Rated short-circuit making current	KA	78.75
9	First pole to clear factor		1.3
10	Rated operating sequence		O-0.3s-CO-3min-CO
11	Rated duration of short circuit	Sec	3
12	Impulse withstand on 1.2/50 μs wave	KV	170
13	Power frequency test voltage (dry) at 50Hz,1 min	KV	70
14	Circuit breaker operating mechanism type		Gang operated spring charged & manual
15	Operating particulars		
	a) Opening time: without current at 100% rated breaking current	ms (max)	0.05
	b) Breaking time	ms	<45ms
	c) Closing time	ms	70±10
16	Is the circuit breaker trip free?	Yes/No	Yes
17	Trip coil voltage	VDC	110
18	Rated supply voltage of shunt opening release	VDC	110
19	Spring charging motor voltage	VAC	415/230
20	Minimum clearance in air		
	a) Between phases	mm	430
	b) Phases to earth	mm	380
21	Degree of protection		IP 55
22	Auxiliary switch:		
	NO		9
	NC		9
23	Is lockout facility fitted		Yes
24	Rated breaking current :		
	Line charging	KA	25

	Cable charging	KA	50
	Small inductive	KA	02
25	Installation		Outdoor
26	Creepage Distance	mm/kv	25
27	Closing Coil	Nos.	01
28	Tripping Coil	Nos.	02
29	Standard		IEC 62271-100

2. 33KV DISCONNECTING SWITCH AND EARTHING SWITCH (DS/ES)

Sl. No.	Description	unit	Requirements
1	Installation		Outdoor
2	Mounting position		Vertical/Horizontal
3	Method of operation		Gang operated
4	Type of operating mechanism		Manual
5	System voltage	kV	33
6	Rated voltage	kV	36
7	Frequency	Hz	50
8	Number of pole	Nos.	3
9	Rated normal current-		
	a) Bus Sectionalizer	A	2000
	b) Incoming Feeder	A	N/A
	c) Outgoing Feeder	A	1250
10	Rated short time withstand current	kA rms	31.5
11	Rated duration of short circuit	sec	3
12	Rated peak withstand current	kA pk	110
13	Basic insulation level	kV	170
14	Power frequency withstand voltage (1min)	Kv	70
15	Creep age distance	mm	900
16	Material contact		Copper with silver / Nickel coating
17	Number of Auxiliary switch:		
	NO		9
	NC		9
18	Earthing blade		6
19	Degree of protection		IP 55
20	Type of breaks per pole		Single
21	Standard		IEC 62271-102

3. 33KV CURRENT TRANSFORMER (CT)

Sl. No.	Description	Unit	Requirements
1	Type		Electromagnetic induction, single phase, outdoor
2	Rated primary current		
	(a) Incoming Feeder (N/A)	Ams	2400-1600/5-5-5A
	(b) Outgoing Feeder	Ams	800-400/5-5-5A
3	Rated secondary current	Ams	5-5-5A
4	Rated secondary accuracy and burden		
	a) Metering (core 1- for indicating meters)		0.2, 30VA
	b) Metering (core 2- dedicated for energy metering)		0.2, 30VA
	c) Protection (core 3)		5P20, 30VA
5	Rated frequency	Hz	50
6	System voltage	kV	33
7	Rated voltage for equipment	kV	36
8	Short time current rating for 3 sec.	kA	31.5
9	Extended current rating (% of rated current)	%	120
10	Over current rating	A	10
11	Basic insulation level on 1.2 / 50 micro-sec wave	kV	170
12	Power frequency withstand voltage (1 min, 50 Hz)	kV	70
13	Creepage distance	mm/kv	25
14	Bushing		Porcelain outdoor type
15	System earthing		Effectively earthed
16	Insulation class		A
17	Standard		IEC 60044-1
18	Knee point voltage(at max ratio)		<150v for metering <600v for protection
*	**Remarks**	**CT ratio to be reviewed with PGCB / REB (if required)**	

4. 33KV VOLTAGE TRANSFORMER (VT FOR BUS & FEEDERS): If Applicable

Sl. No.	Description	Unit	Requirements
1	Type		Electromagnetic induction, single phase, outdoor
2	Rated primary voltage	kV	33/ √3
3	Rated voltage for secondary windings	kV	0.11 / √3 and 0.11 / √3
4	Rated secondary burden and accuracy		
	Secondary winding Core 1 (Dedicated for energy metering)	VA Class	60 0.2
	Secondary winding Core 2	VA Class	50 3P
5	Frequency	Hz	50
6	Impulse withstand voltage (1.2/50 micro sec wave)	kV	170
7	Cree page distance	mm/kV	25
8	System earthing		Effectively earthed
9	Power frequency withstand voltage (1min)	KV	70
10	Partial discharge	PC	≤5
11	Short circuit withstand voltage	KA	63
12	Rated voltage factor		1.2 continuous 1.9 30 second
13	Standard		IEC 60044-2

5. 33KV LIGHTNING ARRESTER (LA)

Sl. No.	Description	Unit	Requirement
1	Type		Metal Oxide, (ZnO) Gapless type, single phase
2	System voltage	kV	33
3	Rated voltage	kV	36
4	System frequency	Hz	50
5	Continuous operating voltage	kV	25 kV (rms)
6	Rated arrester voltage	kV	30
7	Standard nominal discharge current	kA	10
8	Reference current at ambient temperature	mA	2
9	Steep current impulse residual voltage	kV PK	84
10	Basic insulation level on 1.2 / 50 micro-sec wave	kV	170

11	Power frequency withstand voltage (1.2/50 ms)	kV	70
12	Lightning impulse residual voltage at 10kA	kV PK	75
13	Duty Class		Heavy Duty Station Class
14	Earthing system		Effectively earthed
15	Discharge class		3
16	Pressure relief class		Class A
17	Degree of Protection		IP 55
18	Surge Counter & Current Monitor		Yes
19	Standard		IEC 60099-4

6. 33/0.415KV, 100KVA AUXILIARY TRANSFORMER (N/A)

Sl. No.	Description	Unit	Requirement
1	Rated power	KVA	100
2	Type of cooling		ONAN
3	Coolant		Mineral Oil
4	Number of phase		3
5	Frequency	Hz	50
6	Normal transformation ratio	KV	33/0.4
7	Rated primary voltage	KV	33
8	Rated secondary voltage	kV	0.415
9	Nominal LT voltage	KV	0.415 /0.240
10	Highest system voltage of		
	a) Primary winding	kV	36
	b) Secondary winding	V	457
11	Basic insulation level	kV	170
12	Power frequency withstand voltage (1min)		
	a) HT side	kV	70
	b) LT side	kV	2.5
13	Type		Core
14	Insulation		Outdoor, tropical and high humidity
15	Earthing		Neutral earth at LT, 3-phase 4-wire
16	Windings		Double wound and of high conductivity copper
17	Vector Group		DYN ll
18	Neutral to be Brought out		
	a) HT		Nil

	b) LT		Yes
19	Neutral insulation		Full insulation and 100% capacity
20	LT bushing	Nos	4
21	Impedance voltage at 75 ^{o}C at normal ratio and rated capacity		5%
22	Tapping range		1. 5 steps off-load tap changer, 2.5% per step
23	Type of tap changer		Manual
24	Maximum temperature rise over 40 ^{o}C ambient when transformer is working at full load and tap changer is at normal position		
	a) Winding by resistance	^{o}C	65
	b) Oil by temperature	^{o}C	60
25	Type of base		Ground mounted

7. 33KV BUSBARS AND CONNECTORS

Sl. No.	Description	Unit	Requirement
A.	**FLEXIBLE CONDUCTORS**		
1	Conductor/connector material		ACSR/ 2×Martin
2	Rated current (site rating)	A	2500
3	Temperature rise at rated current	^{o}C	35

8. 33KV BUSBAR INSULATOR STRING

Sl. No.	Description	Unit	Requirement
1	Insulator material		Porcelain
2	Number of units per string	nos.	4
3	Insulator voltage class		
4	Type of insulator		Ball and socket type disc, security clip made of rod brass alloy
5	Cree page/leakage distance (min)	mm	298
6	Total Cree page distance of string	mm	900
7	Unit spacing	mm	146
8	Dry arcing distance (min)	mm	1968
9	Diameter of insulator	mm	256
10	Withstand voltage (min)		

	a) Power frequency dry (one min)	kV	70
	b) Power frequency wet(one min)	kV	40
	c) Impulse 1.2 / 50 micro sec	kV	110
11	Flashover voltage (min)		
	a) Power frequency dry (one min)	kV	80
	b) Power frequency wet(one min)	kV	50
	c) 50% impulse 1.2 / 50 micro sec wave, positive or impulse 1.2 / 50 micro sec wave positive	kV	125
	d) 50% impulse 1.2 / 50 micro sec wave, negative	kV	130
12	Power frequency puncture voltage (min)	kV	110
13	Radio influence voltage data (min)		
	a) Power frequency test voltage rms to ground	kV	10
	b) Maximum RIV at 1000Kc	micro V	50
14	Minimum mechanical strength for suspension		
	a) Electro-mechanical breaking load	kg	7260
	b) Mechanical breaking load	kg	6800
	c) Tension proof test load	kg	3400
	d) Time load test value	kg	4536
	e) Mechanical impact strength	mm kg	630
15	Minimum mechanical strength for strain stringing		
	a) Electro-mechanical breaking load	kg	11340
	b) Mechanical breaking load	kg	11340
	c) Tension proof test load	kg	3400
	d) Time load test value	kg	4536
	e) Mechanical impact strength	mm kg	530
16	Insulator hardware		Insulator hardware for insulator strings or bus support insulator shall have UTS-120 KN and galvanized as per IEC-729

9. SHIELD WIRE, EARTHING GRID AND EARTHING ELECTRODE

Sl. No.	Description	Unit	Requirement
A.	**Shield Wires**		
1	Material		High strength steel
2	Grade of steel	kg.	4
3	Number of strands	nos.	7
4	Diameter of each strand	mm	3.25
5	Overall diameter	mm	9.8
6	Nominal cross section	mm^2	35
7	Weight per km length	kg	460
8	Rated ultimate tensile strength	kg	4900

9	Class of Zinc coating		Class-A
B	**Earth Grid**		
1	Material		Copper
2	Maximum earth fault current for 3 sec	kA	31.5
C	**Earth Electrodes**		
1	Material		Copper
2	Diameter	mm	16
3	Calculated resistance of combined earth grid	Ohm	Less than 0.5

10. BATTERIES AND CHARGER (N/A)

Sl. N0.	Description	Unit	Requirements
A.	**BATTERY**		
1	Electrolyte type		Nickel Cadmium / Alkaline
2	Nominal voltage	V/per cell	1.2
3	Capacity at 5 hour rate	Ah	250
4	Number of cells	nos.	92
5	Operating voltage	VDC	110
6	Continuous discharge current at the rate of 10 hour and final cell voltage 1.1 volt	Amp	10
7	Short time discharge current at the rate of 2 hour and final cell voltage 1.1 volt	Amp	50
8	Discharge voltage	V	1.0 – 1.4 per cell
9	Charging voltage (normal)	V	1.4-1.5Volt per cell
10	Charging voltage (Maximum)	V	1.54-1.69 per cell
11	Battery voltage at end of the duty cycle	V	1.1Volt per cell
B.	**CHARGER**		
1	Rectifier Type		(Thyristor Controlled) Silicon or Selenium
2	AC input voltage	V	415V±15%, 3 phase
3	Input a.c frequency	HZ	50±5%
4	DC output voltage range	V DC	110±10%
	a) normal charge	V DC	110±10%
	b) Float charge	V DC	1.42 volt per cell 110±5%
	c) Boast charge	V DC	1.55 volt per cell
5	Installation breakdown voltage	kV	2kV for 1

			minute
6	Output Current (continuous)	A DC	50
7	Type of AVR		DVR-Diode Voltage Regulator
8	Installation		Indoor
9	Charging Mode:		Both constant current & constant Voltage

11. LV AC DC DISTRIBUTION BOARD (N/A)

Sl. No.	Description	Unit	Requirement
A.	**AC DISTRIBUTION BOARD**		
1	Bus bar rating (R, Y, B, N, G)	Amps	600
2	Voltage	Volts	415
3	Incoming breaker rating (MCCB)	Amps	400
B.	**2. D.C. DISTRIBUTION BOARD**		
1	Bus bars:- (+VE,-VE, G)		
	a) Maximum current rating	A DC	200
	b) Voltage rating	V DC	110
C.	Two distribution bus shall be maintained in each pannel (AC & DC Distribution) and both shall be electricity interlocked.		

12. 33KV CONTROL, METERING AND RELAY PANEL

Sl.No.	Description	Unit	Requirement
A.	**33KV CONTROL PANEL**		
1	Number of control panelsKVRH Meter Panel	Nos	1
2	Number of KWH Metering Panel	No.	1
A1.	**PROTECTION**		
A.1.1	**IDMT OVER CURRENT & EARTH FAULT RELAYS**		
1	Manufacturer's Name & Country		Siemens (Germany)/ Alstom (UK/France)/ ABB (Switzerland/Sweden)/ Schneider (France)
2	Type of relay		Numerical Programmable
3	Range of current setting		
	a) Phase element	% of CT rating	
	b) Earth fault element	% of CT rating	
4	Range of timing settings at 10 time CT rating	Sec	
5	Burden of relay at 10 time CT rating	VA	
6	Percentage of current setting at which	%	

	relay will reset		
7	Reset time after removal of 10 times CT rated current for:		
	a) Phase element (100%)	Sec	
	b) E/F element (40%)	Sec	
A2.	**METERING AND INDICATION**		
A.2.1	**KWH METER**		
1	Manufacturer's Name & Country		Siemens(Germany/Switzerland)/Alstom,(UK)/ABB(Switzerland)/AEG(Germany)/Schlumberger(USA)
2	Type of Meter		Numerical Programmable multifunction(3 element 4-wire)
3	Number of KWH Meters	Nos.	02 nos. with provision for 04 meters in the Metering panel
A.2.2	**INDICATION METERS (VOLT, AMPERE, KW, KVAR, PF)**		
1	Manufacturer		Siemens(Germany/Switzerland)/Alstom,(UK)/ABB(Switzerland)/AEG(Germany)/Schlumberger (USA)
2	Type of Meter		Digital /Analog
3	Type of Meters in each Panel		Volt, 3 nos. Amp, kW, kVAR and Pf

13. STEEL STRUCTURE DESIGN

Sl. N0.	Description	Unit	Requirements
1	Maximum ratio slenderness		
	a) Main members	mm	120
	b) Bracings	mm	180
	c) Redundant	mm.	250
2	Minimum size of member	mm	45×45×5
3	Min member thickness		
	Main member	mm	6
	Other bracing member	mm	5
	Plate	mm	5
	Bolt diameter	mm	16
4	Galvanizing thickness	mm	85

14. Control cable

XLPE insulated multi core control cable Laid up beded with PVC or tap. Flat/round wire armoring with helical steel taping and PVC sheathed, rated voltage 600/1000, continuous permissible voltage 720/1200 volts (VDE 027/3.69 BDS 901:85) (NYRGby) suitable for use in indoors, outdoors, underground and in water for continuous permissible service voltage of 720/1200 volts. Maximum resistance 4.73 ohm/km at 35°C.

15. **POWER CABLES**

15.1. **33 KV POWER CABLES (U/G)**

Guaranteed Technical Data Schedule of 33KV, 1-Core × 500 Sq.mm U/G XLPE Copper Cable

SL No.	Description	Unit	Required Specification
1	Name and address of the Manufacturer		To be mentioned
2	Type/Model of the offered cable		To be mentioned
3	Nominal system voltage	KV	33
4	Rated voltage of cable	KV	18/30(36)
5	Process of manufacturing		VCV/CCV
6	Number of core and cross sectional area of conductor cores	Sq.mm	1×500
7	Conductor material		Copper
8	Minimum no of strand	No.	53
9	Diameter of each strand	mm	To be mentioned
10	Shape of conductor		Compacted Circular
11	Type of conductor screen		Semi-conducting
12	Thickness of semi conducting screen	mm	0.6
13	Avg. thickness of insulation	mm	8.0
14	Process of curing		Dry process
15	Material of insulation		Cross Linked Polyethylene (XLPE)
16	Type of non metallic insulating screen		Semi-conducting
17	Thickness of semi conducting insulation screen	mm	1.0
18	Number and diameter of copper screen strands	No./mm	Based on design calculation
19	Composition of filler		PVC
20	Composition of bedding		Extruded PVC
21	Thickness of bedding	mm	Based on design calculation
22	Number and diameter of armour wire	No./mm	As per IEC 60502
23	Avg. thickness of MDPE over sheath	mm	Based on design calculation
24	Nominal diameter of complete cable	mm	Based on design calculation
25	Nominal weight per meter of complete cable	Kg/m	Based on design calculation
26	Minimum radius of bend round which cable can be laid	mm	Based on design calculation
27	Max. D.C resistance of conductor per meter at 20° C	Ohm/m	Based on design calculation
28	Max. A.C resistance of conductor per meter at MAXIMUM CONDUCTOR TEMPARATURE	Ohm/m	Based on design calculation
29	Star resistance per meter of cable at 50Hz	Ohm/m	Based on design calculation
30	Star capacitance per per meter of cable at 50Hz	pF/m	Based on design calculation
31	Charging current per conductor per	mA	Based on design calculation

	meter at 18000/30000 Volts , 50Hz		
32	Maximum current carrying capacity of conductor in ground	A	Based on design calculation
33	Maximum conductor temperature under continuous loading	℃	Based on design calculation
34	Short circuit withstand capacity nof the cable for 1 sec. duration	KA	Min. 25
35	conductor temperature at the end of short circuit	℃	≤250
36	Earth fault withstand capacity for 1 sec.	KA	Min. 25
37	Screen short circuit withstand capacity	KA	Min. 25
38	Armour short circuit capacity	KA	Based on design calculation
39	Cable resistance, reactance		
	a) for positive sequence	Ohm/m	Based on design calculation
	b) negative sequence	Ohm/m	Based on design calculation
	c) Zero sequence	Ohm/m	Based on design calculation

SCHEDULE B

TENDER PRICES

SCHEDULE B

TENDER PRICES

The Tenderer is to complete in full the following Price Schedule in accordance with BOQ described in **section-6** of this Tender Document.

Each item is to be priced separately for switching station & 33KV Line Augmentation work and is to be fully inclusive of all costs associated with completing the Works. The prices are to include for surveying, design, fabrication, manufacture, assembly, quality control, testing, packing, insurance, delivery to site. The estimated cost of elements are to be shown in the appropriate column in the schedule shall include landing, haulage, transport to site, civil works, erection, construction, assembly, connecting, testing finishing of, setting to work and maintenance during the defect liability period including all supervision, project management costs, overheads, on-costs and profits etc.

The Works shall be valued and paid exclusively at the unit prices and total prices quoted in the schedule, which are to remain fixed for the duration of the Contract.

The prices quoted are to be firm for the completed Works in full working order in accordance with the requirements of the Contract.

Prices for the equipment at site, erection/ supervision elements are to be quoted in Bangladesh Taka inclusive of all duties and taxes paid or payable on components and material incorporated or to be incorporated in the plant.

Prices shall also include for all necessary local materials, inland transportation, insurance etc.

SCHEDULE C

BAR CHART PROGRAMME OF KEY ACTIVITIES

SCHEDULE C

BAR CHART PROGRAMME OF KEY ACTIVITIES

The individual dates are all contractually bindings.

The times given under column C are the commissioning target dates at present planned to be achieved and may be the subject of mutual adjustment.

The times entered under column A are to be the dates guaranteed for arrival at site of the equipment before plant erection to the extent necessary to enable him to proceed with work to meet the dates under column B guaranteed for complete delivery, erection and commissioning.

The time include all necessary control, relay, metering, auxiliary power, ancillary equipment to enable the respective item of plant to be completely commissioned and put into commercial operation together with such other associated equipment, e.g. bus-bars etc. as will ensure that subsequent shutdown are unnecessary for at least only of a temporary or short time nature.

List of Equipment	A* Guaranteed Arrival at site	B* Guaranteed Completion	C* Target Completion

* Time in months, after signing of Contract.

Preliminary foundation drawings as called for in the Technical Specification shall be provided within 1.0 month of the contract commencing

SCHEDULE D

MANUFACTURERS, PLACES OF MANUFACTURE AND TESTING

SCHEDULE D

MANUFACTURERS, PLACES OF MANUFACTURE AND TESTING

Item	Description	Manufacturer	Place of Manufacture	Place of Testing and Inspection
1.	33KV SWITCHGEAR Circuit Breakers (VCB) Operating Mechanism Disconnecting Switch (DS) Earthing Switch (ES) Busbar Connector Lightning Arrester (LA) Voltage Transformer (VT) Current Transformer (CT) Insulator Disc Insulator Post Type DO Fuse Remote Control Panel Relays Indicating Instrument Energy Meters Battery Charger Battery LVAC Panel			

	DC Panel LV Power & Control Cables			
2.	11kV indoor Switchgear VCB (2000Amps) for incoming feeder with inbuilt 11 kV 2500Amps copper Bus-bar. 11kV indoor Switchgear VCB (2000Amps) for 11 kV Bus-coupler 11kV indoor Switchgear VCB (630Amps) for 11 kV outgoing feeders.			
3.	STEEL STRUCTURES			
4.	EARTHING Copper Conductor			
5.	SITE ERECTION AND COMMISSIONING BY			
6.	CIVIL WORKS Design to be performed by: Construction by:			

7.	All materials for Augmentation of 33 KV existing line.			

SCHEDULE E

TECHNICAL PARTICULARS AND GUARRANTEES

SCHEDULE E

TECHNICAL PARTICULARS AND GUARRANTEES

1.0 33KV OUTDOOR TYPE VACUUM CIRCUIT BREAKER (VCB)

1.1 33KV OUTDOOR TYPE VACUUM CIRCUIT BREAKER (FEEDER BREAKER)

Sl. No.	Description	Unit	Requirement	Manufacturer's Guaranteed Data
1	Manufacturer		To be mentioned	
2	Model number		To be mentioned	
3	Number of phases		3	
4	No. of break per phase		To be mentioned	
5	Interrupting medium		Vacuum	
6	Vacuum interrupter's manufacturer		To be mentioned	
7	Rated voltage	KV	33	
8	Maximum voltage	KV	36	
9	Rated frequency	HZ	50	
10	Rated normal current for outgoing feeder	A	1250	
11	Rated breaking currents:	Arms		
	a) Line charging	A	25	
	b) Cable charging	A	50	
	c) Small inductive	A	02	
12	Rated short-circuit breaking current	KA rms	31.5	
13	First pole to clear factor		To be mentioned	
14	Rated transient recovery voltage at 100% rated short circuit breaking current	KV	To be mentioned	
15	Rated short-circuit making current	KA	78.75	
16	Rated operating sequence		O-0.3s-CO-3min-C	
17	Rated duration of short-circuit	S	3	
18	Rated out of phase breaking current	KA	To be mentioned	
19	Rated opening time	ms	To be mentioned	
20	Rated break time	ms	To be mentioned	
21	Rated closing time	ms	To be mentioned	
22	Is circuit breaker re-strike free	Yes/no	Yes	
23	Rated short time withstand current, 3 sec rms	KA	31.5	
24	Impulse withstand on 1.2/50μs wave	kV	170	
25	Power frequency test voltage (dry) at 50Hz 1 min	kV	70	
26	Type of arc contacts or arc control device		To be mentioned	
27	Main contact			
	a) Type of contact		To be mentioned	
	b) Material of contact surfaces		To be mentioned	
	c) Contact resistance	μΩ	Less than 40	
28	Length of break	mm	To be mentioned	
29	Length of stroke	mm	To be mentioned	
30	Operating mechanism manufacturer		To be mentioned	
31	Operating mechanism type		Spring	
32	Trip free/or fixed trip		Trip free	
33	Is lockout facility fitted?		Yes	
35	Closing supply			
	a) Closing coil Volts	V DC	110V	
	b) Closing coil current	A DC	To be mentioned	
36	Rated supply voltage of shunt opening release			
	a) Trip coil Volts	V DC	110V	
	b) Trip coil current	A DC	To be mentioned	
37	Spring charging motor			
	a) Current	A AC	To be mentioned	

Sl. No.	Description	Unit	Requirement	Manufacturer's Guaranteed Data
	b) Voltage AC	V AC	415/230	
38	Number of auxiliary switch contacts			
	a) normally open	NO	9	
	b) normally closed	NC	9	
	c) adjustable		As required	
39	Maximum creepage			
	a) to earth	mm	To be mentioned	
	b) across interrupter terminals	mm	To be mentioned	
40	Number of interrupters per pole	Nos	1	
41	Material of interrupter chamber		To be mentioned	
42	Wall thickness of interrupter chamber	mm	To be mentioned	
	a) Material of contact surface primary arcing		To be mentioned	
	b) Contact resistance		To be mentioned	
43	Length of each break	mm	To be mentioned	
44	Length of stroke	mm	To be mentioned	
45	Operating rod for moving contact(s) material		To be mentioned	
46	Dimensions etc.		To be mentioned	
47	Weight of circuit breaker unit complete	kg	To be mentioned	
48	Maximum shock load imposed on floor or foundations when opening under fault conditions (state whether tension or compression)	N	To be mentioned	
49	Period of time equipment has been in commercial operation		To be mentioned	
50	Opening time			
	a) Without current at 100% of rated breaking current	sec	0.5 max	
	b) Breaking time	cycle	5 (0.1 second)	
	c) Closing time	ms	70±10	
51	Maximum arc duration at any duty cycle of IEC 56-2	ms at.....%	To be mentioned	
52	Current at which maximum arc duration occurs (critical current)	A	To be mentioned	
53	Make time	ms	To be mentioned	
54	Time from closing of control switch to completion of closing stroke during fault making	ms	To be mentioned	
55	Is an external series break incorporated in the breaker?	Yes/no	To be mentioned	
56	Is any device used to limit transient recovery voltage?	Yes/no	To be mentioned	
57	Number of close/trip operation possible on one spring charge	Nos.	To be mentioned	
58	Minimum clearance in air:			
	a) between phases	mm	430	
	b) phase to earth	mm	380	
	c) across interrupters	mm	To be mentioned	
	d) live parts to ground level	mm	To be mentioned	
59	Period of time the equipment has been in commercial operation	Years	To be mentioned	
60	Cree page distance (min)	kV/mm	25	
61	Method of indicating VCB ON/OFF	Mech/Elect	To be mentioned	
62	Life of interrupter	Years	To be mentioned	
63	Pressure in vacuum tube for VCB	Bar	To be mentioned	
64	Guaranteed numbers of operation for vacuum interrupter			
	a) at rated crrent switching	Nos.	To be mentioned	
	b) at short circuit current switching	Nos.	To be mentioned	
65	All current carrying parts of VCB shall be made of		Copper	

Sl. No.	Description	Unit	Requirement	Manufacturer's Guaranteed Data
66	Standard		IEC 56	
67	Degree of Protection		IP 55	

1.2 33KV OUTDOOR TYPE VACUUM CIRCUIT BREAKER (BUS COUPLER BREAKER) (N/A)

Sl. No.	Description	Unit	Requirement	Manufacturer's Guaranteed Data
1	Manufacturer		To be mentioned	
2	Model number		To be mentioned	
3	Number of phases		3	
4	No. of break per phase		To be mentioned	
5	Interrupting medium		Vacuum	
6	Vacuum interrupter's manufacturer		To be mentioned	
7	Rated voltage	KV	33	
8	Maximum voltage	KV	36	
9	Rated frequency	HZ	50	
10	Rated normal current-feeder	A	1250	
11	Rated breaking currents:	Arms		
	a) Line charging	A	25	
	b) Cable charging	A	50	
	c) Small inductive	A	02	
12	Rated short-circuit breaking current	KA rms	31.5	
13	First pole to clear factor		To be mentioned	
14	Rated transient recovery voltage at 100% rated short circuit breaking current	KV	To be mentioned	
15	Rated short-circuit making current	KA	78.75	
16	Rated operating sequence		O-0.3s-CO-3min-C	
17	Rated duration of short-circuit	S	3	
18	Rated out of phase breaking current	KA	To be mentioned	
19	Rated opening time	ms	To be mentioned	
20	Rated break time	ms	To be mentioned	
21	Rated closing time	ms	To be mentioned	
22	Is circuit breaker re-strike free	Yes/no	Yes	
23	Rated short time withstand current, 3 sec rms	KA	31.5	
24	Impulse withstand on 1.2/50μs wave	kV	170	
25	Power frequency test voltage (dry) at 50Hz 1 min	kV	70	
Sl. No.	Description	Unit	Requirement	Manufacturer's Guaranteed Data
26	Type of arc contacts or arc control device		To be mentioned	
27	Main contact			
	a) Type of contact		To be mentioned	
	b) Material of contact surfaces		To be mentioned	
	c) Contact resistance	μΩ	Less than 40	
28	Length of break	mm	To be mentioned	
Sl. No.	Description	Unit	Requirement	Manufacturer's Guaranteed Data
29	Length of stroke	mm	To be mentioned	
30	Operating mechanism manufacturer		To be mentioned	
31	Operating mechanism type		Spring	
32	Trip free/or fixed trip		Trip free	
33	Is lockout facility fitted?		Yes	
35	Closing supply			
	a) Closing coil Volts	V DC	110V	

Sl. No.	Description	Unit	Requirement	Manufacturer's Guaranteed Data
	b) Closing coil current	A DC	To be mentioned	
36	Rated supply voltage of shunt opening release			
	a) Trip coil Volts	V DC	110V	
	b) Trip coil current	A DC	To be mentioned	
37	Spring charging motor			
	a) Current	A AC	To be mentioned	
	b) Voltage AC	V AC	415/230	
38	Number of auxiliary switch contacts			
	a) normally open	NO	9	
	b) normally closed	NC	9	
	c) adjustable		As required	
39	Maximum cree page			
	a) to earth	mm	To be mentioned	
	b) across interrupter terminals	mm	To be mentioned	
40	Number of interrupters per pole	Nos	1	
41	Material of interrupter chamber		To be mentioned	
42	Wall thickness of interrupter chamber	mm	To be mentioned	
	a) Material of contact surface primary arcing		To be mentioned	
	b) Contact resistance		To be mentioned	
43	Length of each break	mm	To be mentioned	
44	Length of stroke	mm	To be mentioned	
45	Operating rod for moving contact(s) material		To be mentioned	
46	Dimensions etc.		To be mentioned	
47	Weight of circuit breaker unit complete	kg	To be mentioned	
48	Maximum shock load imposed on floor or foundations when opening under fault conditions (state whether tension or compression)	N	To be mentioned	
49	Period of time equipment has been in commercial operation		To be mentioned	
50	Opening time			
	a) Without current at 100% of rated breaking current	sec	0.5 max	
	b) Breaking time	cycle	5 (0.1 second)	
	c) Closing time	ms	70±10	
51	Maximum arc duration at any duty cycle of IEC 56-2	ms at.....%	To be mentioned	
52	Current at which maximum arc duration occurs (critical current)	A	To be mentioned	
53	Make time	ms	To be mentioned	
54	Time from closing of control switch to completion of closing stroke during fault making	ms	To be mentioned	
55	Is an external series break incorporated in the breaker?	Yes/no	To be mentioned	
56	Is any device used to limit transient recovery voltage?	Yes/no	To be mentioned	
57	Number of close/trip operation possible on one spring charge	Nos.	To be mentioned	
58	Minimum clearance in air:			
	a) between phases	mm	430	
	b) phase to earth	mm	380	
	c) across interrupters	mm	To be mentioned	
	d) live parts to ground level	mm	To be mentioned	
59	Period of time the equipment has been in	Years	To be mentioned	

Sl. No.	Description	Unit	Requirement	Manufacturer's Guaranteed Data
	commercial operation			
Sl. No.	Description	Unit	Requirement	Manufacturer's Guaranteed Data
60	Cree page distance (min)	kV/mm	25	
61	Method of indicating VCB ON/OFF	Mech/Elect	To be mentioned	
62	Life of interrupter	Years	To be mentioned	
63	Pressure in vacuum tube for VCB	Bar	To be mentioned	
64	Guaranteed numbers of operation for vacuum interrupter			
	a) at rated crrent switching	Nos.	To be mentioned	
	b) at short circuit current switching	Nos.	To be mentioned	
65	All current carrying parts of VCB shall be made of		Copper	
66	Standard		IEC 56	
67	Degree of Protection		IP 55	

2. 33KV DISCONNECTING SWITCH AND EARTHING SWITCH (DS/ES)

2.1. 33KV DISCONNECTING SWITCH (AT BUS SIDE FOR INCOMING) (If applicable)

Sl. No.	Description	Unit	Requirement	Manufacturer's Guaranteed Data
1	Manufacturer		To be mentioned	
2	Model number		To be mentioned	
3	Operating system		Vertical	
4	System voltage	kV	33	
5	Rated voltage	kV	36	
6	Frequency	Hz	50	
7	Number of pole	Nos.	3	
8	Rated normal current	A	2000	
9	Rated short time withstand current for 3 sec	kA rms	31.5	
10	Rated duration of short circuit	Sec	3	
11	Rated peak withstand current	kA pk	78.75	
12	Basic insulation level	kV	170	
13	Installation		Outdoor	
14	Type		Air	
15	Construction		Open	
16	Method of operation		Gang operated,	
17	Type of operating mechanism		Manual	
18	Mounting position		Vertical	
19	Type of contact		To be mentioned	
20	Materiall of contact service		To be mentioned	
21	Manual operating torque	KNm	To be mentioned	
22	Load switching capability	A	To be mentioned	
23	Mechanical Terminal Load	N	To be mentioned	
24	Insulation Cree page	mm	To be mentioned	
25	Number of auxiliary switches			
	a) normally open	NO	9	
	b) normally closed	NC	9	
	c) adjustable		As required	
26	Other auxiliary loads			
	a) voltage	V DC	110	
	b) current	A DC	To be mentioned	
27	Total weight of three pole dis-connector complete	.Kg	To be mentioned	
28	Period of time equipment has been in commercial operation	Yr	To be mentioned	
29	Line charging current breaking capacity	A	To be mentioned	
30	Magnetizing current breaking capacity	A	To be mentioned	
31	Standard		IEC-129	
32	Degree of Protection		IP 55	
33	Power frequency with stand voltage	Kv	70	
34	Creepage Distance	mm	900	
35	Material Contact		Copper with Silver Coating	

2.2. 33KV DISCONNECTING SWITCH (BUS SECTION)

Sl. No.	Description	Unit	Requirement	Manufacturer's Guaranteed Data
1	Manufacturer		To be mentioned	
2	Model number		To be mentioned	
3	Operating system		Vertical	
4	System voltage	kV	33	
5	Rated voltage	kV	36	
6	Frequency	Hz	50	
7	Number of pole	Nos.	3	
8	Rated normal current	A	2500	
9	Rated short time withstand current for 3 sec	kA rms	31.5	
10	Rated duration of short circuit	Sec	3	
11	Rated peak withstand current	kA pk	78.75	
12	Basic insulation level	kV	170	
13	Installation		Outdoor	
14	Type		Air	
15	Construction		Open	
16	Method of operation		Gang operated,	
17	Type of operating mechanism		Manual	
18	Mounting position		Vertical	
19	Type of contact		To be mentioned	
20	Materiall of contact service		To be mentioned	
21	Manual operating torque	KNm	To be mentioned	
22	Load switching capability	A	To be mentioned	
23	Mechanical Terminal Load	N	To be mentioned	
24	Insulation Cree page	mm	To be mentioned	
25	Number of auxiliary switches			
	a) normally open	NO	9	
	b) normally closed	NC	9	
	c) adjustable		As required	
26	Other auxiliary loads			
	a) voltage	V DC	110	
	b) current	A DC	To be mentioned	
27	Total weight of three pole dis-connector complete	.Kg	To be mentioned	
28	Period of time equipment has been in commercial operation	Yr	To be mentioned	
29	Line charging current breaking capacity	A	To be mentioned	
30	Magnetizing current breaking capacity	A	To be mentioned	
31	Standard		IEC-129	
32	Degree of Protection		IP 55	
33	Power frequency with stand voltage	Kv	70	
34	Creepage Distance		900	
35	Material Contact		Copper with Silver Coating	

2.3. 33KV DISCONNECTING SWITCH (FOR FEEDERS AT BUS SIDE)

Sl. No.	Description	Unit	Requirement	Manufacturer's Guaranteed Data
1	Manufacturer		To be mentioned	
2	Model number		To be mentioned	
3	Operating system		Vertical	
4	System voltage	kV	33	
5	Rated voltage	kV	36	
6	Frequency	Hz	50	
7	Number of pole	Nos.	3	
8	Rated normal current	A	1250	
9	Rated short time withstand current for 3 sec	kA rms	31.5	
10	Rated duration of short circuit	Sec	3	
11	Rated peak withstand current	kA pk	78.75	
12	Basic insulation level	kV	170	
13	Installation		Outdoor	
14	Type		Air	
15	Construction		Open	
16	Method of operation		Gang operated,	
17	Type of operating mechanism		Manual	
18	Mounting position		Vertical	
19	Type of contact		To be mentioned	
20	Materiall of contact service		To be mentioned	
21	Manual operating torque	KNm	To be mentioned	
22	Load switching capability	A	To be mentioned	
23	Mechanical Terminal Load	N	To be mentioned	
24	Insulation Cree page	mm	To be mentioned	
25	Number of auxiliary switches			
	a) normally open	NO	9	
	b) normally closed	NC	9	
	c) adjustable		As required	
	d) Earting blade		6	
26	Other auxiliary loads			
	a) voltage	V DC	110	
	b) current	A DC	To be mentioned	
27	Total weight of three pole dis-connector complete	.Kg	To be mentioned	
28	Period of time equipment has been in commercial operation	Yr	To be mentioned	
29	Line charging current breaking capacity	A	To be mentioned	
30	Magnetizing current breaking capacity	A	To be mentioned	
31	Standard		IEC-129	
32	Degree of Protection		IP 55	
33	Power frequency with stand voltage	Kv	70	
34	Creepage Distance		900	
35	Material Contact		Copper with Silver Coating	

2.4. 33KV DISCONNECTING SWITCH AND EARTHING SWITCH (FEEDER SIDE)

Sl. No.	Description	Unit	Requirement	Manufacturer's Guaranteed Data
1	Manufacturer		To be mentioned	
2	Model number		To be mentioned	
3	Operating system		Vertical	
4	System voltage	kV	33	
5	Rated voltage	kV	36	
6	Frequency	Hz	50	
7	Number of pole	Nos.	3	
8	Rated normal current	A	1250	
9	Rated short time withstand current for 3 sec	kA rms	31.5	
10	Rated duration of short circuit	Sec	3	
11	Rated peak withstand current	kA pk	78.75	
12	Basic insulation level	kV	170	
13	Installation		Outdoor	
14	Type		Air	
15	Construction		Open	
16	Method of operation		Gang operated,	
17	Type of operating mechanism		Manual	
18	Mounting position		Vertical	
19	Type of contact		To be mentioned	
20	Materiall of contact service		To be mentioned	
21	Manual operating torque	KNm	To be mentioned	
22	Load switching capability	A	To be mentioned	
23	Mechanical Terminal Load	N	To be mentioned	
24	Insulation Cree page	mm	To be mentioned	
25	Number of auxiliary switches			
	a) normally open	NO	9	
	b) normally closed	NC	9	
	c) adjustable		As required	
	d) Earthing blade		6	
26	Other auxiliary loads			
	a) voltage	V DC	110	
	b) current	A DC	To be mentioned	
27	Total weight of three pole dis-connector complete	.Kg	To be mentioned	
28	Period of time equipment has been in commercial operation	Yr	To be mentioned	
29	Line charging current breaking capacity	A	To be mentioned	
30	Magnetizing current breaking capacity	A	To be mentioned	
31	Standard		IEC-129	
32	Degree of Protection		IP 55	
33	Power frequency with stand voltage	Kv	70	
34	Creepage Distance		900	
35	Material Contact		Copper with Silver Coating	

3. 33KV CURRENT TRANSFORMER (CT)

3.1 33KV CURRENT TRANSFORMER (BUS COUPLER) (If applicable)

Sl. No.	Description	Unit	Requirement	Manufacturer's Guaranteed Data
1	Manufacturer		To be mentioned	
2	Model number		To be mentioned	
3	Standard		IEC 185 or equivalent	
4	Installation		Outdoor type mounted on galvanized steel structure	
5	Type		Electromagnetic induction, single phase, outdoor, oil/ Synthetic	
6	Bushing		Porcelain	
7	Major insulation		Low oil content outdoor type	
8	Application		Protection/ metering	
9	Rated secondary accuracy and burden			
	a) Metering (core 1- for indicating metering)		0.2, 50VA	
	b) Metering (core 2- for energy metering)		0.2, 50VA	
	c) Protection (core 3)		5P20, 50VA	
10	Rated primary current	Arms	2400-1600/5-5-5A	
11	Rated secondary current	Arms	5-5-5A	
12	Extended current rating	%	120	
13	Over current rating	A	10	
13	Short time current rating	kA	25 for 3 sec	
14	No of core		3	
15	System voltage	kV	33	
16	Rated voltage	kV	36	
17	Rated frequency	Hz	50	
18	Basic insulation level on 1.2 / 50 micro sec wave	kV	170	
19	Power frequency withstand voltage (1 min, 50Hz)	kV	70	
20	Insulator cree page (phase to earth)	mm/kV	25	
21	Rated dynamic current	kA pk	100	
22	Insulation class		A	
23	Is earth screen fitted between primary and secondary windings		Yes	
24	Extended Current Rating (% of rated current)	%	120	
25	Over Current Rating	A	10	
26	Knee point voltage	V	To be mentioned	
27	System earthing		Effectively earthed	
28	Standard	-	As per relevant IEC-185	

3.2 33KV CURRENT TRANSFORMER (FEEDER)

Sl. No.	Description	Unit	Requirement	Manufacturer's Guaranteed Data
1	Manufacturer		To be mentioned	
2	Model number		To be mentioned	
3	Standard		IEC 185 or equivalent	
4	Installation		Outdoor type mounted on galvanized steel structure	
5	Type		Electromagnetic induction, single phase, outdoor, oil/ Synthetic	
6	Bushing		Porcelain	
7	Major insulation		Low oil content outdoor type	
8	Application		Protection/ metering	
9	Rated secondary accuracy and burden			
	a) Metering (core 1)		0.2, 30VA	
	b) Protection (core 2)		5P20, 30VA	
10	Rated primary current	Amps	800-400/5-5-5A	
11	Rated secondary current	Amps	5-5-5A	
12	Extended current rating	%	120	
13	Over current rating	A	10	
13	Short time current rating	kA	31.5 for 3 sec	
14	No of core		3	
15	System voltage	kV	33	
16	Rated voltage	kV	36	
17	Rated frequency	Hz	50	
18	Basic insulation level on 1.2 / 50 micro sec wave	kV	170	
19	Power frequency withstand voltage (1 min, 50Hz)	kV	70	
20	Insulator cree page (phase to earth)	mm/kV	25	
21	Rated dynamic current	kA pk	100	
22	Insulation class		A	
23	Is earth screen fitted between primary and secondary windings		Yes	
24	Extended Current Rating (% of rated current)	%	120	
25	Over Current Rating	A	10	
26	Knee point voltage	V	To be mentioned	
27	System earthing		Effectively earthed	
28	Standard	-	As per relevant IEC-185	

4. **33KV VOLTAGE TRANSFORMER (VT FOR BUS)**

Sl. No.	Description	Unit	Requirement	Manufacturer's Guaranteed Data
1	Manufacture		To be mentioned	
2	Model number		To be mentioned	
3	Installation		Outdoor type mounted on galvanized steel structure	
4	Type		Electromagnetic induction, single phase, outdoor, Oil	
5	Bushing		Porcelain	
6	Application		Protection and metering	
7	Major insulation		Low oil content	
8	System voltage	kV	33	
9	Rated voltage	kV	36	
10	Frequency	Hz	50	
11	Transformation ratio	kV	33/√3: 0.11/√3: 0.11 /√3	
12	Type of secondary		Double winding	
13	Rated secondary burden and accuracy			
	a) Secondary winding Core 1 (Dedicated for energy metering)	VA Class	60 0.2	
	(a) Secondary winding Core 2	VA Class	50 3P	
14	Total capacitance at 100 Hz	PF	To be mentioned	
15	50 Hz 1(one) minute withstand voltage wet	kV	To be mentioned	
16	Impulse withstand voltage (1.2 / 50 micro sec wave)	kV (min)	170	
17	Temperature co-efficient of ratio per ºC		To be mentioned	
18	Total external cree page distance	mm/kV	25	
19	Maximum errors with 5% primary voltage			
	a) Ratio	%	To be mentioned	
	b) Phase angle	minutes	To be mentioned	
20	Total install weight	kg	To be mentioned	
21	System earthing		Effectively earthed	
22	Standard		IEC 186 or equivalent	
23	Power frequency with stand voltage	Kv	70	
24	Partial Discharge	PC	≤5	
25	Short circuit withstand voltage	KA	63	
26	Rated voltage factor	1.2continuous 1.9 30 second		

5. 33KV LIGHTNING ARRESTER (LA)

Sl. No.	Description	Unit	Requirement	Manufacturer's Guaranteed Data
1	Manufacturer		To be mentioned	
2	Model Number		To be mentioned	
3	Type		Metal Oxide (Zno) single phase, Gapless type,	
4	System voltage	kV	33	
5	Rated voltage	kV	36	
6	Frequency	Hz	50	
7	Continuous operating voltage	kV	24	
8	Rated arrester voltage	kV	30	
9	Standard nominal discharge current	kA	10	
10	Reference current at ambient temperature	mA	2	
11	Steep current impulse residual voltage	kV pk	84	
12	Basic insulation level on 1.2 / 50 micro sec wave	kV	170	
13	Power frequency withstand voltage of housing Dry : Wet : Impulse :	 KVrms KVrms KV	 70 70 170	
14	Power frequency withstand voltage (1.2/50 ms)	kV	70	
15	Lightning impulse residual voltage (8/20 micro sec front time)	kVpk	100	
16	Step current impulse residual voltage at 10kA of 1 micro sec front time	kV pk	110	
17	High current impulse withstand value (4/10 micro sec)	kA	100	
18	Duty Class		Heavy	
19	Nominal diameter of resistor blocks	mm		
20	Pressure relief device fitted?		Yes/no	
21	Temporary over voltage capability			
	a) 0.1 sec		To be mentioned	
	b) 1.0 sec		To be mentioned	
	c) 10.0 sec		To be mentioned	
	d) 100.0 sec		To be mentioned	
22	Leakage current at rated voltage		To be mentioned	
23	Minimum reset voltage		To be mentioned	
24	Overall height of arrester (without supporting structure)	m	To be mentioned	
25	Clearances: Phase to earth (from centre line) Phase to phase (centre line to centre line)	 mm mm	 To be mentioned To be mentioned	
26	Overall weight of arrester (without supporting structure)	kg	To be mentioned	
27	Minimum creepage distance over insulator housing	mm/kV	To be mentioned	
28	Type & Description of surge monitoring device			
29	Over all dimension i) Height ii) Diameter	 mm mm	 To be mentioned To be mentioned	
30	Connecting lead from LA terminal to surge monitor		16 mm^2 insulated cu cable	
31	Neutral connection	-	Effectively Earthed	
32	Surge monitor		Shall be provided	
33	Standard		IEC 99-4	

Sl. No.	Description	Unit	Requirement	Manufacturer's Guaranteed Data
34	Discharge Class		3	
35	Pressure relief class		Class A	
36	Degree of protection		IP 55	

6. 33/0.415KV, 200KVA AUXILIARY TRANSFORMER

Sl. No.	Description	Unit	Requirement	Manufacturer's Guaranteed Data
1	Manufacturer		To be mentioned	
2	Model Number		To be mentioned	
3	Standard		IEC-76	
4	Rated power	KVA	200	
5	Type of cooling		ONAN	
6	Coolant		Mineral Oil	
7	Number of phase		3	
8	Frequency	Hz	50	
9	Normal transformation ratio	KV	33/0.4	
10	Nominal HT voltage	KV	33	
11	Maximum HT voltage	KV	36	
12	Nominal LT voltage	KV	0.415 /0.240	
13	Maximum LT voltage	KV	0.457	
14	Type		Core	
15	Insulation		Outdoor, tropical and high humidity	
16	Earthing		Neutral earth at LT, 3-phase 4-wire	
17	Windings		Double wound and of high conductivity copper	
18	No-load loss, Watts	W	To be mentioned	
19	Load losses at rated full load at 75^0C, Watts	W	To be mentioned	
20	Magnetising current at normal voltage, Amps	A	To be mentioned	
21	Test Voltage:			
	a) Impulse Test voltage 1.2/50 µs i) H.T ii) L.T	 KV KV	 170 10	
	b) Power frequency withstand voltage for 1 minute i) HT ii) L.T	 KV KV	 70 2.5	
22	Vector Group		Dynll	
23	Neutral to be Brought out			
	a) HT		Nil	
	b) LT		Yes	
24	Neutral insulation		Full insulation and 100% capacity	
25	LT bushing	Nos	4	
26	Impedance voltage at 75 ^{o}C at normal ratio and rated capacity		About 5%	
27	Tapping range		5 steps off-load tap changer, 2.5% in each step	
28	Type of tap changer		Manual	
Sl. No.	Description	Unit	Requirement	Manufacturer's Guaranteed Data
29	Maximum temperature rise over 40 ^{o}C ambient when transformer is working at full load and tap changer is at normal position			
	a) Winding by resistance	^{o}C	65	

Sl. No.	Description	Unit	Requirement	Manufacturer's Guaranteed Data
	b) Oil by temperature	^{o}C	60	
30	Type of base		Ground mounted	
31	Dimension of transformer			
	a) Width,	mm	To be mentioned	
	b) Length,	mm	To be mentioned	
	c) Height,	mm	To be mentioned	
	d) Tank Sheet thickness of top, bottom & side, mm			
32	Total weight of complete Transformer including fittings & oil, Kg	kg	To be mentioned	
33	Routine Test Report			
	a) Measurement of Voltage ratio test.		To be mentioned	
	b) Vector group test.		To be mentioned	
	c) Measurement of winding resistance.		To be mentioned	
	d) Measurement of insulation resistance.		To be mentioned	
	e) Measurement of no load loss & no-load current.		To be mentioned	
	f) Measurement of impedance voltage & load loss.		To be mentioned	
	g) Power frequency (Separate source voltage) withstands test.		To be mentioned	
	h) Transformer oil test.		To be mentioned	
34	Type Test Report			
	a) Impulse Voltage Withstand Test.		To be mentioned	
	b) Temperature Rise Test		To be mentioned	
	c) Short Circuit Test or details calculations on the basis of the design data		To be mentioned	

7. 33KV BUSBARS AND CONNECTIONS

Sl. No.	Description	Unit	Requirement	Manufacturer's Guaranteed Data
A.	**CONDUCTORS AND CONNECTIONS**			
1.	Manufacturer		To be mentioned	
2.	Material of conductor		To be mentioned	
	a) Bus-bar		ACSR/2xMartin	
	b) Jumper/connections		To be mentioned	
3.	Overall diameter	mm	To be mentioned	
4.	Nominal cross section	mm^2	To be mentioned	
5.	Maximum rated current	A	2500	
6.	Maximum working tension of main connections	kg/m^2	To be mentioned	
7.	DC resistance of conductors per 1000 meters at 20ºC	Ohms	To be mentioned	
8.	Tensile breaking stress of material	N/mm^2	To be mentioned	
9.	Maximum permissible span length	m	To be mentioned	
10.	Maximum sag under own weight of maximum span	mm	To be mentioned	
11.	Temperature rise at rated current	ºC	35	

8. 33KV BUSBAR INSULATOR STRINGS

Sl. No.	Description	Unit	Requirement	Manufacturer's Guaranteed Data
B.	**INSULATORS**			
1	Manufacturer	-	To be mentioned	
2	Model no.	-	To be mentioned	
3	Insulator material	-	Porcelain	
4	Number of units per string	Nos.	4	
5	Insulator Voltage Class	KV		
6.	Weight of insulator complete	kg		
7	Type of Insulator	-	Ball and socket type disc, security clip made of rod brass alloy.	
8	Creepage/ leakage distance (min.)	mm	To be mentioned	
9	Total creepage distance of string	mm	900	
10	Unit Spacing	mm	To be mentioned	
11	Dry Arcing distance (minimum)	mm	To be mentioned	
12	Diameter of Insulator	mm	To be mentioned	
13	Withstand Voltage, Minimum : a) Power Frequency, dry (one min.) b) Power Frequency, wet (one min.) c) Impulse 1.2/50 µ sec	 KV KV KV	 70 40 110	
14	Flashover Voltage, Minimum : a) Power Frequency, dry b) Power Frequency, wet c) 50% Impulse 1.2/50 µ sec wave, positive or impulse 1.2/50 µ sec wave positive. d) 50% Impulse 1.2/50 µ sec wave Negative	 KV KV KV KV	 80 50 125 130	
15	Power Frequency Puncture Voltage, minimum	KV	110	
16	Minimum Mechanical Strength for Suspension :			
	a) Electro-mechanical Breaking Load	Kg	7260	
	b) Mechanical Breaking load	Kg	6800	
	c) Tension Proof Test Load	Kg	3400	
	d) Time Load Test Value	Kg	4536	
	e) Mechanical Impact Strength	mm Kg	630	
17	Minimum Mechanical Strength for Strain Stringing :			
	a) Electro-mechanical Breaking Load	Kg	11340	
	b) Mechanical Breaking load	Kg	11340	
	c) Tension Proof Test Load	Kg	3400	
	d) Time Load Test Value	Kg	4536	
	e) Mechanical Impact Strength	mm Kg	530	
18	Insulator Hardware		Insulator hardware for insulator strings or bus-support such shall have UTS-120 KN and galvanized as per BS-729.	
19	Standard		AS per latest editions of IEC-383.	

09. 11KV INDOOR TYPE VACUUM CIRCUIT BREAKER

09.1 11KV INDOOR TYPE VACUUM CIRCUIT BREAKER (BUS COUPLER BREAKER)

Sl. No.	Description	Unit	Requirement	Manufacturer's Guaranteed Data
1	Manufacturer's Name & Country of Origin	-	To be mentioned	
2	Manufacturer's Model No.	-	To be mentioned	
3	System nominal voltage	kV	11	
4	Maximum system voltage	kV	12	
5	Rated frequency	Hz	50	
6	**Rated normal current:**			
	• Incoming for 10/13.33 MVA Transformer	A	2000	
	• Outgoing Feeder	A	630	
7	No. of Phase	Nos.	3	
8	No. of breaks per phase	Nos	To be mentioned	
9	Interrupting medium	-	Vacuum	
10	Manufacturer's name and country of origin of Vacuum Interrupter	-	To be mentioned	
11	Manufacturer's model no. of vacuum interrupter	-	To be mentioned	
12	Power frequency withstand voltage	kV	28	
13	Lightning impulse withstand voltage on 1.2/50 µs wave	kV	75	
14	Emergency overload rating of normal at 20C ambient	-	To be mentioned	
15	Duration in any 24 hrs. period	-	To be mentioned	
16	Busbar scheme	No.	Single	
17	Number of busbar	Nos.	3	
18	Temperature rise of busbar at rated current	C	To be mentioned	
19	Material of busbar	-	Copper	
20	Cross-section of busbar	mm^2	To be mentioned	
21	Rated normal current of busbar for 10/13.33 MVA S/S	A	2000	
22	Busbar insulation material	-	To be mentioned	
23	Are floor plates or rails included?	-	To be mentioned	
24	**Overall dimension of each circuit breaker unit:**			
	• **Incomer:**			
	-Height	mm	To be mentioned	
	-Width	mm	To be mentioned	
	-Depth	mm	To be mentioned	
	• **Feeder:**			
	-Height	mm	To be mentioned	
	-Width	mm	To be mentioned	
	-Depth	mm	To be mentioned	
	• **Bus coupler:**			
	-Height	mm	To be mentioned	
	-Width	mm	To be mentioned	
	-Depth	mm	To be mentioned	
25	Width necessary for breaker withdrawal			
26	Rated short time withstand	kA	25	

Sl. No.	Description	Unit	Requirement	Manufacturer's Guaranteed Data
	current (Rated short circuit breaking current) for 3 Sec.			
27	Rated Peak withstand current (Rated short circuit making current)	kA	62.5	
28	**Breaking Capacity:**			
	• Symmetrical rms	kA	25	
	• Asymmetrical mis	kA	25	
29	Rated duration of short circuit	Sec.	To be mentioned	
30	Degrees of protection by enclose	IP	To be mentioned	
31	First pole to clear factor	-	To be mentioned	
32	Rated transient recovery voltage at 100% rated short circuit breaking current	kVp	To be mentioned	
33	Rated line charging breaking current	A	To be mentioned	
34	Rated cable charging breaking current	A	To be mentioned	
35	Rated out of phase breaking current	A	To be mentioned	
36	Is circuit breaker re-strike free?	-	Yes	
37	No. of tripping coil	Nos.	2	
38	Trip coil current	A	To be mentioned	
39	Trip coil voltage	VDC	110	
40	Is circuit breaker trip free?	-	Yes	
41	Type of main contact	-	To be mentioned	
42	Material of contact surface	-	To be mentioned	
43	Contact resistance	µ	To be mentioned	
44	Does magnetic effect of load current increase contract?	-	To be mentioned	
45	Length of each break/phase	mm	To be mentioned	
46	Length of stroke	mm	To be mentioned	
47	Weight of circuit breaker complete without operating mechanism and cubicles	Kg	To be mentioned	
48	Weight of circuit breaker complete with PCM Cubicles as in service	Kg	To be mentioned	
49	Maximum shock load imposed on floor or foundation when opening under fault condition (State compression or tension)	N	To be mentioned	
	OPERATING:			
50	Operating Sequence		To be mentioned	
51	• Opening time without current at 100% of rated breaking current	ms	To be mentioned	
	• Braking time	Cycle	To be mentioned	
	• Closing time	ms	To be mentioned	
52	Maximum arc duration of any duty cycle as per latest	ms at …..%	To be mentioned	

Sl. No.	Description	Unit	Requirement	Manufacturer's Guaranteed Data
	revision of relevant IEC			
53	Current at which maximum arc duration occurs (critical current)	A	To be mentioned	
54	Make time	ms	To be mentioned	
55	Minimum time for arc extinction remake when adapted for auto closing	ms	To be mentioned	
56	Time form closing of control of switch to completion of closing stroke during fault making	ms	To be mentioned	
57	Manufacturer's Name & Country of Origin of vacuum interrupter	-	To be mentioned	
58	Manufacturer's Model No. of vacuum interrupter	-	To be mentioned	
59	Pressure in vacuum tube	bar	To be mentioned	
60	Guaranteed no. of vacuum interrupter	Nos.	To be mentioned	
61	In normal condition at rated current switching	Nos.	To be mentioned	
62	In short circuit condition i.e. at the short circuit current switching	Nos.	≥100	
CONSTRUCTION FEATURE:				
63	Is an external series break incorporated in the breaker?	-	To be mentioned	
64	Is any device used to limit transient recovery voltage?	-	To be mentioned	
65	Method of closing	-	To be mentioned	
66	Method of tripping		To be mentioned	
67	**Minimum clearance in air:**			
	• Between phase	mm	To be mentioned	
	• Phase to earth	mm	To be mentioned	
68	Material of tank or chamber	-	To be mentioned	
69	Material of moving contact tension rod	-	To be mentioned	
70	Period of time equipment has been in commercial operation	Years	To be mentioned	
71	Is removable draw-out VCB mounted on the lower part of the panel i.e. on floor?	-	To be mentioned	
72	All meters, protective relays, signaling etc. mounted on the upper part of the panel	-	To be mentioned	
73	Rated voltage of spring winding motor for closing	Vac	To be mentioned	
74	Materials of all current carrying parts of VCB	-	To be mentioned	
75	Name of relevant IEC standard to be followed in Design, Manufacture, Testing and Performance	-	To be mentioned	
	PROTECTION			
A.	**33/11kV, 10/13.33MVA, 11kV Transformer Incoming Cubicles**			
76.0	**Over current and earth fault protection with IDMT & instantaneous features**			
76.1	Manufacture's name & country	-	Siemens(Germany/	

Sl. No.	Description	Unit	Requirement	Manufacturer's Guaranteed Data
	of relay		Switzerland)/ABB (Switzerland/Swede n/Finland) Schneider (UK/France), Alstom (UK/France)	
76.2	Manufacture's model no.	-	To be mentioned	
76.3	Type of relay	-	Numerical programmable with all necessary features	
76.4	Range of timing settings at 10 time CT rating	Sec.	To be mentioned	
76.5	Burden of relay at 10 time CT rating	VA	To be mentioned	
76.6	Percentage of current setting at which relay will reset	%	To be mentioned	
76.7	Reset time after removal of 10 time CT rated current for :			
	a) Phase element (100%)	Sec	To be mentioned	
	b) E/F element (40%)	Sec	To be mentioned	
77.0	**Standard Earth Fault Protection**			
77.1	Manufacture's name & country	-	Siemens(Germany/ Switzerland)/ABB (Switzerland/Swede n/Finland) Schneider (UK/France), Alstom (UK/France)	
77.2	Manufacture's model no.	-	To be mentioned	
77.3	Type of relay	-	Numerical programmable with all necessary features	
77.4	**Range of current setting:**			
	a) Phase element (% of CT Rating)	Sec	To be mentioned	
	b) earth fault element (%of CT Rating)	Sec	To be mentioned	
77.5	Range of timing settings at 10 time CT rating	Sec	To be mentioned	
77.6	Burden of relay at 10 time CT rating	VA	To be mentioned	
77.7	Percentage of current setting at which relay will reset	%	To be mentioned	
77.8	Reset time after removal of 10 time CT rated current for :			
	a) Phase element (100%)	Sec	To be mentioned	
	b) E/F element (40%)	Sec	To be mentioned	
B.	**11kV Bus Coupler Cubicles:**			
78.0	**Over Current and Earth Fault Protection with IDMT & instantaneous features**			
78.1	Manufacture's name & country of relay	-	Siemens(Germany/ Switzerland)/ABB (Switzerland/Swede n/Finland) Schneider (UK/France), Alstom (UK/France)	
78.2	Manufacture's model no.	-	To be mentioned	
78.3	Type of relay	-	Numerical	

Sl. No.	Description	Unit	Requirement	Manufacturer's Guaranteed Data
			programmable with all necessary features	
78.4	**Range of current setting:**			
	a) Phase element (% of CT Rating)	Sec	To be mentioned	
	b) earth fault element (%of CT Rating)	Sec	To be mentioned	
78.5	Range of timing settings at 10 time CT rating	Sec	To be mentioned	
78.6	Burden of relay at 10 time CT rating	VA	To be mentioned	
78.7	Percentage of current setting at which relay will reset	%	To be mentioned	
78.8	**Reset time after removal of 10 time CT rated current for :**			
	a) Phase element (100%)	Sec	To be mentioned	
	b) E/F element (40%)	Sec	To be mentioned	
C.	**11kV Outgoing Feeder Cubicles**			
79.0	**Over Current and Earth Fault Protection with IDMT & instantaneous features**			
79.1	Manufacture's name & country of relay	-	Siemens(Germany/ Switzerland)/ABB (Switzerland/Sweden/Finland) Schneider (UK/France), Alstom (UK/France)	
79.2	Manufacture's model no.	-	To be mentioned	
79.3	Type of relay	-	Numerical programmable with all necessary features	
79.4	**Range of current setting:**			
	a) Phase element (% of CT Rating)	Sec	To be mentioned	
	b) earth fault element (%of CT Rating)	Sec	To be mentioned	
79.5	Range of timing settings at 10 time CT rating	Sec	To be mentioned	
79.6	Burden of relay at 10 time CT rating	VA	To be mentioned	
79.7	Percentage of current setting at which relay will reset	%	To be mentioned	
79.8	**Reset time after removal of 10 time CT rated current for :**			
	a) Phase element (100%)	Sec	To be mentioned	
	b) E/F element (40%)	Sec	To be mentioned	
Metering and indication for 33/11kV, 10/13.33MVA Transformer 11kV Incoming and 11kV outgoing Feeder				
80.0	**kWh Meter**			
80.1	Manufacture's name & country	-	Siemens(Germany/ Switzerland)/ABB (Switzerland)/AEG (Germany)/Schlumberger (USA)/Elster(Romania)	
80.2	Manufacture's model no.	-	To be mentioned	

Sl. No.	Description	Unit	Requirement	Manufacturer's Guaranteed Data
80.3	Type of Meter	-	Numerical programmable Multifunction	
80.4	Class of Accuracy	-	0.2	
81.0	**Indication Volt Meters & Ammeters**			
81.1	Manufacture's name & country	-	To be mentioned	
81.2	Manufacture's model no.	-	To be mentioned	
81.3	Type of Meter	-	Analogue	
81.4	Class of Accuracy	-	To be mentioned	

09.2 11KV INDOOR TYPE VACUUM CIRCUIT BREAKER (INCOMING BREAKER)

Sl. No.	Description	Unit	Requirement	Manufacturer's Guaranteed Data
1	Manufacturer's Name & Country of Origin	-	To be mentioned	
2	Manufacturer's Model No.	-	To be mentioned	
3	System nominal voltage	kV	11	
4	Maximum system voltage	kV	12	
5	Rated frequency	Hz	50	
6	**Rated normal current:**			
	• Incoming for 10/13.33 MVA Transformer	A	2000	
	• Outgoing Feeder	A	630	
7	No. of Phase	Nos.	3	
8	No. of breaks per phase	Nos	To be mentioned	
9	Interrupting medium	-	Vacuum	
10	Manufacturer's name and country of origin of Vacuum Interrupter	-	To be mentioned	
11	Manufacturer's model no. of vacuum interrupter	-	To be mentioned	
12	Power frequency withstand voltage	kV	28	
13	Lightning impulse withstand voltage on 1.2/50 µs wave	kV	75	
14	Emergency overload rating of normal at 20C ambient	-	To be mentioned	
15	Duration in any 24 hrs. period	-	To be mentioned	
16	Busbar scheme	No.	Single	
17	Number of busbar	Nos.	3	
18	Temperature rise of busbar at rated current	C	To be mentioned	
19	Material of busbar	-	Copper	
20	Cross-section of busbar	mm^2	To be mentioned	
21	Rated normal current of busbar for 10/13.33 MVA S/S	A	2000	
22	Busbar insulation material	-	To be mentioned	
23	Are floor plates or rails included?	-	To be mentioned	
24	**Overall dimension of each circuit breaker unit:**			
	• **Incomer:**			
	-Height	mm	To be mentioned	
	-Width	mm	To be mentioned	
	-Depth	mm	To be mentioned	
	• **Feeder:**			
	-Height	mm	To be mentioned	
	-Width	mm	To be mentioned	
	-Depth	mm	To be mentioned	
	• **Bus coupler:**			
	-Height	mm	To be mentioned	
	-Width	mm	To be mentioned	
	-Depth	mm	To be mentioned	
25	Width necessary for breaker withdrawal			
26	Rated short time withstand current (Rated short circuit	kA	25	

Sl. No.	Description	Unit	Requirement	Manufacturer's Guaranteed Data
	breaking current) for 3 Sec.			
27	Rated Peak withstand current (Rated short circuit making current)	kA	62.5	
28	**Breaking Capacity:**			
	• Symmetrical rms	kA	25	
	• Asymmetrical mis	kA	25	
29	Rated duration of short circuit	Sec.	To be mentioned	
30	Degrees of protection by enclose	IP	To be mentioned	
31	First pole to clear factor	-	To be mentioned	
32	Rated transient recovery voltage at 100% rated short circuit breaking current	kVp	To be mentioned	
33	Rated line charging breaking current	A	To be mentioned	
34	Rated cable charging breaking current	A	To be mentioned	
35	Rated out of phase breaking current	A	To be mentioned	
36	Is circuit breaker re-strike free?	-	Yes	
37	No. of tripping coil	Nos.	2	
38	Trip coil current	A	To be mentioned	
39	Trip coil voltage	VDC	110	
40	Is circuit breaker trip free?	-	Yes	
41	Type of main contact	-	To be mentioned	
42	Material of contact surface	-	To be mentioned	
43	Contact resistance	µ	To be mentioned	
44	Does magnetic effect of load current increase contract?	-	To be mentioned	
45	Length of each break/phase	mm	To be mentioned	
46	Length of stroke	mm	To be mentioned	
47	Weight of circuit breaker complete without operating mechanism and cubicles	Kg	To be mentioned	
48	Weight of circuit breaker complete with PCM Cubicles as in service	Kg	To be mentioned	
49	Maximum shock load imposed on floor or foundation when opening under fault condition (State compression or tension)	N	To be mentioned	
	OPERATING:			
50	Operating Sequence		To be mentioned	
51	• Opening time without current at 100% of rated breaking current	ms	To be mentioned	
	• Braking time	Cycle	To be mentioned	
	• Closing time	ms	To be mentioned	
52	Maximum arc duration of any duty cycle as per latest revision of relevant IEC	ms at …..%	To be mentioned	
53	Current at which maximum arc duration occurs (critical current)	A	To be mentioned	

Sl. No.	Description	Unit	Requirement	Manufacturer's Guaranteed Data
54	Make time	ms	To be mentioned	
55	Minimum time for arc extinction remake when adapted for auto closing	ms	To be mentioned	
56	Time form closing of control of switch to completion of closing stroke during fault making	ms	To be mentioned	
57	Manufacturer's Name & Country of Origin of vacuum interrupter	-	To be mentioned	
58	Manufacturer's Model No. of vacuum interrupter	-	To be mentioned	
59	Pressure in vacuum tube	bar	To be mentioned	
60	Guaranteed no. of vacuum interrupter	Nos.	To be mentioned	
61	In normal condition at rated current switching	Nos.	To be mentioned	
62	In short circuit condition i.e. at the short circuit current switching	Nos.	≥100	
CONSTRUCTION FEATURE:				
63	Is an external series break incorporated in the breaker?	-	To be mentioned	
64	Is any device used to limit transient recovery voltage?	-	To be mentioned	
65	Method of closing	-	To be mentioned	
66	Method of tripping		To be mentioned	
67	**Minimum clearance in air:**			
	• Between phase	mm	To be mentioned	
	• Phase to earth	mm	To be mentioned	
68	Material of tank or chamber	-	To be mentioned	
69	Material of moving contact tension rod	-	To be mentioned	
70	Period of time equipment has been in commercial operation	Years	To be mentioned	
71	Is removable draw-out VCB mounted on the lower part of the panel i.e. on floor?	-	To be mentioned	
72	All meters, protective relays, signaling etc. mounted on the upper part of the panel	-	To be mentioned	
73	Rated voltage of spring winding motor for closing	Vac	To be mentioned	
74	Materials of all current carrying parts of VCB	-	To be mentioned	
75	Name of relevant IEC standard to be followed in Design, Manufacture, Testing and Performance	-	To be mentioned	
	PROTECTION			
A. 76.0	**33/11kV, 10/13.33MVA, 11kV Transformer Incoming Cubicles Over current and earth fault protection with IDMT & instantaneous features**			
76.1	Manufacture's name & country of relay	-	Siemens(Germany/ Switzerland)/ABB (Switzerland/Sweden/Finland) Schneider	

Sl. No.	Description	Unit	Requirement	Manufacturer's Guaranteed Data
			(UK/France), Alstom (UK/France)	
76.2	Manufacture's model no.	-	To be mentioned	
76.3	Type of relay	-	Numerical programmable with all necessary features	
76.4	Range of timing settings at 10 time CT rating	Sec.	To be mentioned	
76.5	Burden of relay at 10 time CT rating	VA	To be mentioned	
76.6	Percentage of current setting at which relay will reset	%	To be mentioned	
76.7	Reset time after removal of 10 time CT rated current for :			
	a) Phase element (100%)	Sec	To be mentioned	
	b) E/F element (40%)	Sec	To be mentioned	
77.0	**Standard Earth Fault Protection**			
77.1	Manufacture's name & country	-	Siemens(Germany/ Switzerland)/ABB (Switzerland/Sweden/Finland) Schneider (UK/France), Alstom (UK/France)	
77.2	Manufacture's model no.	-	To be mentioned	
77.3	Type of relay	-	Numerical programmable with all necessary features	
77.4	**Range of current setting:**			
	a) Phase element (% of CT Rating)	Sec	To be mentioned	
	b) earth fault element (%of CT Rating)	Sec	To be mentioned	
77.5	Range of timing settings at 10 time CT rating	Sec	To be mentioned	
77.6	Burden of relay at 10 time CT rating	VA	To be mentioned	
77.7	Percentage of current setting at which relay will reset	%	To be mentioned	
77.8	Reset time after removal of 10 time CT rated current for :			
	a) Phase element (100%)	Sec	To be mentioned	
	b) E/F element (40%)	Sec	To be mentioned	
B.	**11kV Bus Coupler Cubicles:**			
78.0	**Over Current and Earth Fault Protection with IDMT & instantaneous features**			
78.1	Manufacture's name & country of relay	-	Siemens(Germany/ Switzerland)/ABB (Switzerland/Sweden/Finland) Schneider (UK/France), Alstom (UK/France)	
78.2	Manufacture's model no.	-	To be mentioned	
78.3	Type of relay	-	Numerical programmable with all necessary	

Sl. No.	Description	Unit	Requirement	Manufacturer's Guaranteed Data
			features	
78.4	**Range of current setting:**			
	a) Phase element (% of CT Rating)	Sec	To be mentioned	
	b) earth fault element (%of CT Rating)	Sec	To be mentioned	
78.5	Range of timing settings at 10 time CT rating	Sec	To be mentioned	
78.6	Burden of relay at 10 time CT rating	VA	To be mentioned	
78.7	Percentage of current setting at which relay will reset	%	To be mentioned	
78.8	**Reset time after removal of 10 time CT rated current for :**			
	a) Phase element (100%)	Sec	To be mentioned	
	b) E/F element (40%)	Sec	To be mentioned	
C.	**11kV Outgoing Feeder Cubicles**			
79.0	**Over Current and Earth Fault Protection with IDMT & instantaneous features**			
79.1	Manufacture's name & country of relay	-	Siemens(Germany/ Switzerland)/ABB (Switzerland/Sweden/Finland) Schneider (UK/France), Alstom (UK/France)	
79.2	Manufacture's model no.	-	To be mentioned	
79.3	Type of relay	-	Numerical programmable with all necessary features	
79.4	**Range of current setting:**			
	a) Phase element (% of CT Rating)	Sec	To be mentioned	
	b) earth fault element (%of CT Rating)	Sec	To be mentioned	
79.5	Range of timing settings at 10 time CT rating	Sec	To be mentioned	
79.6	Burden of relay at 10 time CT rating	VA	To be mentioned	
79.7	Percentage of current setting at which relay will reset	%	To be mentioned	
79.8	**Reset time after removal of 10 time CT rated current for :**			
	a) Phase element (100%)	Sec	To be mentioned	
	b) E/F element (40%)	Sec	To be mentioned	
Metering and indication for 33/11kV, 10/13.33MVA Transformer 11kV Incoming and 11kV outgoing Feeder				
80.0	**kWh Meter**			
80.1	Manufacture's name & country	-	Siemens(Germany/ Switzerland)/ABB (Switzerland)/AEG (Germany)/Schlumberger (USA)/Elster(Romania)	
80.2	Manufacture's model no.	-	To be mentioned	
80.3	Type of Meter	-	Numerical programmable	

Sl. No.	Description	Unit	Requirement	Manufacturer's Guaranteed Data
			Multifunction	
80.4	Class of Accuracy	-	0.2	
81.0	**Indication Volt Meters & Ammeters**			
81.1	Manufacture's name & country	-	To be mentioned	
81.2	Manufacture's model no.	-	To be mentioned	
81.3	Type of Meter	-	Analogue	
81.4	Class of Accuracy	-	To be mentioned	

09.3 11KV INDOOR TYPE VACUUM CIRCUIT BREAKER (FEEDER BREAKER)

Sl. No.	Description	Unit	Requirement	Manufacturer's Guaranteed Data
1	Manufacturer's Name & Country of Origin	-	To be mentioned	
2	Manufacturer's Model No.	-	To be mentioned	
3	System nominal voltage	kV	11	
4	Maximum system voltage	kV	12	
5	Rated frequency	Hz	50	
6	**Rated normal current:**			
	• Incoming for 10/13.33 MVA Transformer	A	1250	
	• Outgoing Feeder	A	630	
7	No. of Phase	Nos.	3	
8	No. of breaks per phase	Nos	To be mentioned	
9	Interrupting medium	-	Vacuum	
10	Manufacturer's name and country of origin of Vacuum Interrupter	-	To be mentioned	
11	Manufacturer's model no. of vacuum interrupter	-	To be mentioned	
12	Power frequency withstand voltage	kV	28	
13	Lightning impulse withstand voltage on 1.2/50 µs wave	kV	75	
14	Emergency overload rating of normal at 20C ambient	-	To be mentioned	
15	Duration in any 24 hrs. period	-	To be mentioned	
16	Busbar scheme	No.	Single	
17	Number of busbar	Nos.	3	
18	Temperature rise of busbar at rated current	C	To be mentioned	
19	Material of busbar	-	Copper	
20	Cross-section of busbar	mm^2	To be mentioned	
21	Rated normal current of busbar for 10/13.33 MVA S/S	A	1250	
22	Busbar insulation material	-	To be mentioned	
23	Are floor plates or rails included?	-	To be mentioned	
24	**Overall dimension of each circuit breaker unit:**			
	• **Incomer:**			
	-Height	mm	To be mentioned	
	-Width	mm	To be mentioned	
	-Depth	mm	To be mentioned	
	• **Feeder:**			
	-Height	mm	To be mentioned	
	-Width	mm	To be mentioned	
	-Depth	mm	To be mentioned	
	• **Bus coupler:**			
	-Height	mm	To be mentioned	
	-Width	mm	To be mentioned	
	-Depth	mm	To be mentioned	
25	Width necessary for breaker withdrawal			
26	Rated short time withstand current (Rated short circuit	kA	25	

Sl. No.	Description	Unit	Requirement	Manufacturer's Guaranteed Data
	breaking current) for 3 Sec.			
27	Rated Peak withstand current (Rated short circuit making current)	kA	62.5	
28	**Breaking Capacity:**			
	• Symmetrical rms	kA	25	
	• Asymmetrical mis	kA	25	
29	Rated duration of short circuit	Sec.	To be mentioned	
30	Degrees of protection by enclose	IP	To be mentioned	
31	First pole to clear factor	-	To be mentioned	
32	Rated transient recovery voltage at 100% rated short circuit breaking current	kVp	To be mentioned	
33	Rated line charging breaking current	A	To be mentioned	
34	Rated cable charging breaking current	A	To be mentioned	
35	Rated out of phase breaking current	A	To be mentioned	
36	Is circuit breaker re-strike free?	-	Yes	
37	No. of tripping coil	Nos.	2	
38	Trip coil current	A	To be mentioned	
39	Trip coil voltage	VDC	110	
40	Is circuit breaker trip free?	-	Yes	
41	Type of main contact	-	To be mentioned	
42	Material of contact surface	-	To be mentioned	
43	Contact resistance	µ	To be mentioned	
44	Does magnetic effect of load current increase contract?	-	To be mentioned	
45	Length of each break/phase	mm	To be mentioned	
46	Length of stroke	mm	To be mentioned	
47	Weight of circuit breaker complete without operating mechanism and cubicles	Kg	To be mentioned	
48	Weight of circuit breaker complete with PCM Cubicles as in service	Kg	To be mentioned	
49	Maximum shock load imposed on floor or foundation when opening under fault condition (State compression or tension)	N	To be mentioned	
	OPERATING:			
50	Operating Sequence		To be mentioned	
51	• Opening time without current at 100% of rated breaking current	ms	To be mentioned	
	• Braking time	Cycle	To be mentioned	
	• Closing time	ms	To be mentioned	
52	Maximum arc duration of any duty cycle as per latest revision of relevant IEC	ms at …..%	To be mentioned	
53	Current at which maximum arc duration occurs (critical current)	A	To be mentioned	

Sl. No.	Description	Unit	Requirement	Manufacturer's Guaranteed Data
54	Make time	ms	To be mentioned	
55	Minimum time for arc extinction remake when adapted for auto closing	ms	To be mentioned	
56	Time form closing of control of switch to completion of closing stroke during fault making	ms	To be mentioned	
57	Manufacturer's Name & Country of Origin of vacuum interrupter	-	To be mentioned	
58	Manufacturer's Model No. of vacuum interrupter	-	To be mentioned	
59	Pressure in vacuum tube	bar	To be mentioned	
60	Guaranteed no. of vacuum interrupter	Nos.	To be mentioned	
61	In normal condition at rated current switching	Nos.	To be mentioned	
62	In short circuit condition i.e. at the short circuit current switching	Nos.	≥100	
CONSTRUCTION FEATURE:				
63	Is an external series break incorporated in the breaker?	-	To be mentioned	
64	Is any device used to limit transient recovery voltage?	-	To be mentioned	
65	Method of closing	-	To be mentioned	
66	Method of tripping		To be mentioned	
67	**Minimum clearance in air:**			
	• Between phase	mm	To be mentioned	
	• Phase to earth	mm	To be mentioned	
68	Material of tank or chamber	-	To be mentioned	
69	Material of moving contact tension rod	-	To be mentioned	
70	Period of time equipment has been in commercial operation	Years	To be mentioned	
71	Is removable draw-out VCB mounted on the lower part of the panel i.e. on floor?	-	To be mentioned	
72	All meters, protective relays, signaling etc. mounted on the upper part of the panel	-	To be mentioned	
73	Rated voltage of spring winding motor for closing	Vac	To be mentioned	
74	Materials of all current carrying parts of VCB	-	To be mentioned	
75	Name of relevant IEC standard to be followed in Design, Manufacture, Testing and Performance	-	To be mentioned	
	PROTECTION			
A. 76.0	**33/11kV, 10/13.33MVA, 11kV Transformer Incoming Cubicles Over current and earth fault protection with IDMT & instantaneous features**			
76.1	Manufacture's name & country of relay	-	Siemens(Germany/ Switzerland)/ABB (Switzerland/Sweden/Finland) Schneider (UK/France), Alstom	

Sl. No.	Description	Unit	Requirement	Manufacturer's Guaranteed Data
			(UK/France)	
76.2	Manufacture's model no.	-	To be mentioned	
76.3	Type of relay	-	Numerical programmable with all necessary features	
76.4	Range of timing settings at 10 time CT rating	Sec.	To be mentioned	
76.5	Burden of relay at 10 time CT rating	VA	To be mentioned	
76.6	Percentage of current setting at which relay will reset	%	To be mentioned	
76.7	Reset time after removal of 10 time CT rated current for :			
	a) Phase element (100%)	Sec	To be mentioned	
	b) E/F element (40%)	Sec	To be mentioned	
77.0	**Standard Earth Fault Protection**			
77.1	Manufacture's name & country	-	Siemens(Germany/ Switzerland)/ABB (Switzerland/Sweden/Finland) Schneider (UK/France), Alstom (UK/France)	
77.2	Manufacture's model no.	-	To be mentioned	
77.3	Type of relay	-	Numerical programmable with all necessary features	
77.4	**Range of current setting:**			
	a) Phase element (% of CT Rating)	Sec	To be mentioned	
	b) earth fault element (%of CT Rating)	Sec	To be mentioned	
77.5	Range of timing settings at 10 time CT rating	Sec	To be mentioned	
77.6	Burden of relay at 10 time CT rating	VA	To be mentioned	
77.7	Percentage of current setting at which relay will reset	%	To be mentioned	
77.8	Reset time after removal of 10 time CT rated current for :			
	a) Phase element (100%)	Sec	To be mentioned	
	b) E/F element (40%)	Sec	To be mentioned	
B.	**11kV Bus Coupler Cubicles:**			
78.0	**Over Current and Earth Fault Protection with IDMT & instantaneous features**			
78.1	Manufacture's name & country of relay	-	Siemens(Germany/ Switzerland)/ABB (Switzerland/Sweden/Finland) Schneider (UK/France), Alstom (UK/France)	
78.2	Manufacture's model no.	-	To be mentioned	
78.3	Type of relay	-	Numerical	

Sl. No.	Description	Unit	Requirement	Manufacturer's Guaranteed Data
			programmable with all necessary features	
78.4	**Range of current setting:**			
	a) Phase element (% of CT Rating)	Sec	To be mentioned	
	b) earth fault element (%of CT Rating)	Sec	To be mentioned	
78.5	Range of timing settings at 10 time CT rating	Sec	To be mentioned	
78.6	Burden of relay at 10 time CT rating	VA	To be mentioned	
78.7	Percentage of current setting at which relay will reset	%	To be mentioned	
78.8	**Reset time after removal of 10 time CT rated current for :**			
	a) Phase element (100%)	Sec	To be mentioned	
	b) E/F element (40%)	Sec	To be mentioned	
C.	**11kV Outgoing Feeder Cubicles**			
79.0	**Over Current and Earth Fault Protection with IDMT & instantaneous features**			
79.1	Manufacture's name & country of relay	-	Siemens(Germany/ Switzerland)/ABB (Switzerland/Sweden/Finland) Schneider (UK/France), Alstom (UK/France)	
79.2	Manufacture's model no.	-	To be mentioned	
79.3	Type of relay	-	Numerical programmable with all necessary features	
79.4	**Range of current setting:**			
	a) Phase element (% of CT Rating)	Sec	To be mentioned	
	b) earth fault element (%of CT Rating)	Sec	To be mentioned	
79.5	Range of timing settings at 10 time CT rating	Sec	To be mentioned	
79.6	Burden of relay at 10 time CT rating	VA	To be mentioned	
79.7	Percentage of current setting at which relay will reset	%	To be mentioned	
79.8	**Reset time after removal of 10 time CT rated current for :**			
	a) Phase element (100%)	Sec	To be mentioned	
	b) E/F element (40%)	Sec	To be mentioned	
Metering and indication for 33/11kV, 10/13.33MVA Transformer 11kV Incoming and 11kV outgoing Feeder				
80.0	**kWh Meter**			
80.1	Manufacture's name & country	-	Siemens(Germany/ Switzerland)/ABB (Switzerland)/AEG (Germany)/Schlumberger	

Sl. No.	Description	Unit	Requirement	Manufacturer's Guaranteed Data
			(USA)/Elster(USA)	
80.2	Manufacture's model no.	-	To be mentioned	
80.3	Type of Meter	-	Numerical programmable Multifunction	
80.4	Class of Accuracy	-	0.2	
81.0	**Indication Volt Meters & Ammeters**			
81.1	Manufacture's name & country	-	To be mentioned	
81.2	Manufacture's model no.	-	To be mentioned	
81.3	Type of Meter	-	Analogue	
81.4	Class of Accuracy	-	To be mentioned	

10. SHIELD WIRES, EARTHING GRID AND EARTHING ELECTRODE

A	**SHIELD WIRES**			
Sl. No.	Description	Unit	Requirement	Manufacturer's Guaranteed Data
1	Manufacturer		To be mentioned	
2	Conductor material		High strength steel	
3	Grade of steel	PSI	60000	
4	Nos. of strand	Nos	7	
5	Diameter of each strand	mm	3.25	
6	Overall diameter	mm	9.80	
7	Nominal cross section	mm^2	35	
8	Weight per 1000 meter length	kg	460	
9	Maximum rated current (3 sec)	A	To be mentioned	
10	Maximum working tension of main connection	kg/m^2	To be mentioned	
11	Resistance of conductors per 1000 meters at 20ºC	Ohms	To be mentioned	
12	Rated ultimate tensile strength	kg/m^2	4900	
13	Maximum permissible span length	m	To be mentioned	
14	Maximum sag under own weight of maximum span	mm	To be mentioned	
15	Co-efficient of linear expansion	cm/ºC	To be mentioned	
16	Class of zinc coating		class – A	
17	Galvanization		As per BS-729	
B	**EARTHING GRID**			
1	Manufacturer		To be mentioned	
2	Material		Copper	
3	Overall diameter	mm	To be mentioned	
4	Nominal cross section			
	A) interconnecting the earth electrodes	mm^2	To be mentioned	
	B) Connecting equipment to mesh	mm^2	To be mentioned	
5	Area of each earthing grid	mxm	To be mentioned	
6	Depth of bedding of conductor	mm	To be mentioned	
7	Maximum earth fault current for 3 sec	kA	31.5	
8	Resistance of conductors per 1000 meters at 20ºC	Ohms	To be mentioned	
C.	**EARTHING ELECTRODES**			
1	Manufacturer		To be mentioned	
2	Material		Copper	
3	Dimentions			
	a) Diameter		To be mentioned	
	b) Length		To be mentioned	
4	Number of electrodes per group		To be mentioned	
5	Number of earthing points		To be mentioned	
6	Caculated resistance of combined earth grid and points	Ohm	Less than 0.5	

11. BATTERIY AND CHARGER CUBICLE

Sl. No.	Description	Unit	Requirement	Manufacturer's Guaranteed Data
A.	**BATTERY**			
1	Manufacturer		To be mentioned	
2	Model no		To be mentioned	
3	Electrolyte		Nickel Cadmium Alkaline	
4	Installation		Indoor	
5	Operating voltage	V DC	110	
6	Continuous Discharge Current at rate of 10 hour & Final Cell Voltage 1.1 Volt.	Amp	10	
7	Short Time Discharge Current at rate of 2 hour & Final Cell Voltage 1.1 Volt.	Amp	50	
8	Charging Voltage (Maximum)	Volt	1.54-1.69 Per Cell	
9	Normal float charge rate	A	To be mentioned	
10	Maximum boost charge rate	A	To be mentioned	
11	Voltage per cell	V/per cell	1.2	
12	Capacity at 5 hour rate	Ah	250	
13	Number of cells	Nos	92	
14	Float voltage per cell	V per cell	1.4-1.42	
	Discharge voltage	v per cell	1.3-1.5	
15	Battery voltage at end of the duty cycle	V	1.1V per cell	
16	Nominal charging rate	A	40	
17	Maximum charging rate	A	40	
18	Ampere-hour efficiency at ten hour rate	%	To be mentioned	
19	Ampere-hour efficiency at one hour rate	%	To be mentioned	
20	Dimensions of cells	mm	To be mentioned	
22	Weight of cell complete with electrolyte	kg	To be mentioned	
23	Internal resistance per cell when fully charged	ohms	To be mentioned	
24	Material of battery case		To be mentioned	
25	Standard		IEC 623	
B.	**CHARGER**			
1	Manufacturer		To be mentioned	
2	Model no		To be mentioned	
3	Rectifier Type		Thyristor	
4	AC input voltage	V	415V±15%	
5	Input a.c frequency	HZ	50±5%	
6	DC output voltage			
	a) Normal Charge	V DC	110±10%	
	b) Float Charge	V DC	1.42 for110±15%	
	c) Boost Charge	V DC	1.53 volt per cell	
7	Output current (continuous)	A	50	
8	Rated Battery Current	A	To be mentioned	
9	Efficiency	%	To be mentioned	
10	Ripple Voltage	%	To be mentioned	
11	Type of AVR		Static	
12	Standard	%	IEC-146	
C	**CHARGER CUBCLE COMPLETE**			
1	Manufacturer		To be mentioned	
2	Overall dimensions		To be mentioned	
3	Total weight		To be mentioned	

12. LV AC / DC DISTRIBUTION PANEL

Sl. No.	Description	Unit	Requirement	Manufacturer's Guaranteed Data
A.	**AC DISTRIBUTION PANEL**			
1	Manufacturer		To be mentioned	
2	Model number		To be mentioned	
3	Bus bar rating	Amps	400	
4	Fault Rating for 1 sec.	KA	15	
5	Voltage	Volts	400	
6	Incoming breaker rating	A	400	
7	Thickness of sheet steel (encloser)	mm	To be mentioned	
8	Number and rating of circuits	Nos./A	To be mentioned	
9	Overall dimensions	mmxmm xmm	To be mentioned	
10	Total weight	Kg	To be mentioned	
11	MCCB			
	a) Manufacturr		To be mentioned	
	b) Model number		To be mentioned	
	c) Rated voltage	V	To be mentioned	
	d) Rated current	A	To be mentioned	
B.	**DC DISTRIBUTION PANEL**			
1	Manufacturer		To be mentioned	
2	Model number			
3	Bus bar rating	Amps	40	
4	Fault Rating for 1 sec	KA	6	
5	Voltage	Volts	400	
6	Incoming breaker rating	A	400	
7	Thickness of sheet steel (encloser)	mm	To be mentioned	
8	Number and rating of circuits	Nos./A	To be mentioned	
9	Overall dimensions	mmxmm xmm	To be mentioned	
10	Total weight	Kg	To be mentioned	
11	MCCB			
	a) Manufacturr		To be mentioned	
	b) Model number		To be mentioned	
	c) Rated voltage	V	To be mentioned	
	d) Rated current	A	To be mentioned	

13. 33KV CONTROL AND ENERGY METERING PANEL

Sl. No.	Description	Unit	Requirement	Manufacturer's Guaranteed Data
A.	**33KV CONTROL PANEL**			
1	Manufacturer		To be mentioned	
2	Model number		To be mentioned	
3	Overall dimensions	mm	To be mentioned	
4	Weight of panel	Kg	To be mentioned	
A1.	**PROTECTION**			
A.1.1	**IDMT OVER CURRENT & EARTH FAULT RELAY**			
1	Manufacturer		Siemens (Germany)/ Alstom (UK/France)/ ABB (Switzerland/ Sweden	
2	Model number		To be mentioned	
3	Type of relay		Numerical Programmable	
4	Range of current setting			
	a) Phase element	% of CT rating	To be mentioned	
	b) Earth fault element	% of CT rating	To be mentioned	
5	Range of timing settings at 10 time CT rating	Sec	To be mentioned	
6	Burden of relay at 10 time CT rating	VA	To be mentioned	
7	Percentage of current setting at which relay will reset	%	To be mentioned	
8	Reset time after removal of 10 times CT rated current for:			
	a) Phase element (100%)	Sec	To be mentioned	
	b) E/F element (40%)	Sec	To be mentioned	
A2.	**METERING AND INDICATION**			
A.2.1	**KWH METER**		Separate Panel for Energy Metering	
1	Manufacturer		Siemens(Germany/Switzerland)/Alstom,(UK)/ABB(Switzerland)/AEG(Germany)/Schlumberger (USA)	
2	Model number		To be mentioned	
3	Type of Meter		Numerical Programmable multifunction	
4	Number of KWH Meters		2 with provision of 4 meters in a separate metering panel	
5	Class of accuracy		0.2	
A2.2	**INDICATION METERS (VOLT, AMPERE, KW, KVAR & POWER FACTOR)**			
1	Manufacturer		Siemens(Germany/Switzerland)/Alstom,(UK)/ABB(Switzerland)/AEG(Germany)/Schlum	

Sl. No.	Description	Unit	Requirement	Manufacturer's Guaranteed Data
			berger(USA)	
2	Model number		To be mentioned	
3	Type of Meter		Digital/Analog	
4	Class of accuracy		To be mentioned	

14. STEEL STRUCTURE

Sl. No.	Description	Unit	Requirement	Manufacturer's Guaranteed Data
1	Manufacturer	-	To be mentioned	
2	Maximum ratio of unsupported length compression to their least redius of gyr			
	a) Main members	mm	120	
	b) Bracing's	mm	200	
	c) Redundant	mm	250	
3	Steel Grade Mild Steel			
	a) Elastic limit stress in tension membe	Kg/ mm	To be mentioned	
	b) Ultimate stress in compression me (expressed as function L/R)	Kg/ mm	To be mentioned	
4	Steel Grade HTGH Tension Steel			
	a) Elastic limit stress in tension membe	Kg/ mm	To be mentioned	
	b) Ultimate stress in compression me (expressed as function L/R)	Kg/ mm	To be mentioned	
5	Minimum size of member	mm	45 x 45 x 6	
6	Weight of each Column	Kg	To be mentioned	
7	Weight of each Girder	Kg	To be mentioned	
8	Total weight	Kg	To be mentioned	
9	Minimum member thickness	mm	6	
	Main member	mm	5	
	Other breching member	mm	5	
	Bolt diameter	mm	16	
10	Galvanizing thickness	mm	85	

15. Control cable

PVC insulated multi core control cable Laid up beded with PVC or tap. Flat / round wire armoring with helical steel taping and PVC sheathed, rated voltage 600/1000, continuous permissible voltage 720/1200 volts (VDE 0271/3.69 BDS 901: 85) (NYRGby) suitable for use in indoors, outdoors, underground and in water for continuous permissible service voltage of 720/1200 volts. Maximum resistance 4.73 ohm/km at 35°C.

a) Guaranteed Technical Particulars for 4C×4 mm2 XLPE Insulated and PE Sheathed Copper Cable
(To be filled u by the Manufacturer in Manufacturer's Letterhead Pad with appropriated data)

Sl No.	Description	Unit	Purchaser's Requirement	Manufacturer's Particulars
1	Name of the Item		4c×4 mm2×LPE Insulated and PE Sheathed Copper Cable with Armouring	
2	Name of the Manufacturer		Shall be mentioned	
3	Address of the Manufacturer		Shall be mentioned	
4	Standard		Performance Design and Testing shall be in accordance to the BS, IEC, BDS or equivalent International Standards.	
5	Cable Size	mm2	4C×4 rm	
6	Material		XLPE Insulated and PE Sheathed Copper Cable with Armouring	
7	Numbers & Diameter of Copper Wires	mm	7/0.85	
8	Numbers & Diameter of Steel Wires	mm	24/1.4	
9	Nominal size of Steel Tape	mm	8×0.3	
10	Maximum resistance at 30 deg.c	Ω/Km	4.56	
11	Nominal thickness of insulation	mm	0.8 (min)	
12	Nominal thickness of sheath	mm	1.8 (min)	
13	Colour of sheath		Black	
14	Colour of Core		Red, Yellow, Blue, Black	
15	Approximate outer diameter	mm	19	
16	Approximate weight	Kg/Km	760	
17	Drum wound length	m	1000	
18	Net Weight	Kg	Shall be mentioned	
19	Gross weight	Kg	Shall be mentioned	
20	Treated Wooden Drum Standard		AWPA C1-82, C2-83, c16-82, P5-83.	

b) Guaranteed Technical Particulars for 4C×6 mm^2 XLPE Insulated and PE Sheathed Copper Cable

(To be filled u by the Manufacturer in Manufacturer's Letterhead Pad with appropriated data)

Sl No.	Description	Unit	Purchaser's Requirement	Manufacturer's Particulars
1	Name of the Item		To be mentioned	
2	Name of the Manufacturer		To be mentioned	
3	Address of the Manufacturer		To be mentioned	
4	Standard		To be mentioned	
5	Cable Size	mm2	**4C×6 rm**	
6	Material		To be mentioned	
7	Numbers & Diameter of Copper Wires	mm	To be mentioned	
8	Numbers & Diameter of Steel Wires	mm	To be mentioned	
9	Nominal size of Steel Tape	mm	To be mentioned	
10	Maximum resistance at 30 deg.c	Ω/Km	To be mentioned	
11	Nominal thickness of insulation	mm	To be mentioned	
12	Nominal thickness of sheath	mm	To be mentioned	
13	Colour of sheath		To be mentioned	
14	Colour of Core		To be mentioned	
15	Approximate outer diameter	mm	To be mentioned	
16	Approximate weight	Kg/Km	To be mentioned	
17	Drum wound length	m	To be mentioned	
18	Net Weight	Kg	To be mentioned	
19	Gross weight	Kg	To be mentioned	
20	Treated Wooden Drum Standard		To be mentioned	

c) Guaranteed Technical Particulars for 2C×4 mm2 XLPE Insulated and PE Sheathed Copper Cable

(To be filled u by the Manufacturer in Manufacturer's Letterhead Pad with appropriated data)

Sl No.	Description	Unit	Purchaser's Requirement	Manufacturer's Particulars
1	Name of the Item		To be mentioned	
2	Name of the Manufacturer		To be mentioned	
3	Address of the Manufacturer		To be mentioned	
4	Standard		To be mentioned	
5	Cable Size	mm2	**2C×4 rm**	
6	Material		To be mentioned	
7	Numbers & Diameter of Copper Wires	mm	To be mentioned	
8	Numbers & Diameter of Steel Wires	mm	To be mentioned	
9	Nominal size of Steel Tape	mm	To be mentioned	
10	Maximum resistance at 30 deg.c	Ω/Km	To be mentioned	
11	Nominal thickness of insulation	mm	To be mentioned	
12	Nominal thickness of sheath	mm	To be mentioned	
13	Colour of sheath		To be mentioned	
14	Colour of Core		To be mentioned	
15	Approximate outer diameter	mm	To be mentioned	
16	Approximate weight	Kg/Km	To be mentioned	
17	Drum wound length	m	To be mentioned	
18	Net Weight	Kg	To be mentioned	
19	Gross weight	Kg	To be mentioned	
20	Treated Wooden Drum Standard		To be mentioned	

d) Guaranteed Technical Particulars for 2C×6 mm2 XLPE Insulated and PE Sheathed Copper Cable

(To be filled u by the Manufacturer in Manufacturer's Letterhead Pad with appropriated data)

Sl No.	Description	Unit	Purchaser's Requirement	Manufacturer's Particulars
1	Name of the Item		To be mentioned	
2	Name of the Manufacturer		To be mentioned	
3	Address of the Manufacturer		To be mentioned	
4	Standard		To be mentioned	
5	Cable Size	mm2	2C×6 rm	
6	Material		To be mentioned	
7	Numbers & Diameter of Copper Wires	mm	To be mentioned	
8	Numbers & Diameter of Steel Wires	mm	To be mentioned	
9	Nominal size of Steel Tape	mm	To be mentioned	
10	Maximum resistance at 30 deg.c	Ω/Km	To be mentioned	
11	Nominal thickness of insulation	mm	To be mentioned	
12	Nominal thickness of sheath	mm	To be mentioned	
13	Colour of sheath		To be mentioned	
14	Colour of Core		To be mentioned	
15	Approximate outer diameter	mm	To be mentioned	
16	Approximate weight	Kg/Km	To be mentioned	
17	Drum wound length	m	To be mentioned	
18	Net Weight	Kg	To be mentioned	
19	Gross weight	Kg	To be mentioned	
20	Treated Wooden Drum Standard		To be mentioned	

e) Guaranteed Technical Particulars for 19C×4 mm2 XLPE Insulated and PE Sheathed Copper Cable

(To be filled u by the Manufacturer in Manufacturer's Letterhead Pad with appropriated data)

Sl No.	Description	Unit	Purchaser's Requirement	Manufacturer's Particulars
1	Name of the Item		To be mentioned	
2	Name of the Manufacturer		To be mentioned	
3	Address of the Manufacturer		To be mentioned	
4	Standard		To be mentioned	
5	Cable Size	mm^2	**19C×4 rm**	
6	Material		To be mentioned	
7	Numbers & Diameter of Copper Wires	mm	To be mentioned	
8	Numbers & Diameter of Steel Wires	mm	To be mentioned	
9	Nominal size of Steel Tape	mm	To be mentioned	
10	Maximum resistance at 30 deg.c	Ω/Km	To be mentioned	
11	Nominal thickness of insulation	mm	To be mentioned	
12	Nominal thickness of sheath	mm	To be mentioned	
13	Colour of sheath		To be mentioned	
14	Colour of Core		To be mentioned	
15	Approximate outer diameter	mm	To be mentioned	
16	Approximate weight	Kg/Km	To be mentioned	
17	Drum wound length	m	To be mentioned	
18	Net Weight	Kg	To be mentioned	
19	Gross weight	Kg	To be mentioned	
20	Treated Wooden Drum Standard		To be mentioned	

16. POWER CABLES

16.1. 33 KV POWER CABLES (U/G)

Guaranteed Technical Data Schedule of 33KV, 1-Core × 500 Sq.mm U/G XLPE Copper Cable

SL No.	Description	Unit	Required Specification	Manufacturer's Particulars
1	Name and address of the Manufacturer		To be mentioned	
2	Type/Model of the offered cable		To be mentioned	
3	Nominal system voltage	KV	33	
4	Rated voltage of cable	KV	18/30(36)	
5	Process of manufacturing		VCV/CCV	
6	Number of core and cross sectional area of conductor cores	Sq.mm	1×500	
7	Conductor material		Copper	
8	Minimum no of strand	No.	53	
9	Diameter of each strand	mm	To be mentioned	
10	Shape of conductor		Compacted Circular	
11	Type of conductor screen		Semi-conducting	
12	Thickness of semi conducting screen	mm	0.6	
13	Avg. thickness of insulation	mm	8.0	
14	Process of curing		Dry process	
15	Material of insulation		Cross Linked Polyethylene (XLPE)	
16	Type of non metallic insulating screen		Semi-conducting	
17	Thickness of semi conducting insulation screen	mm	1.0	
18	Number and diameter of copper screen strands	No./mm	Based on design calculation	
19	Composition of filler		PVC	
20	Composition of bedding		Extruded PVC	
21	Thickness of bedding	mm	Based on design calculation	
22	Number and diameter of armour wire	No./mm	As per IEC 60502	
23	Avg. thickness of MDPE over sheath	mm	Based on design calculation	
24	Nominal diameter of complete cable	mm	Based on design calculation	
25	Nominal weight per meter of complete cable	Kg/m	Based on design calculation	
26	Minimum radius of bend round which cable can be laid	mm	Based on design calculation	
27	Max. D.C resistance of conductor per meter at 20° C	Ohm/m	Based on design calculation	
28	Max. A.C resistance of conductor per meter at MAXIMUM CONDUCTOR TEMPARATURE	Ohm/m	Based on design calculation	
29	Star resistance per meter of cable at 50Hz	Ohm/m	Based on design calculation	
30	Star capacitance per per meter of cable at 50Hz	pF/m	Based on design calculation	

SL No.	Description	Unit	Required Specification	Manufacturer's Particulars
31	Charging current per conductor per meter at 18000/30000 Volts , 50Hz	mA	Based on design calculation	
32	Maximum current carrying capacity of conductor in ground	A	Based on design calculation	
33	Maximum conductor temperature under continuous loading	℃	Based on design calculation	
34	Short circuit withstand capacity nof the cable for 1 sec. duration	KA	Min. 25	
35	conductor temperature at the end of short circuit	℃	≤250	
36	Earth fault withstand capacity for 1 sec.	KA	Min. 25	
37	Screen short circuit withstand capacity	KA	Min. 25	
38	Armour short circuit capacity	KA	Based on design calculation	
39	Cable resistance, reactance			
	a) for positive sequence	Ohm/m	Based on design calculation	
	b) negative sequence	Ohm/m	Based on design calculation	
	c) Zero sequence	Ohm/m	Based on design calculation	

16.2. **11 KV POWER CABLES (U/G)**

16.2.1: Guaranteed Technical Data Schedule of 11KV, 1-Core × 500 Sq.mm U/G XLPE

Copper Cable

SL No.	Description	Unit	Required Specification	Supplier's/ Manufacturer's Particulars
1	Name and address of the Manufacturer		To be mentioned	
2	Type/Model of the offered cable		To be mentioned	
3	Nominal system voltage	KV	11	
4	Rated voltage of cable	KV	6/10(12)	
5	Process of manufacturing		VCV/CCV	
6	Number of core and cross sectional area of conductor cores	Sq.mm	1×500	
7	Conductor material		Copper	
8	Shape of conductor		Round	
9	Type of conductor screen		Semi-conducting	
10	Thickness of semi conducting screen	mm	0.6	
11	Avg. thickness of insulation	mm	3.4	
12	Process of curing		Dry process	
13	Material of insulation		Cross Linked Polyethylene (XLPE)	
14	Type of non metallic insulating screen		Semi-conducting	
15	Thickness of semi conducting insulation screen	mm	1.0	
16	Number and diameter of copper screen strands	No./mm	Based on design calculation	
17	Composition of filler		MDPE	
18	Composition of bedding		Extruded PVC	
19	Thickness of bedding	mm	Based on design calculation	
20	Number and diameter of armour wire	No./mm	As per IEC 60502	
21	Avg. thickness of MDPE over sheath	mm	Based on design calculation	
22	Nominal diameter of complete cable	mm	Based on design calculation	
23	Nominal weight per meter of complete cable	Kg/m	Based on design calculation	
24	Minimum radius of bend round which cable can be laid	mm	12×D	
25	Max. D.C resistance of conductor per meter at 20°C	Ohm/m	Based on design calculation	
26	Max. A.C resistance of conductor per meter at MAXIMUM CONDUCTOR TEMPARATURE	Ohm/m	Based on design calculation	
27	Star resistance per meter of cable at 50Hz	Ohm/m	Based on design calculation	

SL No.	Description	Unit	Required Specification	Supplier's/ Manufacturer's Particulars
28	Star capacitance per per meter of cable at 50Hz	pF/m	Based on design calculation	
29	Charging current per conductor per meter at 18000/30000 Volts , 50Hz	mA	Based on design calculation	
30	Maximum current carrying capacity of conductor in ground	A	775	
31	Maximum conductor temperature under continuous loading	℃	90	
32	Short circuit withstand capacity nof the cable for 1 sec. duration	KA	Min. 20	
33	conductor temperature at the end of short circuit	℃	≤250	
34	Earth fault withstand capacity for 1 sec.	KA	Min.10	
35	Screen short circuit withstand capacity	KA	Min. 10	
36	Armour short circuit capacity	KA	Based on design calculation	
37	Cable resistance, reactance			
	a) for positive sequence	Ohm/m	Based on design calculation	
	b) negative sequence	Ohm/m	Based on design calculation	
	c) Zero sequence	Ohm/m	Based on design calculation	

16.2.2: Guaranteed Technical Data Schedule of 11KV, 1-Core × 185 Sq.mm U/G XLPE

Copper Cable

SL No.	Description	Unit	Required Specification	Supplier's/ Manufacturer's Particulars
1	Name and address of the Manufacturer		To be mentioned	
2	Type/Model of the offered cable		To be mentioned	
3	Nominal system voltage	KV	To be mentioned	
4	Rated voltage of cable	KV	To be mentioned	
5	Process of manufacturing		To be mentioned	
6	Number of core and cross sectional area of conductor cores	Sq.mm	1×185	
7	Conductor material		Copper	
8	Shape of conductor		Round	
9	Type of conductor screen		To be mentioned	
10	Thickness of semi conducting screen	mm	To be mentioned	
11	Avg. thickness of insulation	mm	To be mentioned	
12	Process of curing		To be mentioned	
13	Material of insulation		To be mentioned	
14	Type of non metallic insulating screen		To be mentioned	
15	Thickness of semi conducting insulation screen	mm	To be mentioned	
16	Number and diameter of copper screen strands	No./mm	Based on design calculation	
17	Composition of filler		To be mentioned	
18	Composition of bedding		To be mentioned	
19	Thickness of bedding	mm	Based on design calculation	
20	Number and diameter of armour wire	No./mm	To be mentioned	
21	Avg. thickness of MDPE over sheath	mm	Based on design calculation	
22	Nominal diameter of complete cable	mm	Based on design calculation	
23	Nominal weight per meter of complete cable	Kg/m	Based on design calculation	
24	Minimum radius of bend round which cable can be laid	mm	To be mentioned	
25	Max. D.C resistance of conductor per meter at 20°C	Ohm/m	Based on design calculation	
26	Max. A.C resistance of conductor per meter at MAXIMUM CONDUCTOR TEMPARATURE	Ohm/m	Based on design calculation	
27	Star resistance per meter of cable at 50Hz	Ohm/m	Based on design calculation	
28	Star capacitance per per meter of cable at 50Hz	pF/m	Based on design calculation	
29	Charging current per conductor per meter at	mA	Based on design calculation	

SL No.	Description	Unit	Required Specification	Supplier's/ Manufacturer's Particulars
	18000/30000 Volts , 50Hz			
30	Maximum current carrying capacity of conductor in ground	A	To be mentioned	
31	Maximum conductor temperature under continuous loading	℃	To be mentioned	
32	Short circuit withstand capacity nof the cable for 1 sec. duration	KA	To be mentioned	
33	conductor temperature at the end of short circuit	℃	To be mentioned	
34	Earth fault withstand capacity for 1 sec.	KA	To be mentioned	
35	Screen short circuit withstand capacity	KA	To be mentioned	
36	Armour short circuit capacity	KA	Based on design calculation	
37	Cable resistance, reactance			
	a) for positive sequence	Ohm/m	Based on design calculation	
	b) negative sequence	Ohm/m	Based on design calculation	
	c) Zero sequence	Ohm/m	Based on design calculation	

Tenderer shall provide all necessary information which deem to be necessary to complete the work in all respect

Seal and Signature of
the Tenderer

SCHEDULE F

DEPARTURES FROM SPECIFICATIONS

SCHEDULE F

DEPARTURES FROM SPECIFICATIONS

Tenderers are to list all departures from the requirements of the specification in this schedule. All departures whether they be commercial, financial, technical or of a contractual nature are to be included and submitted with the Technical Proposal.

Any item that does not have a departure listed in this schedule will be deemed to be in full accordance with the requirements of the specification.

No other document or detail accompanying the tender will be considered in evaluating departures. Tenderers are not permitted to offer any alternative to this schedule.

Item	Volume	Clause	Detail of Departure from Specification

SCHEDULE G

PROPOSED ALTERNATIVE STANDARDS TO WHICH EQUIPMENT SHALL BE PROVIDED

SCHEDULE G

PROPOSED ALTERNATIVE STANDARDS TO WHICH EQUIPMENT SHALL BE PROVIDED

The Tenderer shall list below all the alternative engineering and design Standards, which he proposes to use in his design, manufacture and testing of equipment to be supplied. Should these standards differ from the specified standard in any respect, the Tenderer shall detail the differences between the proposed and specified standard.

Compliance with any standard equal or superior to those specified will be considered acceptable.

In the absence of any listed alternative standard, it is deemed that the standards specified in the Tender Documents are fully complied with.

SCHEDULE H

PROPOSED CONTRACT AND SITE ORGANISATION AND SITE RESOURCES

SCHEDULE H

PROPOSED CONTRACT AND SITE ORGANISATION AND SITE RESOURCES

The Tenderer is required to provide full organization charts of his proposed head office and site office arrangements. This should include how site subcontractors are to interface with the contractor's organization.

The Tenderer shall list in the form of Schedule attached, the key personnel (including first nominee and the second choice alternate)he will employ at head office and site office to direct and execute and work for the execution of the Contract together with their qualifications, positions held and their nationalities. Should specialist sub-designers be proposed (e.g civil designers) details of these are also to be provided with how this interface with the contractor's organization.

Should the Tenderer be proposing to put any restriction on his site managers authority to carry out the instructions issued by the Employer Representative, full details of these, be they financial/contractual/technical are to be provided in the tender.

The information provided in the Tender in accordance with the above, will not represent any limitations on the staff required to perform the works in accordance with the conditions of Contract. Should the Contractor require utilizing additional staff to those proposed in order to meet his obligations these are to be provided at no additional cost. The Contractor shall however have to employ all the expatriate staffs proposed in the tender as to be employed at site. In case of failure to employ the expatriate staffs at site as per tender proposal, the Employer may go for termination of the Contract.

In addition the Tenderer is required to provide a schedule of the site resources he intends to provide, e.g. equipment for haulage, lifting, site power supplies, foundation, erection, stringing, testing and commissioning. Major items of equipment for construction purposes, which the Tenderer proposes to import, are to be submitted with the Tender. The Tenderer shall have to bring the above proposed equipment during construction otherwise they may be panelized, as per clause of the tender, for any delay due to non-availability of such equipment at site. The successful Tenderer will be required to submit detailed schedules of his proposed site testing and commissioning equipment and experience of his commissioning engineers.

The Tenderer is also required to provide details of his site organization concerning office locations, storage facilities proposed, both open and covered, site transportation, etc. The successful Tenderer will be required to provide details of his proposed organizational procedures for the receipt, inspection and transportation of plant, plus monthly progress monitoring, invoice submission etc.

The Contractor shall ensure that the cash flow is maintained as forecasted in their price proposal. In case there is any liquidity problem for which there is any delay in implementing the project, the Contractor may be panelized as per tender.

SCHEDULE H OF KEY PERSONNEL

Position	Name	Nationality	Summary of qualifications, experience and present occupation
Head Office Staff: Site Office Staff:			

Signature and Seal of the Tenderer

SCHEDULE H OF EQUIPMENT FOR CONSTRUCTION

Name of Equipment	Ownership	Present Location

Signature and Seal of the Tenderer

SCHEDULE I

DRAWINGS AND DOCUMENTS TO BE SUBMITTED WITH TENDER

SCHEDULE I

DRAWINGS AND DOCUMENTS TO BE SUBMITTED WITH TENDER FOR 33 KV SWITCHING STATION WORK

The Tenderer shall submit the following drawings/documents with the tender:

1. Typical plan and section drawings of transformer incoming, bus coupler and outgoing feeders for 33 kV switchyard.

2. Block diagram showing overall dimensions of 33kV switchyard at site.

3. Drawings of circuit breakers, disconnecting switches, current transformers, voltage transformers, lightning arresters and disc Insulator units showing details of construction and dimensions.

4. Typical arrangement drawing of control panel cubicles, energy meter panel cubicle, battery charger cubicle, LVAC and DC distribution boards.

5. Typical block-schematic and logic diagrams of all protection and control schemes.

6. Lay-out Plan of control panel to be installed in substation control room building.

7. Cross Section Drawing of the head design of the insulator unit.

8. Type test certificate of the following shall be submitted as per relevant IEC/BS standards.

i) Circuit Breaker (VCB)

(a) Lightning impulse voltage withstand dry test
(b) Temperature rise test
(c) Power frequency withstand test
(d) Short time withstand & Peak withstand current test
(e) Mechanical operation tests
(f) Short Circuit Current making & breaking test
(g) Out of phase making & breaking test

ii) Disconnecting Switch DS/ES)

(a) Lightning Impulse voltage withstand dry test
(b) Power frequency voltage withstand dry test
(c) Short time withstand current test

iii) Current Transformer (CT)

(a) Short time current test
(b) Impulse voltage withstands tests for current transformers for service in exposed installation.
(c) Power frequency voltage withstand test

(d) Temperature rise test

iv) Voltage Transformer (VT)

(a) Temperature rise test
(b) Impulse voltage withstand tests for voltage transformers for service in exposed installation.
(c) Short circuit test
(d) Short time over voltage test

v) Lightning Arrester (LA)

(a) Lightning impulse voltage withstand test on Arrester Housing
(b) Lightning impulse residual voltage test
(c) Step current impulse residual voltage test
(d) Long duration current impulse withstand test
(e) High Current Impulse withstand test
(f) Pressure relief test

vi) Disc Insulator units

(a) Mechanical failing load test
(b) Impulse voltage puncture test
(c) Power are test
(d) Residual strength test

9. Type test certificates of the above equipment shall be from independent testing laboratory.

10. Quality Assurance Certificate ISO9001/9002 Certification (or equivalent and Quality Assurance Program & Typical Quality Plan for the work from the manufacturers of the following equipment:

i) Circuit breaker
ii) Disconnecting switch
iii) Current transformer
iv) Voltage transformer
v) Lightning arrester
vi) Insulator
vii) Relays

DRAWINGS AND DOCUMENTS TO BE SUBMITTED WITH TENDER
FOR 33 KV LINE AUGMENTATION WORK

1. According to design & drawing, Technical Specification and GTP of all materials to be used for augmentation of 33 kV existing line.

2. Relevant all Test Report of all materials to be used for augmentation of 33 kV existing line confirming the Technical Specification and GTP submitted by the Tenderer.

3. Manufacturer's Assurance Certificate for supplying line materials in favour of the Tender.

4. Quality Assurance Certificate ISO9001/9002 Certification (or equivalent and Quality Assurance Program & Typical Quality Plan for the work from the manufacturers of the required materials for 33 kV line augmentation work.

5. Brochure/Catalog of manufacturer indicating manufacturing facilities and available materials.

SCHEDULE K

MANUFACTURER'S AUTHORIZATION LETTER

SCHEDULE J

Manufacturer's Authorization Letter

[This letter of authorization should be on the letterhead of the manufacturer and should be signed by the person with the proper authority to sign documents that are binding on the manufacturer]

Invitation for Tender No: Date:

Tender Identification No:

To:

(Name and address of The Employer)

WHEREAS, we [name and address of manufacturer] are reputable manufacturers having factories at [list of places of factories].

Therefore, we do hereby:

1. Authorize [name of Tenderer] to submit a Tender in response to the invitation for Tenders indicated above, the purpose of which is to provide the [description of goods], manufactured by us, and to subsequently sign the Contract for the supply of such Goods; and,

2. Extend our full guarantee and warranty in accordance with GCC Clause 10 with respect to the Goods offered in the Tender.

Signed

In the capacity of:

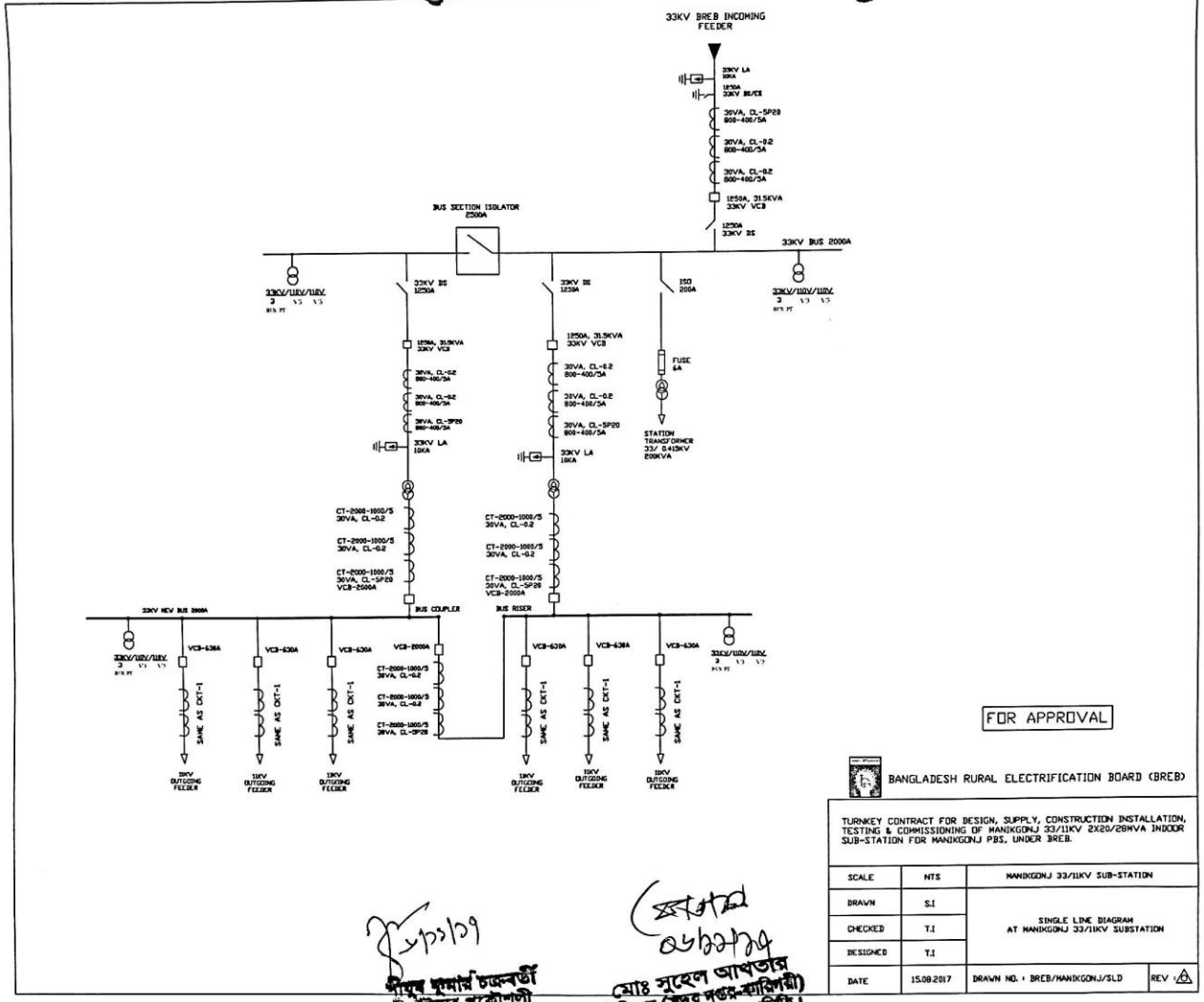
Duly authorized to sign the authorization for and on behalf of

[name of manufacturer]

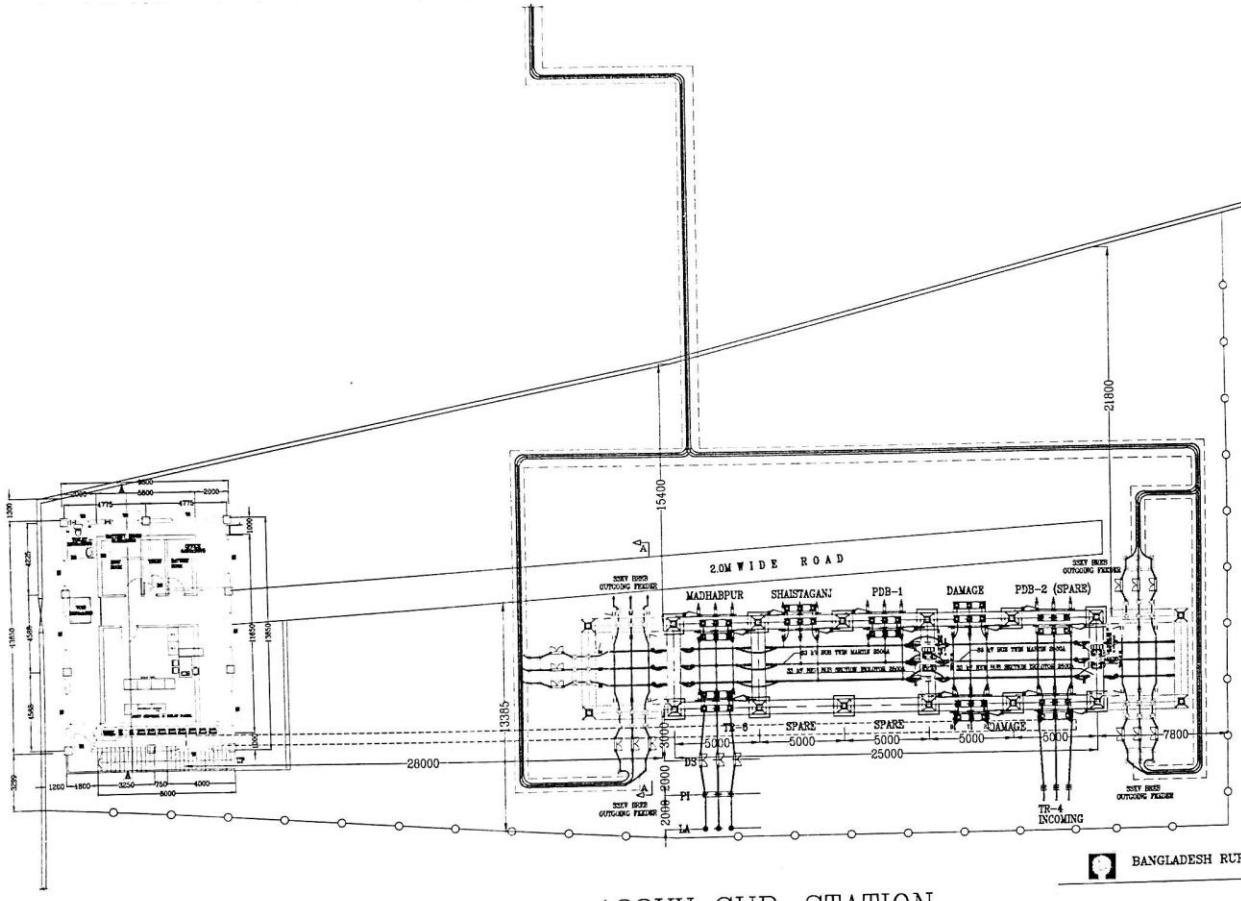
Date:

Section 9

Drawings


33KV BREB INCOMING FEEDER
33KV LA 10KA
1250A 33KV BS/CB
30VA, CL-5P20 800-400/5A
30VA, CL-0.2 800-400/5A
30VA, CL-0.2 800-400/5A
1250A, 31.5KVA 33KV VCB
1250A 33KV BS
33KV BUS 2000A
BUS SECTION ISOLATOR 2500A
33KV/110V/110V. 3 1Ø 3 PT'S
33KV BS 1250A
33KV BS 1250A
ISO 200A
33KV/110V/110V. 3 1Ø 3 PT'S
1250A, 31.5KVA 33KV VCB
30VA, CL-0.2 800-400/5A
30VA, CL-0.2 800-400/5A
30VA, CL-5P20 800-400/5A
33KV LA 10KA
CT-2000-1000/5 30VA, CL-0.2
CT-2000-1000/5 30VA, CL-0.2
CT-2000-1000/5 30VA, CL-5P20 VCB-2000A
FUSE 6A
STATION TRANSFORMER 33/ 0.415KV 200KVA
30VA, CL-0.2 800-400/5A
30VA, CL-0.2 800-400/5A
30VA, CL-5P20 800-400/5A
33KV LA 10KA
CT-2000-1000/5 30VA, CL-0.2
CT-2000-1000/5 30VA, CL-0.2
CT-2000-1000/5 30VA, CL-5P20 VCB-2000A
33KV REV BUS 2000A
BUS COUPLER
BUS RISER
33KV/110V/110V. 3 1Ø 3 PT'S
VCB-630A
VCB-630A
VCB-630A
VCB-2000A
CT-2000-1000/5 30VA, CL-0.2
CT-2000-1000/5 30VA, CL-0.2
CT-2000-1000/5 30VA, CL-5P20
VCB-630A
VCB-630A
VCB-630A
33KV/110V/110V. 3 1Ø 3 PT'S
SAME AS CKT-1
SAME AS CKT-1
SAME AS CKT-1
SAME AS CKT-1
SAME AS CKT-1
SAME AS CKT-1
11KV OUTGOING FEEDER
11KV OUTGOING FEEDER
11KV OUTGOING FEEDER
11KV OUTGOING FEEDER
11KV OUTGOING FEEDER
11KV OUTGOING FEEDER
FOR APPROVAL
BANGLADESH RURAL ELECTRIFICATION BOARD (BREB)
TURNKEY CONTRACT FOR DESIGN, SUPPLY, CONSTRUCTION INSTALLATION, TESTING & COMMISSIONING OF MANIKGONJ 33/11KV 2X20/28MVA INDOOR SUB-STATION FOR MANIKGONJ PBS, UNDER BREB.
SCALE NTS
MANIKGONJ 33/11KV SUB-STATION
DRAWN S.I
CHECKED T.I
DESIGNED T.I
SINGLE LINE DIAGRAM AT MANIKGONJ 33/11KV SUBSTATION
DATE 15.08.2017
DRAWN NO. : BREB/MANIKGONJ/SLD
REV 1
পীযুষ কুমার চক্রবর্তী
ডিটেইলার ড্রফৌশলী
এসিরি এল, মাপবিস।
মোঃ সুহেল আখতার
ডিজিএম (সদর দপ্তর-চাকরিরী)
মানিকগঞ্জ পল্লী বিদ্যুৎ সমিতি।

ALL DIMENSIONS ARE IN mm



132KV SUB-STATION

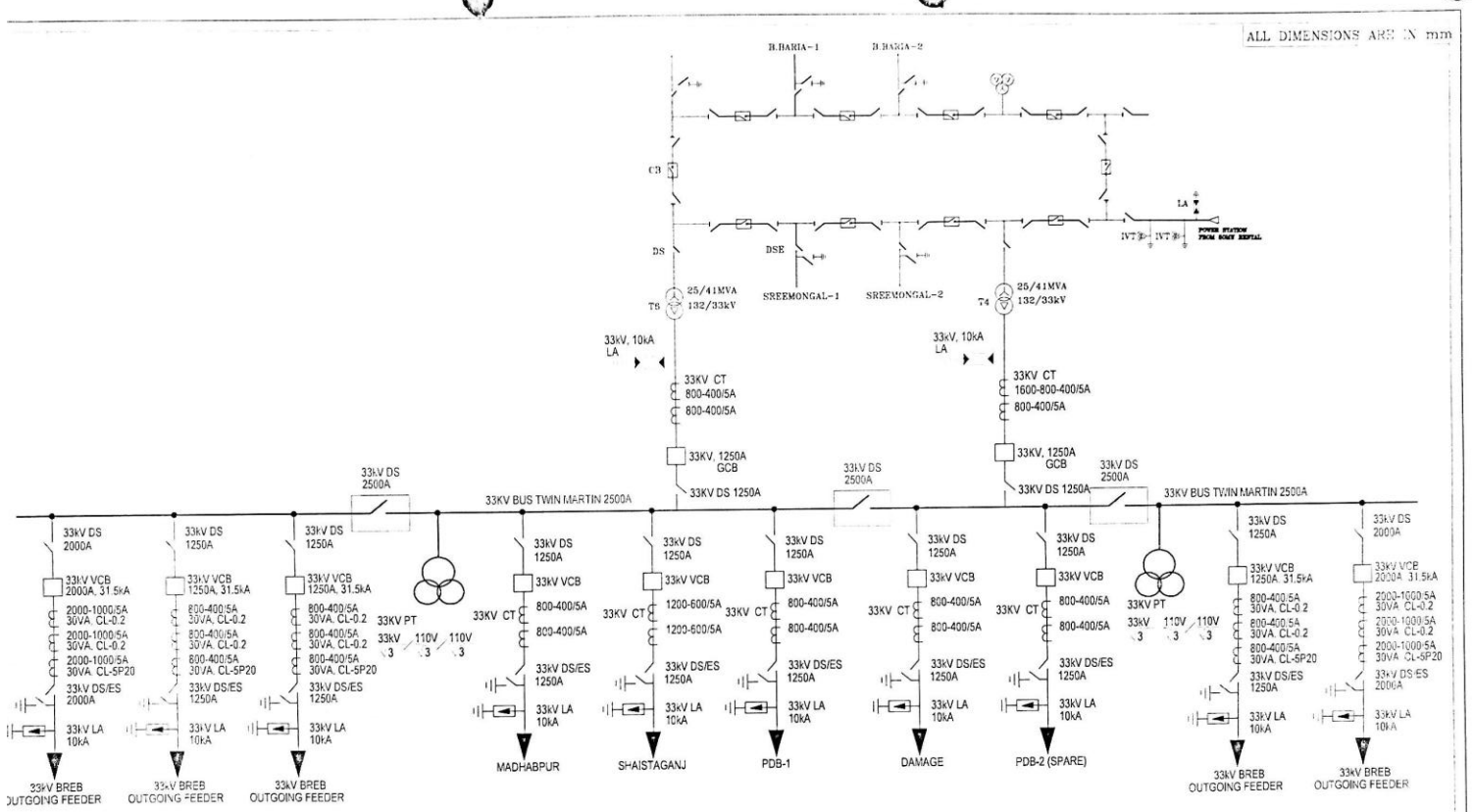
BANGLADESH RURAL ELECTRIFICATION BOARD (BREB).

TURNKEY CONTRACT FOR DESIGN, SUPPLY, CONSTRUCTION, INSTALLATION, TESTING & COMMISSIONING OF BAY-BREAKER EXTENSION AND BUS-BAR RELATED WORKS OF SHAHJIBAZAR 132/33kV GRID SUBSTATION FOR HOBIGONJ PBS. UNDER BRRB.

SCALE	NTS	SHAHJIBAZAR 132/33kV GRID S/S.
DRAWN	S.I.	PROPOSED LAYOUT PLAN OF 33KV BREB BAY EXTENSION AT SHAHJIBAZAR 132/33/11kV SUBSTATION.
CHECKED	T.I.	
DESIGNED	T.I.	
DATE	24.10.2017	DRAWING NO. : BREB/HOBIGONJ PBS/PLAN REV : A

FOR APPROVAL

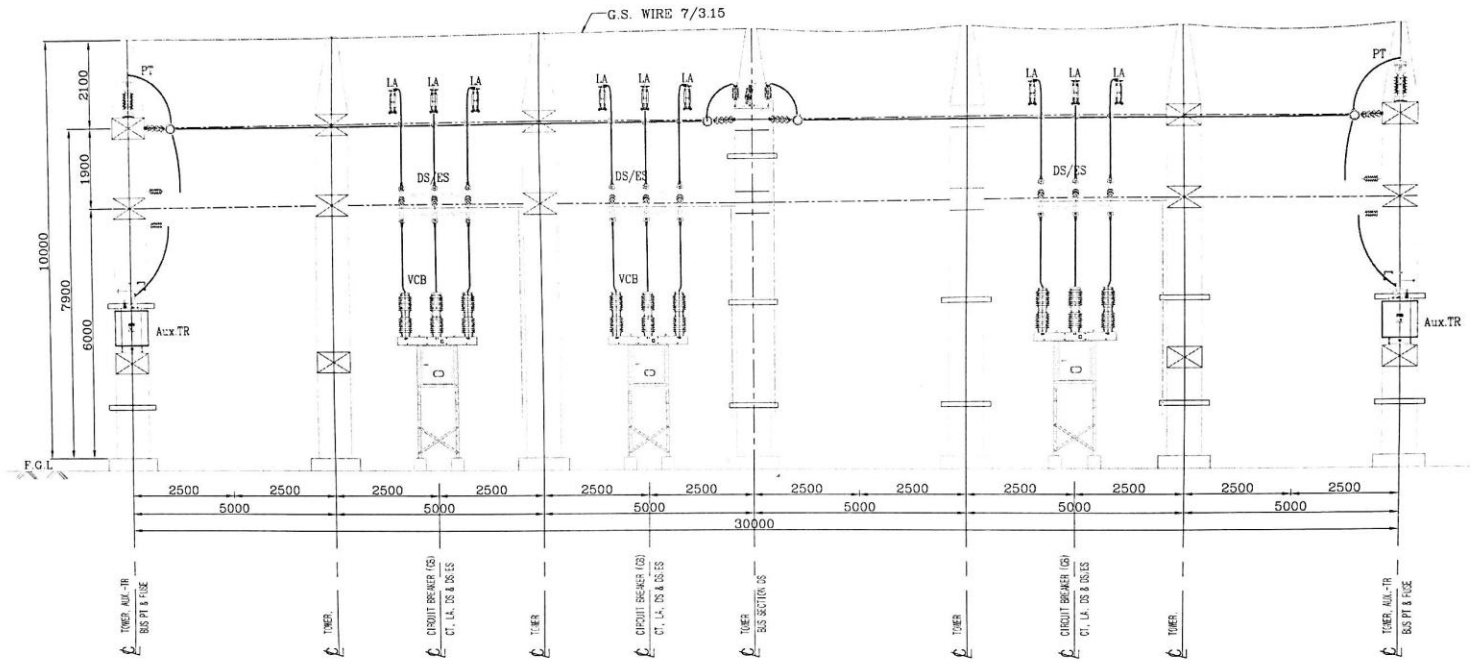
মো: সুহেল আখতার
এজিএম (সদর দপ্তর-কারিগরী)
নিকলপ্ত পল্লী বিদ্যুৎ সমিতি।



০৬/১১/১৭
মোঃ সুহেল আখতার
উজিএম (সদর দপ্তর-কাকিগী)
মানিকগঞ্জ পল্লী বিদ্যুৎ সমিতি।

ALL DIMENSIONS ARE
= SCOPE OF SUPP
= EXISTING
FOR APPROVAL
BANGLADESH RURAL ELECTRIFICATION BOARD
TURNKEY CONTRACT FOR DESIGN, SUPPLY, CONSTRUCTION, INSTALLATIO
TESTING & COMMISSIONING OF MANIKGANJ 33/11KV 2x20/26MVA (ONAN
SUB-STATION FOR MANIKGANJ PBS UNDER BPDB.
MANIKGANJ 33/11kV SUB-STATION
SECTION B-B
MANIKGANJ 33/11kV SUB-STATION
DRAWING NO : BPDB/MANIKGANJ/SEC
DATE : 18.08.2017
SCALE : NTS
DRAWN : RI
CHECKED : TI
DESIGNED : TI
SECTION : B-B
G.S. WIRE 7/3.15
33kV LINE
DS/ES
LA
CB
CT
DS
PT
STATION SERVICE TRANSFORMER WITH FUSE
10/14 MVA 33/11 kV NPR
MB F
2805
1500
1000
1000
1000
1500
5000
3700
300
F.G.L
XLPE CABLE (2x1Cx500mm²/Phase)
EM TOWER
POWER TRANSFORMER 33/11kV, 10/13.33MVA
LIGHTNING ARRESTOR (LA)
CURRENT TRANSFORMER (CT)
TOWER, CB
DS
LA, DS & DS/ES
CURRENT TRANSFORMER (CT)
4000
4000
15800
1200
800
5000
800
2700
1000
3700
6000
7900
10000

ALL DIMENSIONS ARE IN MM.



SECTION : A-A

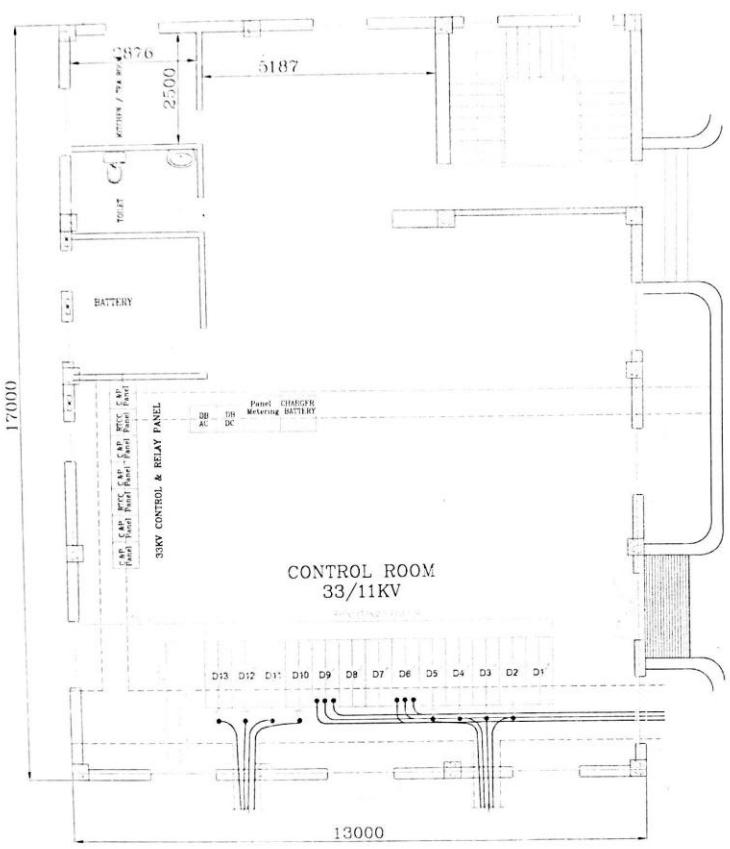
FOR APPROVAL

BANGLADESH RURAL ELECTRIFICATION BOARD (BRED).

TURNKEY CONTRACT FOR DESIGN, SUPPLY, CONSTRUCTION, INSTALLATION, TESTING & COMMISSIONING OF MANIKGANJ 33/11KV 2x20/28MVA INDOOR SUB-STATION FOR MANIKGANJ PBS, UNDER BRED.

SCALE	NTS	MANIKGANJ 33/11kV SUB-STATION
DRAWN	S.I.	SECTION A-A AT MANIKGANJ 33/11kV SUBSTATION.
CHECKED	T.I.	
DESIGNED	T.I.	
DATE	15.08.2017	DRAWING NO : BRED/MANIKGANJ/SEC REV. A

০৬/১২/১৭
মোঃ সুহেল আখতার
উজিএম (সদর দপ্তর-কারিগরী)
মানিকগঞ্জ পল্লী বিদ্যুৎ সমিতি।



ALL DIMENSIONS ARE IN

N
W E
S

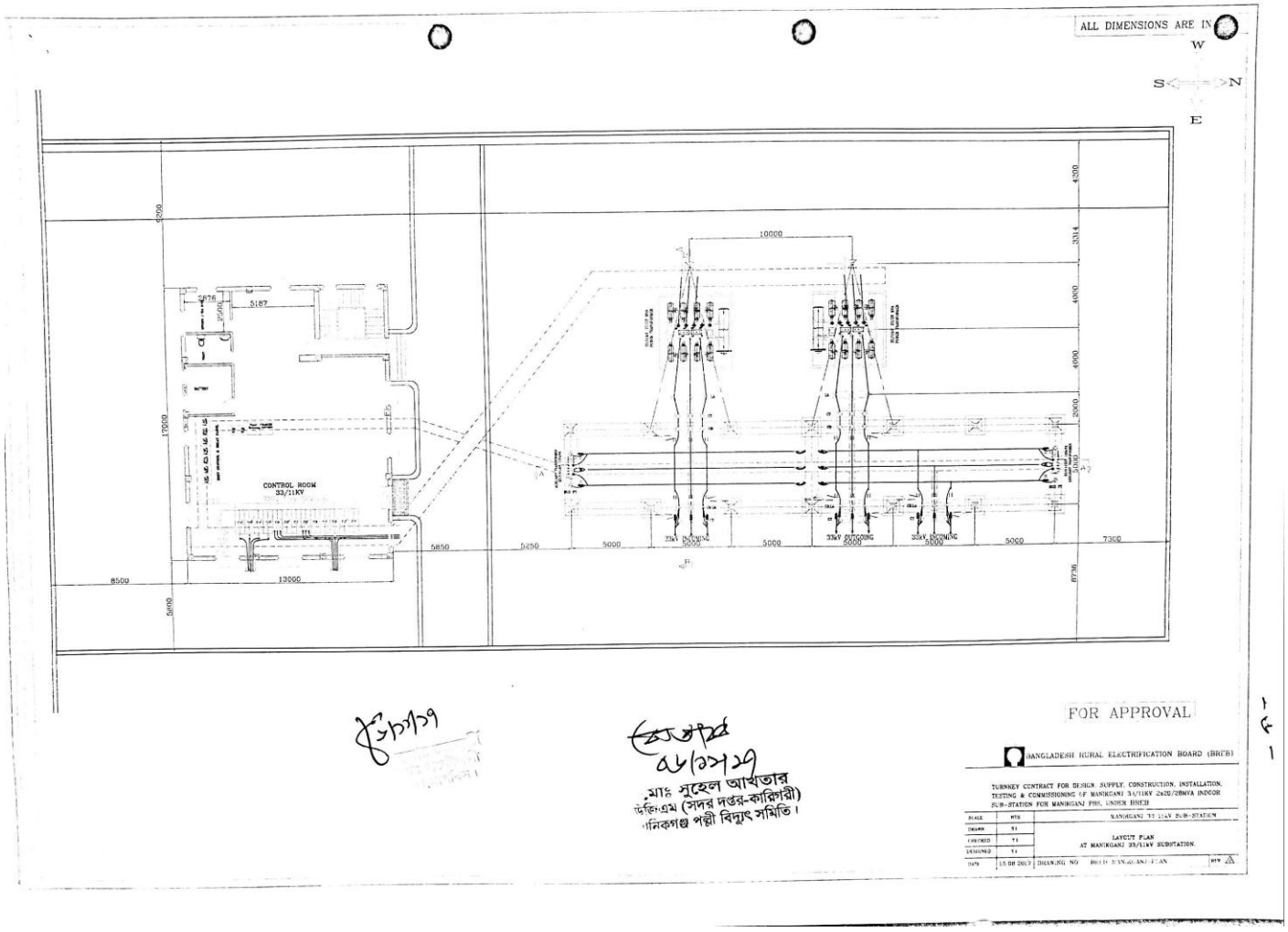
FOR APPROVAL

BANGLADESH RURAL ELECTRIFICATION BOARD (BREB)

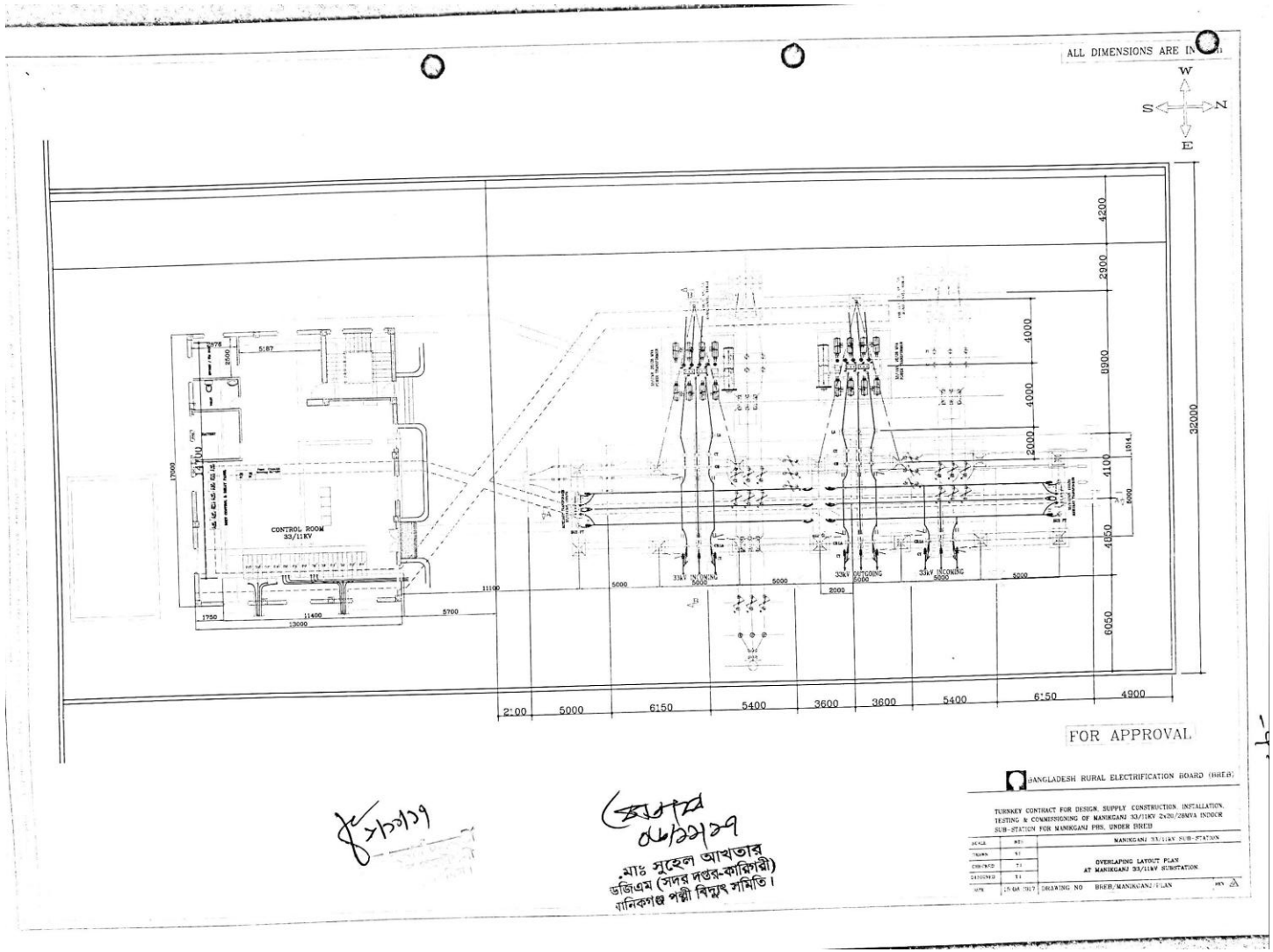
TURNKEY CONTRACT FOR DESIGN, SUPPLY, CONSTRUCTION, INSTALLATION, TESTING & COMMISSIONING OF MANIKGANJ 33/11KV 2x20/28MVA INDOOR SUB-STATION FOR MANIKGANJ PBS UNDER BREB

SCALE	NTS	MANIKGANJ 33/11kV SUB-STATION
DRAWN	XI	CONTROL ROOM AT MANIKGANJ 33/11kV SUBSTATION.
CHECKED	YI	
DESIGNED	FI	
DATE	15.08.2017	DRAWING NO. BREB/MANIKGANJ/PLAN

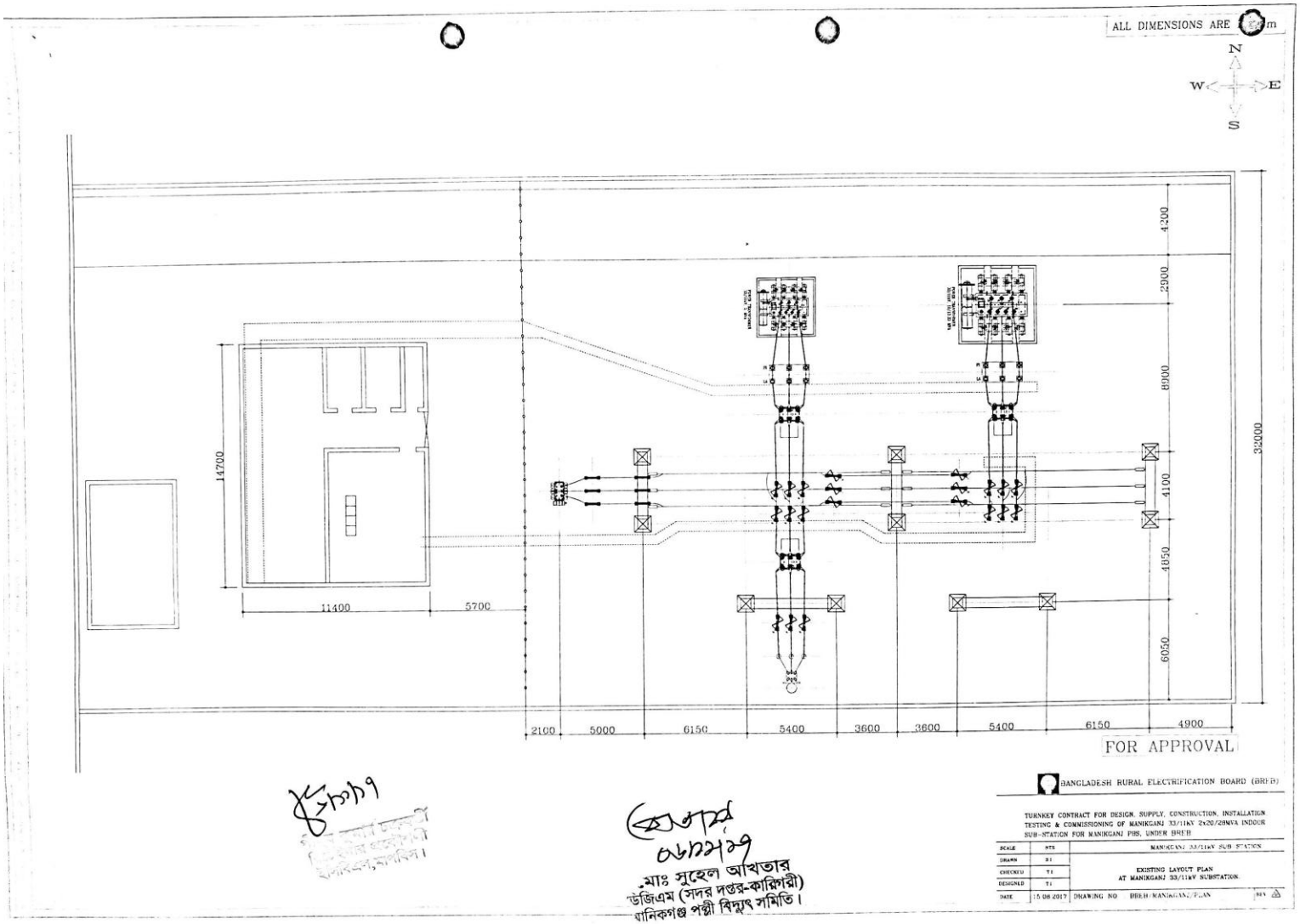
নাঃ সুহেল আখতার
উজিএম (সদর দপ্তর-কারিগরী)
মানিকগঞ্জ পল্লী বিদ্যুৎ সমিতি।



মোঃ সুহেল আখতার
ডিজিএম (সদর দপ্তর-কারিগরী)
পল্লী বিদ্যুৎ সমিতি।



মোঃ সুহেল আখতার
ডজিএম (সদর দপ্তর-কাকিগ্রী)
মানিকগঞ্জ পল্লী বিদ্যুৎ সমিতি।



০৬/১১/১৭
মোঃ সুহেল আখতার
ডিজিএম (সদর দপ্তর-কারিগরী)
মানিকগঞ্জ পল্লী বিদ্যুৎ সমিতি।