

DEENDAYAL PORT AUTHORITY



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No. EL/AC/ 2020

Date: 15/06/2024

Expression of Interest (EOI)

Sub: Providing of HT cable from GIS 66 KV substation to other dock area inside cargo jetty

Sir,

Expression of Interests (EOI) is invited to carry out the work “Providing of HT cable from GIS 66 KV substation to other dock area inside cargo jetty area” The work is to be carried out as per the scope of work and in accordance with terms & conditions stipulated below.

The Expression of Interest (EOI) along with filled Schedule-B should reach this office of undersigned on or before 24/06/2024 at 15:00 hrs, which shall be opened on the same day. The soft copy may also have accepted of this email ID, xenedpt@gmail.com.

S/d

*Executive Engineer (E)
Deendayal Port Authority*

Schedule - B

Sub: - Providing of HT cable from proposed GIS 66 KV substation to other dock.

Sr. No.	Description	Unit	Qty	Rate	Amount
1	Supply at site 3 Core x 150 Sq.mm. 11/11KV HT armoured aluminium conductor XLPE cable of 11KV grade of the following type & size as per IS: 7098 (Part - II) 1988 & as per Technical Specification No. 1.	Mtr	10190		
2	Supply at site 3 Core x 400 Sq.mm. 11/11KV HT armoured aluminium conductor XLPE cable of 11KV grade of the following type & size as per IS: 7098 (Part - II) 1988 & as per Technical Specification No. 2.	Mtr.	1000		
3	Supply at site 3 Core x 300 Sq.mm. 11/11KV HT armoured aluminium conductor XLPE cable of 11KV grade of the following type & size as per IS: 7098 (Part - II) 1988 & as per Technical Specification No. 3.	Mtr.	500		
4	Laying, Testing & Commissioning of 3CX400 Sq.mm HT XLPE cable through following and as per Technical Specification No.4				
i)	Hard & Soft Soil	Mtr	850		
ii)	Lying of HT Cable through Horizontal Direction Drilling underneath RCC Road /Rail Crossing/RCC/Road crossing with HDPE Heavy Duty Pipe HDPE Pipe 150mm Dia size to accommodate supplied.	Mtr	150		
5	Laying, Testing & Commissioning of 3CX300 Sq.mm HT XLPE cable through following and as per Technical Specification No.5				
	1) Cable Trench	Mtr	400		

	2) Lying of HT Cable through Horizontal Direction Drilling underneath RCC Road /Rail Crossing/RCC/Road crossing with HDPE Heavy Duty Pipe HDPE Pipe 150mm Dia size to accommodate supplied.	Mtr	100		
6	Laying, Testing & Commissioning of 3CX150 Sq.mm HT XLPE cable through following and as per Technical Specification No.6				
i)	Cable Trench	Mtr	4310		
ii)	Hard & Soft Soil	Mtr	4220		
iii)	Lying of HT Cable through Horizontal Direction Drilling underneath RCC Road /Rail Crossing/RCC/Road crossing with HDPE Heavy Duty Pipe HDPE Pipe 150mm Dia size to accommodate supplied.	Mtr.	1660		
7	Supply of Heat shrink straight through Joint kit for 11KV, 3C x 400 Sq.mm H.T XLPE cable as per Technical Specification No. 7	Nos	02		
8	Fixing the Heat Shrink Straight through Joint kit for 11KV 3C x 400 Sq.mm H.T XLPE cable as per Technical Specification No.8	Nos	02		
9	Supply of Heat shrink long sleeve & boat, suitable for RMU End termination kit (Indoor Type) for 11KV 3C x 400 Sq.mm H.T XLPE cable as per Technical Specification No. 9	Nos	02		
10	Fixing of Heat shrink long sleeve & boat, suitable for RMU End termination kit (Indoor Type) for 11KV 3C x 400 Sq.mm H.T XLPE cable as per Technical Specification No. 10	Nos	02		

11	Supply of Heat shrink straight through Joint kit for 11KV, 3C x 150 Sq.mm H.T XLPE cable as per Technical Specification No. 11	Nos	23		
12	Fixing the Heat Shrink Straight through Joint kit for 11KV 3C x 150 Sq.mm H.T XLPE cable as per Technical Specification No.12	Nos	21		
13	Supply of Heat shrink long sleeve & boat, suitable for RMU End termination kit (Indoor Type) for 11KV 3C x 150 Sq.mm H.T XLPE cable as per Technical Specification No. 13	Nos	21		
14	Fixing of Heat shrink long sleeve & boat, suitable for RMU End termination kit (Indoor Type) for 11KV 3C x 150 Sq.mm H.T XLPE cable as per Technical Specification No. 14	Nos	19		
15	Supply, Installation, Testing & commissioning at 11KV/0.433KV Outdoor type of gas Insulated, Ring Main unit (RMU) with fixing in floor HT Rubber Mat Describe as below a) 4 Way, 11KV/0.433KV RMU Outdoor type b) 6 Way, 11KV/0.433KV RMU Outdoor type, as per Technical Specification No.15	No No	1 1		
16	Supply, of 11KV GIS panel -11 Module for indoor application 2 nos. I/C + 1B/C + 8 O/G as per technical specification No.16	No	1		

17	Installation, Testing & Commissioning of supplied 11 KV GIS panel as per Technical Specification No.17	No	1		
18	Preparation earthing station, chemical treated back filled compound earthing system with Pipe-In-Pipe 80 mm Dia Hot dip GI type 3 Mtr Depth, Maintenance free as per Technical Specification No.18	Nos	12		
19	Hot Dip G. I. Strip for Earthing Supply, laying, fixing including termination / connection of following type and size of GI earth strips 50 X 6 mm GI earth strips and as per technical specification no.19	Mtr.	250		
20	Supply and Installation of Pre cast RCC Cable Route Marker install every 50 Mtr. and turning point of Cable Trench end/HDD area/Excavated cable route along with Masonry work with complete work and as per Technical Specification no.20	Nos	140		
21	Supply, Installation, Testing and Commissioning of Outdoor type Compact Substation with 11kV, 630Amps with 21KA for 3 Sec. Non-extendable compact Switchgear 2Nos. Fixed Manual Load Breaking Switch and 1 No. fixed Manual Circuit Breaker in SF6 insulated stainless steel enclosure along with LT panels I/C and O/G Feeders with metering all accessories and Switchgear along with Complete work installation of Shade with all side cover with 1 gate arrangement for operation and Maintenance with Elevated Foundation, GI Structure and Roof with white colored Galvanized High quality Powder				

	Coated Roofing sheets and Painting with Structure Pipe. a) 250KV Outdoor Type Compact Substation with 3 Way RMU As per Technical Specification No.21	No	04		
22	Supply at site FRP ladder type cable tray support for 300mm width cable tray on the wall/column structure of shed.	Mtr.	100		

(In Words:

Rs. _____
_____)

(NOTE: The rates should be inclusive of all taxes, duties, fees, cess etc. and all incidental charges; but exclusive of GST).

**Seal & Sign of
Contractor**

**Executive Engineer (E)
Deendayal Port Authority**

Scope of Work & Technical Specifications

The Deendayal Port Authority (earlier known as Kandla Port Authority) is one of the ISO: 9001-2008 & ISO: 14001 - 2004 certified Major Port Authorities in India, under Ministry of Shipping, Govt. of India. It is situated in the Western Coast of India on a Creek and is 90 KM away from the Gulf of Kutch connected to the Arabian Sea.

Deendayal Port Authority intend to upgrade the Down Stream, 11/0.433 KV Substations for strengthening the HT Distribution network for providing Healthy HT power. The work involves Supply, Installation, Testing & commissioning of HT SF-6 GAS insulated RMU panels at various substation i.e. 66KV Sub Station, New NDA, Old NDA 13th & 15th Berth S/S as directed by EIC.

The details of work are mentioned in Schedule-B & below giving brief detail of work. Though detailed work may not be explained but the firm will complete the perfectly, precisely & accurately entire satisfaction of EIC.

Supply, Installation, Testing & commissioning at various rating gas Insulated application, Ring Main unit (RMU) as per Technical Specification.

Before dispatching the RMU panel, contractor shall take dispatch clearance from EIC; in this regard KPT official will come at factory site to inspect the Panel.

Contractor shall take prior approval regarding the drawing from EIC.

Earthing shall be carried out as per IS.

The electrical installation shall conform to all currently applicable ISI specification such as IS: 732, IS: 3043, IS: 2309, IS: 3045 etc. with up to date amendments including relevant IEC regulation and Indian Electricity rules 1956 with up to date amendment.

Before quote the rate contractor should visit the site at their own cost to get familiar with the site condition.

After successful completion of whole work in all respect, to carry out testing and commissioning of the complete work is to be carried out to the entire satisfaction of EIC.

After Completion of all work successfully, contractor shall submit the four sets project compendium in hard copy & soft copy, which shall contain, the complete single line Drawing, Schematic, All Test Report, operation & Maintenance manual of RMU Module panel etc to EIC.

1. Technical Specification for Item No. 1:

This includes supply at site of HT11KV grade, size 3CX150 Sq.mm (U/E) XLPE Insulated Aluminum conductor, armoured cable of given size which confirming to IS: 7098 (Part-II) 1988 with up to date amendments and of approved make with ISI mark. The manufacturer shall produce TYPE TEST certificate with similar size of cable, which shall not be more than 2 years old. The cable shall have marking/embossing at the interval of every meter showing its progressive length. During the cable inspection, the manufacturer shall show the relevant Routine Tests to inspecting authority or otherwise the manufacturer / Contractor shall produce the routine test certificate during supply of cable at site.

2. Technical Specification for Item No. 2:

This includes supply at site of HT11KV grade, size 3CX400 Sq.mm (U/E) XLPE Insulated Aluminum conductor, armoured cable of given size which confirming to IS: 7098 (Part-II) 1988 with up to date amendments and of approved make with ISI mark. The manufacturer shall produce TYPE TEST certificate with similar size of cable, which shall not be more than 2 years old. The cable shall have marking/embossing at the interval of every meter showing its progressive length. During the cable inspection, the manufacturer shall show the relevant Routine Tests to inspecting authority or otherwise the manufacturer / Contractor shall produce the routine test certificate during supply of cable at site.

3. Technical Specification for Item No. 3:

This includes supply at site of HT11KV grade, size 3CX300 Sq.mm (U/E) XLPE Insulated Aluminum conductor, armoured cable of given size which confirming to IS: 7098 (Part-II) 1988 with up to date amendments and of approved make with ISI mark. The manufacturer shall produce TYPE TEST certificate with similar size of cable, which shall not be more than 2 years old. The cable shall have marking/embossing at the interval of every meter showing its progressive length. During the cable inspection, the manufacturer shall show the relevant Routine Tests to inspecting authority or otherwise the manufacturer / Contractor shall produce the routine test certificate during supply of cable at site.

4. Technical Specification for Item No. 4:

This includes laying of supplied 3 core x 400 Sq.mm HT armoured aluminum Conductor XLPE Cable of 11KV Grade (excluding supply of cable) through following methods.

- i) **In Hard/soft Soil:** - The cable shall be laid through excavation in soft/hard soil. The trench to be excavated 0.5 Mtr. Wide 1.5 Mtr. deep. The bed of 50mm of river sand shall be provided in the bottom of the excavated trench. The cable shall be laid over the bed of river sand. This includes providing & lying of half round RCC Pipe on cable lengthwise i.e. parallel to the cable and the gaps shall be filled by fresh river sand. The cable shall be covered by keeping half round heavy duty RCC NP 2 Pipe. The filling of the trench shall be done with by provided Sand cover (at least 50mm from cable surface) completely & followed by excavated stuff & should be watered and rammed properly to its original position. The excess excavated stuff shall be disposed off from the Site of work and spreaded in low laying area as directed. The DPT shall provide heat shrinkable straight through joint of relevant size of approved make specified in tender item no. 3 & 4 to be supplied by contractor, if the laying of cable shall be more than standard drum length. This includes all labour and material as directed by Engineer-in-Charge.
- ii) **Road Crossing/Rail crossing:** Cable shall be laid underneath by using Horizontal Directional Drilling (HDD) method by putting suitable diameter HDPE (suitable for cable size up to HT 3CX 400 Sq.mm {HDPE pipe having strength 10Kg/sq.cm} shall in contractor scope), the contractor shall arrange JCB Machine for excavation, water for drilling, de- watering pump, HDD equipments at their own cost.

The cable shall be pass through heavy duty HDPE pipe buried at nominal minimum depth 2500 mm or according to construction of RCC Road/ Rail network or as per directed by EIC. For single cable individual HDPE Pipe shall be pass through a road /rail crossing, for separate cable; separate HDPE pipe shall pass through the Tunnel / trench. The Laying of HDPE pipes coupled by HDPE socket only after standard length in excavated trench/tunnel and also sealing of HDPE pipe ends by suitable cap at every manhole. Back filling & dressing of excavated trenches as per specification. This includes all labour and material as directed by Engineer-in-Charge.

5. Technical Specification for Item No. 5:

This includes laying of supplied 3 core x 300 Sq.mm HT armoured aluminum Conductor XLPE Cable of 11KV Grade (excluding supply of cable) through following methods.

- iii) **In Hard/soft Soil:** - The cable shall be laid through excavation in soft/hard soil. The trench to be excavated 0.5 Mtr. Wide 1.5 Mtr. deep. The bed of 50mm of river sand shall be provided in the bottom of the excavated trench. The cable shall be laid over the bed of river sand. This includes providing & lying of half round RCC Pipe on cable lengthwise i.e. parallel to the cable and the gaps shall be filled by fresh river sand. The cable shall be covered by keeping

half round heavy duty RCC NP 2 Pipe. The filling of the trench shall be done with by provided Sand cover (at least 50mm from cable surface) completely & followed by excavated stuff & should be watered and rammed properly to its original position. The excess excavated stuff shall be disposed off from the Site of work and spreaded in low laying area as directed. The DPT shall provide heat shrinkable straight through joint of relevant size of approved make specified in tender item no. 3 & 4 to be supplied by contractor, if the laying of cable shall be more than standard drum length. This includes all labour and material as directed by Engineer-in-Charge.

- iv) **Road Crossing/Rail crossing:** Cable shall be laid underneath by using Horizontal Directional Drilling (HDD) method by putting suitable diameter HDPE (suitable for cable size up to HT 3CX 300 Sq.mm {HDPE pipe having strength 10Kg/sq.cm} shall in contractor scope), the contractor shall arrange JCB Machine for excavation, water for drilling, de- watering pump, HDD equipments at their own cost.

The cable shall be pass through heavy duty HDPE pipe buried at nominal minimum depth 1650 mm or according to construction of RCC Road/ Rail network or as per directed by EIC. For single cable individual HDPE Pipe shall be pass through a road /rail crossing, for separate cable; separate HDPE pipe shall pass through the Tunnel / trench. The Laying of HDPE pipes coupled by HDPE socket only after standard length in excavated trench/tunnel and also sealing of HDPE pipe ends by suitable cap at every manhole. Back filling & dressing of excavated trenches as per specification. This includes all labour and material as directed by Engineer-in-Charge.

6. Technical Specification for Item No. 6:

This includes laying of supplied 3 core x 150 Sq.mm HT armoured aluminum Conductor XLPE Cable of 11KV Grade (excluding supply of cable) through following methods.

- i) **In RCC Trench:** - The cable shall be laid after opening of RCC trench by removing the RCC Covers either through manpower or earthmover & cable trench shall be cleaned properly including removal of garbage, stones, bricks & old unused cables etc from the trench line without damaging the other cables laying in the trench. After laying of the cable, cable trench shall be properly covered with removed RCC covers as per original. The DPT shall provide heat shrinkable straight through joint of relevant size of approved make specified in tender item no. 3 & 4 to be supplied by contractor, if the laying of cable shall be more than

standard drum length. This includes all labour and material as directed by Engineer-in-Charge.

ii) **In Hard/soft Soil:** - The cable shall be laid through excavation in soft/hard soil. The trench to be excavated 0.5 Mtr. Wide 1.5 Mtr. deep. The bed of 50mm of river sand shall be provided in the bottom of the excavated trench. The cable shall be laid over the bed of river sand. This includes providing & laying of half round RCC Pipe on cable lengthwise i.e. parallel to the cable and the gaps shall be filled by fresh river sand. The cable shall be covered by keeping half round heavy duty RCC NP 2 Pipe. The filling of the trench shall be done with by provided Sand cover (at least 50mm from cable surface) completely & followed by excavated stuff & should be watered and rammed properly to its original position. The excess excavated stuff shall be disposed off from the Site of work and spreaded in low laying area as directed. The DPT shall provide heat shrinkable straight through joint of relevant size of approved make specified in tender item no. 3 & 4 to be supplied by contractor, if the laying of cable shall be more than standard drum length. This includes all labour and material as directed by Engineer-in-Charge.

iii) **Road Crossing/Rail crossing:** Cable shall be laid underneath by using Horizontal Directional Drilling (HDD) method by putting suitable diameter HDPE (suitable for cable size up to HT 3CX 150 Sq.mm {HDPE pipe having strength 10Kg/sq.cm} shall in contractor scope), the contractor shall arrange JCB Machine for excavation, water for drilling, de- watering pump, HDD equipments at their own cost.

The cable shall be pass through heavy duty HDPE pipe buried at nominal minimum depth 2500 mm or according to construction of RCC Road/ Rail network or as per directed by EIC. For single cable individual HDPE Pipe shall be pass through a road /rail crossing, for separate cable; separate HDPE pipe shall pass through the Tunnel / trench. The Laying of HDPE pipes coupled by HDPE socket only after standard length in excavated trench/tunnel and also sealing of HDPE pipe ends by suitable cap at every manhole. Back filling & dressing of excavated trenches as per specification. This includes all labour and material as directed by Engineer-in-Charge.

iv) **RCC/CC Surface:** - Cable shall be laid through Asphalted Road / RCC/CC Road by providing & laying 150 mm diameter HDPE pipe, the trench to be excavated 0.3 Mtr wide 1.0 Mtr deep by JCB/ Pneumatic breaker / excavator/ RCC Cutter Machine. If Road/RCC crossing length more than length of standard length of HDPE pipe, then firm shall joint/coupler shall be provided for both end & then lay across Road, the single cable shall be passed through one pipe, the excavated stuff shall be disposed off from the Site of work and spreaded in low laying area. After that re-filling with sand cushioning & 300mm CC/RMC work done on by proper curing or its original

position. This includes all labour and material as directed by Engineer-in-Charge.

7. Technical Specification for Item No. 7:

This includes providing of heat shrinkable straight through joint kit suitable for HT XLPE power cable jointing to HT 3 Core X 400 sq mm.

The supply of cable joint kits as per approved make like 3M/Raychem/ASCON/YAMUNA DENSON.

8. Technical Specification for Item No. 8:

This includes fixing of heat shrinkable straight through joint suitable for 3 Core X 150 sq mm grade. This including fixing of all required materials and by validated person work will be carried out. The joint shall be made in such a way that the joint shall be electrically and mechanically permanent. The work includes all labour, tools tackles, joint kit of approved make and as directed by Engineer-in-Charge.

9. Technical Specification for Item No. 9:

This includes supply of following type End termination HT XLPE 3C X 400 Sq.mm indoor kit as per approved make like 3M/Raychem/ASCON/YAMUNA DENSON. Any Major activity and query about work related to be discussed with Engineer-in-Charge and finalized as per his directions.

10. Technical Specification for Item No. 10:

This include making/fixing of following type End termination HT XLPE indoor kit HT 3CX 400 Sq.mm. This including fixing of all required materials. The joint shall be made in such a way that the joint shall be electrically and mechanically permanent. The work by validated person will be carried out includes all labour, tools tackles, joint kit of approved make and as directed by Engineer-in-Charge.

11. Technical Specification for Item No. 11:

This includes providing of heat shrinkable straight through joint kit suitable for HT XLPE power cable jointing to HT 3 Core X 150 sq mm.

The supply of cable joint kits as per approved make like 3M/Raychem/ASCON/YAMUNA DENSON.

12. Technical Specification for Item No. 12:

This includes fixing of heat shrinkable straight through joint suitable for 3 Core X 150 sq mm grade. This including fixing of all required materials and by validated person work will be carried out. The joint shall be made in such a way that the joint shall be electrically and mechanically permanent. The work includes all labour, tools tackles, joint kit of approved make and as directed by Engineer-in-Charge.

13. Technical Specification for Item No. 13:

This includes supply of following type End termination HT XLPE 3C X 150 Sq.mm indoor kit as per approved make like 3M/Raychem/ASCON/YAMUNA DENSON. Any Major activity and query about work related to be discussed with Engineer-in-Charge and finalized as per his directions.

14. Technical Specification for Item No. 14:

This include making/fixing of following type End termination HT XLPE indoor kit HT 3CX 150 Sq.mm. This including fixing of all required materials. The joint shall be made in such a way that the joint shall be electrically and mechanically permanent. The work by validated person will be carried out includes all labour, tools tackles, joint kit of approved make and as directed by Engineer-in-Charge.

15. Technical Specification for Item No. 15:

Deendayal Port Authority intend to upgrade the Down Stream, 11/0.433 KV Substations for strengthening the HT Distribution network for providing Healthy HT power. The work involves Supply, Installation, Testing & commissioning of HT SF-6 GAS insulated RMU panels at various substation i.e. 66KV Sub Station, New NDA and Old NDA or as directed by EIC.

The broad details of each item & Technical Specification of the work are shown in the Schedule "B" attached herewith.

TECHNICAL SPECIFICATIONS

The scope of work comprises of the following:

The RMU Out Door switchgear shall comply with the requirement stated in the following standard & specification amended up to date.

Metal Enclosed switchgear	IEC 62271-200/IEC20 298/IS 12729:1988
Medium voltage switch	IEC 265
Alternation current disconnecter (Load Break isolator & Earthing switch)	IEC 60129/ IEC 62271 - 102/ IS 9921
Specification of Alternation current Breakers	IEC62271100/IEC/60056/IS:13118:1991
Panel Design, SF-6/Vacuum Ckt. Breakers	IEC 62271-1/IEC 60694
Current Transformer	IEC 60044-1/IEC 60185/IS 2705:1992
HV switches	IEC 60265/IS 19920:1981
Filling of SF-6 in RMU	IEC 376
Pressure of SF6 gas	1.4 bars at 20 °C
Cable bushings	DIN 47636
Temperature class	-25 °C - +40 °C Out door
Degree of protection:	IEC 60273/IS 13947 (P-1)
- SF6 tank: IP 67	IP 67
- Front cover: IP 67	IP 67
- Cable cover: IP 67	IP 3X
Busbars	240 mm ² Cu

Earth bar (external):	120 mm ² Cu - Bolt dimension: M10
Colour	
Front Cover	RAL 7035
Side & Cable Cover	RAL 7035

The RMU meeting with the requirements of any other authorities standards, which ensures equal or better quality than the standard mentioned above shall also be acceptable. If the equipments, offered by the bidder conform to other standards, salient points of difference between the standards adopted and the specific standards shall be clearly brought out in relevant schedule. In case of any difference between provisions of these standards and provisions of this specification, the provisions contained in this specification shall prevail. One copy of such standards with authentic English Translations in Hard Copy shall be furnished along with the offer.

General Requirement:

The Ring Main Unit shall be installed at 66KV Substation for 4 Way 11/0.433KV for Old NDA and 6 Way 11/0.433KV location for HT Network of Substation. The RMU shall be out door type and extensible. Two Load break isolators for incoming & outgoing cables and one Circuit breaker shall be enclosed in the main tank using SF₆ gas as insulating and vacuum as arc quenching medium or SF₆ gas as both insulating and arc quenching medium. Incomer interlocking facility available whole location RMU. The main tank shall be stainless steel sheet of minimum 3mm thickness and robotically welded with a pressure relief arrangement.

The total breaking time for transient fault should not exceed 40-60 MS (CB + Relay+ trip coil).

The main tank (Inner enclosure of Circuit Breaker & Load break Isolators assembly and all Switchboard assembly shall be housed in a single compact metal clad suitable for both indoor applications.

The design of enclosure for Switchgear, RMU & Switchboard housing shall be in accordance with IEC 298.

The Switchgear and switchboard shall be designed such that the position of the different devices shall be visible to the operator on the front of switchboard and

easy to operate & prevent access to all live parts during operation without the use of tools. There shall be no access to exposed conductors.

An absorption material such as activated alumina in the tank shall be provided to absorb the moisture from the SF₆ gas to regenerate the SF₆ gas following arc interruption. A temperature compensating gas pressure indicator offering a simple indication shall constantly monitor the SF₆ insulating medium.

The SF₆ gas shall comply with IEC 376,376A, and 376B and shall be suitable in all respects for use in RMUs under the stipulated service conditions. The SF₆ shall be tested for purity, dew point air hydrolysable fluorides and water content as per IEC 376,376A and 376B and test certificate shall be furnished to the owner indicating all the tests as per IEC 376 for each Lot of SF₆ Gas.

Outer Enclosure:

The RMU enclosure (Outer) shall be made up of CRCA of 2.5 mm thickness / galvanized 1.6 mm thickness. The rating of enclosure shall be suitable for operation on three phases, three wires, 11 KV, 50 cycles, A.C. System with short-time current rating of 21KA for 3 seconds for 11kV. The complete RMU enclosure shall be of degree of protection IP 67 (Main Door open)

The Outer enclosure shall provide full insulation, making the Switchgear insensitive to the environment like temporary flooding, high humidity etc. The active parts of the Switchgear shall be maintenance-free and the unit shall be minimum -maintenance.

The complete RMU unit shall be powder coating of Dark Grey Code 632 as per BS 381C. Each switchboard shall be identified by an appropriately sized label which clearly

Indicates the functional units and their electrical characteristics.

The RMU metal parts shall be made of high thickness high tensile steel which must be grit/short blasted, thermally sprayed with Zinc alloy (not for galvanized), phosphate and subsequently painted with Polyurethane based powder paint, the overall (including outer

And inner paint layer), the thickness of paint layer shall be not less than 150 microns.

Inner enclosure (Main tank)

The tank shall be robotically welded stainless steel sheet of minimum 3mm thickness. The

Tank shall be sealed and no handling of gas is required throughout the 25 years of service life. However, the SF6 gas pressure inside the tank shall be constantly monitored by a temperature compensating gas pressure indicator offering a simple go, no-go indication. The gas pressure indicator shall be provided with green pressure and red pressure zones. There shall be one Non - return valve to fill up the gas. The manufacturer shall give guarantee for maximum leakage rate of SF6 gas will be lower than 0.1 % /year. An absorption material such as activated alumina in the tank shall be provided to absorb the moisture from the SF6 gas to regenerate the SF6 gas following arc interruption. The degree of protection of the inner enclosure shall be IP 67.

Oil or Air filled Switchgear will not be considered. The temperature rise test shall be carried out on complete RMU unit and test reports shall be submitted with the offer. Every RMU Cable connection compartment per feeder width should be 400-500 mm for tightness of cable connection.

The compact RMU Unit shall be provided with a pedestal made up of M.S. Angle to mount the unit on plain surface. The height of the bottom of cable box shall be 400 mm to provide the turning radius for the HT cable termination.

BUSBARS:

The three no's of continuous Bus bars made up of EC grade tinned copper of rating current 630A shall be provided. The Short time rating current shall be 20 kA for 3 seconds for 11KV. The Busbar connections shall Anti-oxide greased.

ELECTRICAL DATA – 12 kV - 28kV-1min

Nominal voltage: 11 kV

Rated frequency: 50 Hz

Rated current bus bars: 630 A

Rated current cable switch disconnecter: 630 A

Short time withstands current: -Cable switch disconnecter with interface C (400-bolt) bushing: 21 kA RMS 3 sec

- Vacuum circuit breaker with interface C (400-bolt) bushing: 21 kA RMS 3 sec.

Rated current for transformer T-off: 630 A

Impulse withstands voltage: To earth and between phases: 95 kV

Insulation level: - Power frequency 1 min: 28 kV.

Relay & Protection Scheme-Numerical Relay with Control Supply 24V DC, 50HZ.Phase current input Relay shall be suitable for 1A and %A CT secondary (selectable at site) Relay shall be suitable for 2CT as well as 3CT connection. Ground current input Relay shall be suitable for residually connected CT input and also for CBCT input. The relay shall have provision for digital inputs, speed switch inputs Communication System the relay shall be equipped with RS485 for remote communication or for connection to DCS, SCADS or PLC. The relay shall be suitable for RS232 port for connection to Laptop and PC preferably of front. The relay shall support multiple / universal protocols for communication with any type of DCS / SCADA. Make of Relay must be Areva, Siemens, ABB, and Alstom ONLY.

FAULT PASSAGE INDICATORS / Earth Fault Indicators (FPI/EFI):

These shall facilitate quick detection of faulty section of line. The fault indication may be On the basis of monitoring fault current flow through the device. The unit should be self- contained requiring no auxiliary power supply. The FPI shall be integral part of RMU.

11. TROPICALISATION:

Due regard should be given to the climatic conditions under which the equipment is to work. Ambient temperature normally varies between 20-degree C and 40-degree C, although direct sun temperature may reach 45-degree C. The climate is very humid and rapid variations occur, relative humidity between 90% and 95% being frequently recorded, but these values generally correspond to the lower ambient temperatures. The equipment should also be designed to prevent ingress of vermin, accidental contact with live parts and to minimize the ingress of dust and dirt. The use of materials, which may be liable to attack by termites and other insects, should be avoided.

12. Safety of people

Any accidental overpressure inside the sealed chamber will be limited by the opening of a pressure limiting device in the enclosure. Gas will be released to the rear of the unit away from the operator. Manufacturer shall provide type test report to prove compliance with IEC 298 appendix AA 'Internal fault'.

13. Operating lever

An anti-reflex mechanism on the operating lever shall prevent any attempts to re-open immediately after closing of the switch or earthing switch. All manual operations will be carried out on the front of the switchboard. The effort exerted on the lever by the operator should not be more than 250 N for the switch and circuit breaker. The overall dimensions of the RMU shall not be increased due to the use of the operating handle. The operating handle should have two workable positions 180 degree apart.

14. Front plate

The front shall include a clear mimic diagram which indicates different functions.

The position indicators shall give a true reflection of the position of the main contacts.

They shall be clearly visible to the operator. The lever operating direction shall be clearly indicated in the mimic diagram. The manufacturer's plate shall include the switchboard's main electrical characteristics.

Danger Board:

The danger Board plate as per relevant IS shall be riveted on the front plate of the RMU in Languages viz Gujarati, Hindi, English.

TYPE and ROUTINE TESTS:

Type tests:

The equipment offered in the tender should have been successfully type tested at NABL

Laboratories in India or ERDA or equivalent international laboratories for the tests in line with the relevant standard and technical specification and manufacture to submit the valid type test certificates older not more than 3 years from the date of NIT,

Following Type Test must have been carried out.

Short time current withstand test and peak current withstand test.

Lightening Impulse voltage with-stand test.

Temperature rise test.

Short Circuit current making and breaking tests.

Power frequency voltage withstand test (dry).

Capacitive current switching test confirming to IEC.

Mechanical operation test.

Measurement of the resistance of the main circuit.

Checking of degree of protection of main tank and outer enclosure.

Switch, circuit breaker, Earthing switch making capacity. Switch.

Circuit breaker breaking capacity. Internal arc withstand.

Checking of partial discharge on complete unit.

ACCEPTANCE & ROUTINE TESTS:

All acceptance and routine tests as stipulated in the respective applicable standards amended Up-to-date for all the equipment shall be carried out by the contractor in the presence of DPT representative & TPIA without any extra cost to the purchaser before dispatch.

The Tenderers shall have full facilities to carry out all the acceptance and routine test as per the Applicable standards. After finalization of the program of type/acceptance/routine testing, the Contractor shall give 15 days' advance intimation to the DPT, to enable him to depute his representatives for witnessing the tests. The routine tests carried out by the manufacturer at the works in presence of Executive Engineer (EL) & Jr. Engineer (E) & TPIA.

The routine tests are as follows:

1. Conformity with drawings and diagrams,
2. Measurement of closing and opening speeds,
3. Measurement of operating torque,
4. Checking of filling pressure,

5. Checking of gas-tightness,
6. Dielectric testing and main circuit resistance measurement.
7. Power frequency voltage
8. Resistance test for the circuit.
9. Mechanical operation tests.

The supplier in the presence of DPT & TPIA representative shall carry out all above acceptance and routine tests. The supplier shall give at least 15 days advance intimation to the DPT to enable them to depute their representative for witnessing the tests.

The DPT reserves the right for carrying out any other tests of a reasonable nature at the works of the supplier/laboratory or at any other recognized laboratory/research institute in addition to the above mentioned type, acceptance and routine tests at the cost of the DPT to satisfy that the material complies with the intent of this specification.

QUALITY ASSURANCE PLAN:

The firm shall invariably furnish following information within 15 days' issue of Work Order.

(i) Statement giving list of important raw materials including but not

Limited to

(a) Contact material

(a) Insulation

(c) Sealing material

(d) Contactor, limit switches, etc. in control cabinet.

e) List of testing equipment available with the contractor for final testing of RMU and associated combinations vis-à-vis, the type, special, acceptance and routine tests specified in the relevant standards. These limitations shall be very clearly brought out in the relevant schedule i.e. schedule of deviations from specified test requirements. The supplier shall, within 15 days from the date of receipt of work Order submit following information to the DPT.

- ii) List of raw materials as well bought out accessories.
- iii) Necessary test certificates of the raw material and bought out accessories.
- iii) Quality Assurance Plan (QAP) withhold points for Board's inspection. The quality

Assurance plan and hold points shall be discussed between the DPT and supplier before the QAP is finalized.

DRAWINGS:

All drawings shall conform to relevant IEC Standards Specification. All drawings shall be in ink. The Contractor / Firm shall submit along with his tender dimensional general arrangement drawings of the equipments, illustrative and descriptive literature in triplicate for various items in the RMUs, which are all essentially required for future automation.

- i) Schematic diagram of the RMU panel
- ii) Instruction manuals
- iii) Catalogues of spares recommended with drawing to indicate each items of spares
- iv) List of spares and special tools recommended by the supplier.
- v) Copies of Type Test Certificates as per latest IS/IEC.
- vi) Drawings of equipments, relays, control wiring circuit, etc.
- vii) Foundation drawings of RMU.
- viii) Dimensional drawings of each material used for item Vii.
- ix) Actual single line diagram of RMU/RMUs with or without extra combinations shall be made displayed on the front portion of the RMU so as to carry out the operations easily.

The following should be supplied to each consignee circle along with the initial supply of the Equipments ordered.

Copies in triplicate of printed and bound volumes of operation, maintenance and erection Manuals in English along with the copies of approved drawings and type test reports etc. 3 sets of the manuals as above shall be supplied to the Executive Engineer, DPT. A soft Copy of the all Technical and Drawing furnished in a CD.

NAME PLATE:

Each RMU and its associated equipments shall be provided with a nameplate legible and indelibly marked with at least the following information.

Name of manufacturer

Type,

Serial number

Voltage Current

Frequency

Symmetrical breaking capacity

Making capacity

Short time current and its duration

Purchase Order number and date

Month and Year of supply

PACKING & FORWARDING:

The equipment shall be packed in crates suitable for vertical/horizontal transport as the case may be and the packing shall be suitable to withstand handling during the transport and outdoor storage during transit. The supplier shall be responsible for any damage to the equipment during transit, due to improper and inadequate packing. The easily damageable materials shall be carefully packed and marked with the appropriate caution symbols. Wherever necessary, proper arrangement for lifting, such as lifting hooks etc. shall be provided. Any material found short inside the packing cases shall be supplied by the supplier without any extra cost.

Each consignment shall be accompanied by a detailed packing list containing the

Following information:

Name of the consignee. Details of consignment. Destination.

Total weight of consignment.

Sign showing upper/lower side of the crate. Handling and unpacking instructions

SCHEDULES:

23.1 The tenderer shall fill-in the following schedules which is part and parcel of the tender Specification and offer. If the schedules are not submitted duly filled-in with the offer, the offer shall be liable for rejection.

Schedule 'A' ... Guaranteed and technical particulars.

Schedule 'B' ... Bill of Quantity.

The discrepancies, if any, between the specification and the catalogues or literature Submitted as part of the offer by the bidder shall not be considered as valid deviations and no representations in this regard will be entertained unless these are specifically brought out in the schedule of deviations as stated above. Any additional information other than those called for as per the above schedules may be furnished separately by the tenderer, if felt necessary by him.

PERFORMANCE GUARANTEE:

All equipment supplied against this specification shall be guaranteed for a period of 18 Months from the date of the receipt of material at site or 12 months from the date of commissioning, whichever is earlier. However, any engineering error, omission, wrong provision, etc. which do not have any effect on the time period, shall be attended to as and when observed/pointed out without any financial implication on DPT.

Technical Specification of RMU Outdoor Unit

Module Description Detail as under.

a) 11KV, 630Amp, Outdoor Compact Switchgear (Gas Insulated), Extensible on One Side, Motor Driven Spring Charging

(Having 4 nos. Vacuum Circuit Breaker) 4 Way for Old NDA Substation

Total number of modules 04 pcs + Extensible

Module No. 01, 02 (as I/c) used Vacuum Circuit Breaker Module suitable with Metering Facility along with PT Vacuum circuit breaker module with vacuum

circuit breaker, three position isolator/earthing switch, bus bars, interlocking, earth bar and stored spring energy mechanism (A-mech.)

Qty.	Module Detail
1	Stored energy mech. for manual and Motor Driven Spring Charged operation
1	Vacuum circuit breaker 12KV, 630A
1	Control voltage, trip coil 24 V DC
1	<p>Protection system: - Relay make: - Alstom, ABB, Schinder, Areva, Siemens.</p> <p>a). Self-Powered OC+EF Protection Relay.</p> <p>b) Control voltage, 24 V DC.</p> <p>c) Interference RS-485, RS232 port.</p> <p>d) Equivalent to CAG 37 for Instantaneous Over Current.</p> <p>e). Equivalent to CTUM 15 for short Circuit protection, Inst. Earth fault.</p> <p>f) Inst. Definite time & inverse type protection of over current.</p>
1	<p>Set of 03nos. Ring Core Protection CTs having ratio 300-150/1-1, 2.5VA, 5P10</p> <p>(considering X'mer rating of 1500kVA and cable-size less than or equal to 3Cx400sqmm)</p>
1	Breaker ON(red)/OFF(green)/TRIP(amber) LED Indication
1	Capacitive voltage indication fixed type
1	Suitable Power Pack for Auxiliary DC Power supply for Relays

Module No. 03, 04 (O/g) used Vacuum Circuit Breaker Module suitable

Vacuum circuit breaker module with vacuum circuit breaker, three position isolator/earthing switch, bus bars, interlocking, earth bar and stored spring energy mechanism (A-mech.)

Qty.	Module Detail
1	Stored energy mech. For manual and Motor Driven Spring Charged operation
1	Vacuum circuit breaker 12kV, 630A
1	Control voltage, trip coil 24 V DC
1	a). Self-Powered OC+EF Protection Relay. b) Control voltage, 24 V DC. c) Interference RS-485, RS232 port. d) Equivalent to CAG 37 for Instantaneous Over Current. e). Equivalent to CTUM 15 for short Circuit protection, Inst. Earth fault. f) Inst. Definite time & inverse type protection of over current.
1	Set of 03nos. Ring Core Protection CTs having ratio 150-100/1-1, 5VA, 5P10 for Module 03 and Module No 04 having CT Ratio 150-100/1-1, 5VA. (considering X'mer rating of 1500kVA and cable-size less than or equal to 3Cx400sqmm)
1	Breaker ON(red)/OFF(green)/TRIP(amber) LED Indication
1	Capacitive voltage indication fixed type

c) 11KV, 630Amp, Outdoor Compact Switchgear (Gas Insulated), Extensible on One Side, Motor Driven Spring Charging

(Having 6 nos. Vacuum Circuit Breaker) 6 Way for New NDA Substation

Total number of modules 06 pcs+ Extensible

Module No. 01, 02 (As a I/c) used Vacuum Circuit Breaker Module suitable +Metering Facility along with PT

Vacuum circuit breaker module with vacuum circuit breaker, three position isolator/earthing switch, bus bars, interlocking, earth bar and stored spring energy mechanism (A-mech.)

Qty.	Module Detail
1	Stored energy mech. For manual and Motor Driven Spring Charged operation
1	Vacuum circuit breaker 12kV, 630A
1	Control voltage, trip coil 24 V DC
1	Protection system: - Relay make: - Alstom, ABB, Schinder. Areva, Siemens. a). Self-Powered OC+EF Protection Relay. b) Control voltage, 24 V DC. c) Interference RS-485, RS232 port. d) Equivalent to CAG 37 for Instantaneous Over Current. e). Equivalent to CTUM 15 for short Circuit protection, Inst. Earth fault. f) Inst. Definite time & inverse type protection of over current.
1	Set of 03nos. Ring Core Protection CTs having ratio 300-150/1-1, 5VA, 5P10 (considering X'mer rating of 1500kVA and cable-size less than or equal to 3Cx400sqmm)
1	Breaker ON(red)/OFF(green)/TRIP(amber) LED Indication
1	Capacitive voltage indication fixed type
1	Suitable Power Pack for Auxiliary DC Power supply for Electro-Mechanical Aux Relays and Master Trip Relays

Module No. 03, 04, 05, 06(O/g) used Vacuum Circuit Breaker Module suitable

Vacuum circuit breaker module with vacuum circuit breaker, three position isolator/earthing switch, bus bars, interlocking, earth bar and stored spring energy mechanism (A-mech.)

Qty.	Module Detail
1	Stored energy mech. for manual and Motor Driven Spring Charged operation
1	Vacuum circuit breaker 12kV, 630A
1	Control voltage, trip coil 24 V DC
1	<ul style="list-style-type: none"> a). Self-Powered OC+EF Protection Relay. b) Control voltage, 24 V DC. c) Interference RS-485, RS232 port. d) Equivalent to CAG 37 for Instantaneous Over Current. e). Equivalent to CTUM 15 for short Circuit protection, Inst. Earth fault. f) Inst. Definite time & inverse type protection of over current.
1	<p>Set of 03nos. Ring Core Protection CTs having ratio 150-100/1-1, 2.5VA, 5P10</p> <p>(considering X'mer rating of 1500kVA and cable-size less than or equal to 3Cx300sqmm)</p>
1	Breaker ON(red)/OFF(green)/TRIP(amber) LED Indication
1	Capacitive voltage indication fixed type

Additional equipment delivered separately or mounted in respective panel.

Qty.	Module Detail
8	Set of Terminal Protector boots for covering cable-termination.

1	Manometer installed on RMU for Gas Pressure indication.
1	Operating handle

Each circuit breaker module shall have the following accessories: In each phase one core balance Current transformer (CBCT).

Bottom Cable Entry & Front Cable Termination

Any Major activity and query about work related to be discussed with Engineer-in-Charge and finalized as per his directions.

Schedule-A

The bidder should fill up the details in Schedule-A - 'Guaranteed Technical Particulars' and the statement such as, "as per DPT requirement" "Technical Specification", "as per IS", "as per specification" etc. shall be considered as details not furnished and such offers will be rejected.

Schedule-A.

Sr. No	Description	DPT's Requirement	To be filled by bidder
01	Make	ABB, Schneider, Siemens	
02	Type	Outdoor Application	
03	Reference Standard	IEC 56, IEC 123, IEC 298, IEC 694, IEC 265.	
04	Voltage (Normal /Max) KV	11KV/12 KV.	
05	Phase.	3	
06	Frequency	50 +/- 3	
07	Short Circuit Rating		

	<p>Breaking Symmetrical (KA).</p> <p>Breaking asymmetrical (KA)</p> <p>Short Time for 1 sec (KA).</p> <p>Short Time for 3 sec (KA).</p>	<p>20 KA</p> <p>20 KA</p> <p>20 KA.</p> <p>20 KA</p>	
08	<p>Insulation Level</p> <p>Impulse withstand (KV peak).</p> <p>1 minute 50 Hz. Voltage withstand (KV RMS).</p>	<p>75KVp</p> <p>28 KV</p>	
09	<p>Degree of Protection</p> <p>Degree of Protection of Outer Enclosure.</p> <p>Degree of Protection of S.S. Tank.</p>	<p>IP 67</p> <p>IP 67</p>	
10	<p>Bus Bar Make.</p> <p>Material</p> <p>Ref. Standard</p> <p>Cross sectional area (mm²).</p> <p>Size</p>	<p>Bidder to be filled</p> <p>Copper</p> <p>IEC 129</p> <p>400 Sq.mm</p> <p>Bidder to be filled</p>	
10.1	Continues Current	630 A	

10.2	Maximum Temp. rise over	55°C (Above Ambient Temp 40 °C)	
10.3	Short Time Current for 1 sec (KA rms)	16	
10.4	Bus bar Provided with. Insulation Sleeve. Phase barrier Cast Resin Shroud for joints.	Yes. Yes. Yes.	
10.5	Bus Bar Connection. Silver Plated Made with anti-oxide Grease	Yes Yes	
10.6	Bus Bar Support Spacing.	Bidder to be filled.	
10.7	Bus Bar Support Insulator. Make Type Ref. Standard. Voltage Class. Minimum Creepage Distance	Bidder to be filled. Bidder to be filled. Bidder to be filled. Bidder to be filled. Bidder to be filled.	
11	SF-6/VCB Circuit Breaker.		
11.1	Make	Siemens , ABB , Schneider	

11.2	Ref. Standard	IEC 56	
11.3	Rated Voltage	11KV	
11.4	No. Of Poles	3	
11.5	Rated Frequency	50+/- 3	
11.6	Rated Current	200 Amps.	
11.7	Rupturing capacity at rated Voltage	400	
11.8	Breaking Capacity at rated Voltage & operating duty. Symmetrical (KA rms. Asymmetrical (KA rms.	 20 20	
11.9	Rated making current KA peak.	50	
11.10	Short Time Current for 1 sec.(KA rms)	20	
11.11	Short Time Current for 3sec (KA rms)	20	
11.12	Transient Recovery Voltage. Rate of rise (KV/Ms. Peak Voltage (KV)	 34KV/micro Sec (as per IEC) 23(35% DC component	
11.13	No. of Break Pole	Single	
11.14	No. of Breakers operation permissible without requiring inspection		

	<p>replacement of contact 7 other main parts.</p> <p>At 100 % rated current.</p> <p>At 100 % breaking current.</p>	2000 & 40 nos. at 20 KA	
11.15	<p>Type of contacts.</p> <p>Main.</p> <p>b). Arching</p>	<p>Copper, Chromium, Butt type.</p> <p>Copper Chromium</p>	
11.16	<p>Operating mechanism- Closing</p> <p>Type.</p> <p>No. of breaker operation.</p> <p>Trip Free or fixed trip.</p>	<p>Stored Energy.</p> <p>One Trip Free.</p> <p>Anti Reflex for earthing.</p>	
11.17	<p>Operating Mechanism Tripping.</p> <p>a). Type.</p> <p>b) No. of breaker operation.</p> <p>c). Trip free.</p>	<p>To be filled by Firm.</p> <p>One.</p> <p>Tripp free.</p>	
11.18	<p>Spring Charge mechanism</p>	To be filled by Firm.	
11.19	Tripping Coil Details	To be filled by Firm.	

11.20	<p>Breakers /Accessories such as control switch indication lamp etc. furnished as specified.</p> <p>Mechanical Safety Interlock.</p> <p>Operational Interlock.</p> <p>Emergency manual Trip.</p> <p>Operation Counter.</p> <p>Charge / Discharge indicator.</p> <p>Manual Spring Charging facility.</p>	<p>Yes.</p> <p>Yes.</p> <p>Yes.</p> <p>Yes.</p> <p>Yes.</p>	
12	<p>Isolator.</p> <p>a). Make.</p> <p>b). Type.</p> <p>c).Reference standard.</p> <p>d). Rated Voltage.</p> <p>e). Rated Frequency.</p> <p>f). No. Of Poles.</p> <p>g).Normal Rated Current.</p> <p>h).Derated Rated Current.</p>	<p>To be filled by bidder.</p> <p>To be filled by bidder.</p> <p>IEC 129.</p> <p>12.</p> <p>50.</p> <p>3.</p> <p>630.</p> <p>630.</p>	
12.1	<p>Isolator provided with the following mechanical safety, Mechanical ON, Off, Cable earth indicators, operation</p>	<p>Yes.</p>	

	counter, and manual spring charging facility.		
13	Current Transformer.		
13.1	Make	To be filled by Firm.	
13.2	Type & Voltage Level.	To be filled by Firm.	
13.3	Reference Standard.	IEC 298	
13.4	CT Ratio	As per Sub Station load Mentioned in Technical Specification.	
13.5	Rated Frequency	50	
13.6	Class of insulation	To be filled by Firm.	
13.7	Rated Burden.	To be filled by Firm.	
13.8	Knee point voltage.	To be filled by Firm.	
14	Painting. a). Finish of Breaker . Inner. Outer.	To be filled by Firm.	

16. Technical Specification for Item No. 16:

Supply of 11 module compact GIS panel as site heaving following Technical Specification:-

For 11 KV GIS Breaker panel the scheme configuration as under

- 1) 2 No. I/C + 1 no. Bus Coupler
- 2) 8 O /G, 11 KV

Technical Data:

14.1 System particulars:

- a. Rated voltage ... 12 Kv
- b. Rated frequency ... 50 Hz \pm 3 %
- c. Rated Short – duration power frequency with stand voltage: 28KV¹)
- d. Rated lighting impulse with stand voltage : 75KV¹)
- e. Rated peak with stand current : 65.75KA
- f. Rated Short circuit making current : 65.75 kA
- g. Partition class: PM
- h. Normal feeder current: 1250A
- i. Internal Arc classification: IAC A FLR 26.3kA 1s
- j. Rated short-time withstand current 3s: 26.3kA
- k. Rated short circuit breaking current: 26.3kA
- l. Relative Humidity ... 90 %
- m. Maximum ambient Temp. ... 45 %

Standards:

Metal Enclosed switchgear:	IEC 62271-200
General Purpose switches:	IEC 60265- 1
Dis-connector and Earthing switches:	IEC 62271- 102
Switch Fuse Combination:	IEC 62271-105
Circuit Breakers:	IEC 62271-100
Common clauses:	IEC 60694
Pressure of SF ₆ Gas	1.4 bar at 20 °C
Cable bushing:	DIN 47636

Temperature class:

-25 °C - +40 °C **Indoor**

Degree of Protection

- SF6 Tank: ... IP 67
- Fuse canisters: ... IP 67
- Front Cover: ... IP 4X
- Cable Cover: ... IP 4X

Bus bars to be designed for 1250Amps.

Earth bar (external) 120 mm² Cu – Bolt dimension: M10

The item includes 8 module Fixed-mounted 12KV Gas insulated medium voltage Switchgear, three position isolator/ earthing switch, bus bars, interlocking, earth bar and stored spring energy mechanism (A. mech.)

1	Switchgear Panel	<ul style="list-style-type: none">➤ The Gas insulated Metal clad switchgear shall be complete with all the accessories for efficient and trouble free operation. The equipment offered shall be safe, reliable and compact to install. The workmanship shall be high order. The circuit breaker switches and protective device etc shall be latest design so as to ensure rapid and efficient interruption of fault current low arc energy, small arcing time and freedom from fire shall be fully arc proof, free standing, floor mounted, fully compartmentalized, metal, enclosed construction complying requirements of IEC 62271-200. Each circuit shall have a separate vertical panel with required compartments for circuit breaker, cable termination main bus-bars and auxiliary control devices.➤ Switchgear shall have an Internal Rac classification of IAC –A – FLR 26 KA, 1 sec. (as per EI guidelines all switchgears shall be at least 1.2 meters away from well) The switchgear construction shall be such that the operating personnel are not endangered by breaker operation and internal explosions, and the front of the panels shall be specially designed to withstand these. Gas Pressure
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		<p>relief device/ Explosion Vent/ Pressure relief duct shall be compartment, so that in case of a fault in a compartment, the gages produced are safely vented out, thereby minimizing the possibility of it's spreading to other compartments and panels. The pressure relief device/Explosion vent/pressure relief duct shall not however reduce the degree of protection of panels under normal working conditions.</p> <ul style="list-style-type: none"> ➤ The switchgear shall be cooled by natural air flow. The switch board shall have the facility for extension of additional breakers (to existing set up) for future expansion shall be provided. ➤ The manufacture shall give guarantee for maximum leakage rate of SF6 gas will be lower than 0.1 % per year. In case of GAS leakage the GIS should have the capability to withstand die-electric strength at 1 bar pressure. Separate gas monitoring sensors should be available for all the gas filled chambers. ➤ The minimum operating SF6 gas pressure shall be 1.4 Bar at 20°C Alarm shall be generated if the SF6 gas pressure drops to 85% of the minimum operating pressure and if it further drops below 80% the circuit breaker shall trip & go into lockout mode. ➤ Thermostatically controlled space heater with common MCB shall be provided for various compartments.
2	GIS SWITCHGEAR WITH BUS BAR IN SF6 GAS:	<ul style="list-style-type: none"> ➤ The SF6 gas insulated metal enclosed switchgear shall be construction from corrosion- resistant stainless steel sheet of min 2 mm thickness, filled with SF6 accommodating the primary switching devices (Busbar and Three position dis-connector cum earthing switch) and all live

		<p>parts. This panel complying ingress protection min IP 67.</p> <ul style="list-style-type: none"> ➤ The GIS switchgear shall be provided with silicon coated busbars. ➤ The switchgear enclosure complying ingress protection IP4X ➤ Paint shade of indoor switchgear shall be 694 as per IS: 5 (Dove grey)
3	Bus Bar	<ul style="list-style-type: none"> ➤ Busbar shall be of made of electrolytic high grade copper of adequate size and bus bar size calculation / supporting type test report shall be submitted for approval (current density of copper shall not exceeded more than 1.6 Amp/sq.mm). They shall be adequately supported on insulator to withstand electrical and mechanical stresses due to specified short circuit currents. ➤ All piping for SF6 gas shall be made of copper & their fittings shall be made of non-magnetic stainless steel. ➤ The temperature of the busbars and all other equipment, when carrying the rated current continuously shall be limited 60deg C above ambient temperature 45deg C as per the relevant Standards.
4	GIS Circuit Breaker	<ul style="list-style-type: none"> ➤ GIS Circuit Breaker can be used for system voltage 11KV. ➤ 11 KV GIS breaker shall comprise of three single pole interrupting unites or 3-pole interrupting unit, operated through a common shaft by a sturdy operating mechanism. ➤ Closing spring charging shall only be acceptable. Anti-pumping features shall be provided for each breaker. An arrangement of two breakers in parallel to meet a specified current rating shall not be acceptable. (No parallel interrupter)

		<ul style="list-style-type: none"> ➤ Circuit breaker shall be provided with two trip coils. ➤ Suitable indicators shall be provided on the front of panel to indicate OPEN/CLOSED conditions of the circuit breaker, and CHARGED/ DISCHARGED conditions of the closing spring, SF6 gas density monitor for all gas compartments. ➤ For 11 KV feeder: Tripping time; 45-50 ms (including Relay Time) closing Time 40-60 ms. ➤ Manual /Auto Spring Charging shall be provided in all feeders. ➤ The circuit breakers has to control at least 10,000 Make-Break cycles without maintenance. The mechanical life and operating cycles of the vacuum interrupter shall confirm relevant IS/IEC amended up to date. ➤ The circuit breaker shall be provided with motor operated spring charged closing. Spring charging motor shall be suitable for 240V, 50 Hz, single phase AC. Suitable rating starter shall be provided for motor protection. Spring release coil for closing shall be suitable for 24 V DC. ➤ Tripping of the circuit breakers shall be through “Shunt trip” coils rated for 30V DC auxiliary supply. It shall be possible to trip the breaker manually in case of necessity.
4	Dis-connector & Earth Switch	<ul style="list-style-type: none"> ➤ Switch panel shall be provided with three (3) position disconnecting –cum-earthing switch of required rating. ➤ The earthing position for all 3 phase must be visible via a mechanical position indicator (MIMIC) directly connected to the drive shaft on panel front fascia. The mechanical operation of isolator / 3 position dis-

		connector switch must be possible with door closed for operator safety.
5	Control & Interlock	<ul style="list-style-type: none"> ➤ Switchgear having mechanically & Electrically interlock as per scheme configuration. ➤ Necessary mechanical & electrical interlock shall be provided between CB, Isolator & Earth switches for safe operation.
6	SCADA compatibility	<ul style="list-style-type: none"> ➤ Panel shall have SCADA compatibility
7	Numerical protection Realy	<ul style="list-style-type: none"> ➤ Indoor switchgear panels shall have communicable numerical protection relays (IEDs) complying with IEC-61850 on all feeders which shall be networked on Ethernet to communicate with substation SAS/SCADA system on EIC- 61850. Relay shall have redundant RJ45 ports complying to PRP redundancy of IEC 61850. These IEDs shall also be used for control & monitoring the switchgear from SAS. In addition to status of devices) CBs/Isolator /Earth Switches) and equipment alarms, metering data shall also be made available to SAS/SCADA station from protection IEDs. Directional numerical relays shall have provision of both current (CT) and Voltage (PT) inputs as required for protection & measurement purpose using protection cores. ➤ All Numerical relays shall have feature for electrical measurement of current. ➤ Numerical relays as per IEC including report for IEC 61850 protocols from accredited lab. ➤ All numerical relays shall be rated for control supply voltage 24 Volt DC and shall be capable of satisfactory continuous operation between 80-110% of the rated voltage. Making and carrying and breaking current rating of their contacts shall be adequate for the circuit in which they are used. Heavy duty

		<p>binary output contacts of IEDs to be used for breaker close and trip commands shall be so rated as to be used directly used in the closing and tripping circuits of breaker without the need of any interposing / master trip relays.</p>
8	Numerical Protection I/C feeder	<ul style="list-style-type: none"> ➤ The relay shall have instantaneous as well as time delayed three over current (50) and one earth fault (50N) protection elements. With standard inverse characteristics (1.3 and 3 Sec) IDMT. ➤ The over current element should have the minimum setting adjustable between 20-200% of CT secondary rated current with increment / decrement by 1 % and High set setting 100-2000%. ➤ The earth fault element of relay shall be suitable for detection of earth fault currents in the range of 5% to 80% of the CT rated current (IDMT) and high set 100-1000%. ➤ For transformers of rating Min. 6.3 to 10 MVA & 12.5 MVA, definite time delayed stand by earth fault protection shall be provided having a pick up setting range of 10% to 40% with a timer delay of 0sec to 3 sec. in step of 0.01s. ➤ Trip circuit supervision shall be provided to monitor the circuit breaker trip circuit both in pre-trip and post-trip conditions.
09	Numerical protection for O/g Feeders	<ul style="list-style-type: none"> ➤ Self-powered, Earth Fault, O/C, instantaneous earth fault.
10	2 Nos. I/C feeder + 1 Nos Bus Coupler shall equipped with instrument i.e. CT, for	<p><u>CT Ratio 300-150 /5.5</u></p> <ul style="list-style-type: none"> ➤ Accuracy Class =0.2 ➤ CT shall be designed considering the 25 KA for 3 sec ➤ CT shall be metering & protection core both. ➤ Rated burden 15 VA. ➤ Insulation Class E.

	metering & protection, PT, for Differential protection PS class CT (for incomer feeder Only).	<ul style="list-style-type: none"> ➤ 5P20 ➤ The CTs shall be resin /epoxy cast. Correct polarity shall be invariably marked on each primary and secondary terminal. ➤ All current transformers for GIS shall be ring type (Tape wound /resin cast.) ➤ Confirming to IEC: 60044-1. ➤ No of secondary core : 2 ➤ PS Class CT for Differential Scheme equipped in I/C:- 600-300/1-1, Burden 15VA, <u>PT Ratio 11KV√3 / 110 V AC.</u> ➤ P.T. shall be epoxy/resign cast. Contact tips of primary/secondary contacts shall be silver plated. Correct polarity shall be distinctly marked on primary and secondary terminal. ➤ 3 phase primary input 11 KV. ➤ Output 110 Volt. ➤ Core 2. ➤ Rated Burden 15 VA.
11	8 O/G Feeder	<ul style="list-style-type: none"> ➤ CT=> 300-150/5.5 ➤ Accuracy Class => 0.2 ➤ Metering & Protection Core. ➤ The CTs shall be resin/epoxy cast. Correct polarity shall be invariably marked on each primary and secondary terminal. ➤ Burden 20VA. ➤ 5P20

General requirement of 11 module Gas insulated switchgear as under

Qty. (In nos.)	Requirement
11	Set of Terminal Protector boots for covering cable-termination.
3	Manometer installed on for Gas Pressure indication
3	Operating handle
11	Each feeder shall have power pack unit for Auxiliary 24 volt DC Power supply for Electro Mechanical Aux Relays and Master Trip Relays.
11	Ammeter, Voltmeter for 2 I/c +1 BC + 8 O/G
11	Multifunction Meter for 2 I/c +1 BC + 9 O/G

11	Breaker ON(red)/OFF(green)/TRIP(amber) LED Indication for each.
11	Local/remote selector switch for each feeder.
11	Auto/Manual selector switch for each feeder.
	Numerical relay for 2 Nos. I/C feeder + 1 Bus coupler for over Current, Earth Fault, Instantaneous Earth, with trip Ckt. Supervision relay
Make of GIS	SIEMENS/ABB/Schneider/GE

17. Technical Specification No.17:

This including **erection, testing** and commissioning of 11 way of 11KV Gas insulated switchgear at Exiting 66/11 KV sub station.

All the GIB's shall be erected on fabricated "C" Channel platform of suitable size of M.S. Channel having height of 1.5 meter & the platform shall be ground with suitable Anchor fasteners. Surrounding the MS platform the brick masonry with fine plaster may be provided. Each panel shall be connected with 2 separate and distinct Earthing. After installation of GIB panel, necessary test and trail are to be carried out for proper functioning of safety, devices, relay panel etc. and before charging GIB's all the test required under relevant ISS and IEC- Rules 1956 shall be carried out and the result shall be in conformity with specification and copies of test result shall be furnished to EIC. The complete work shall be carried out as directed by E.I.C. The works includes all special tools, tackle man & material required for installation & commissioning of GIB and shall be done as by E.I.C.

18. Technical Specification No.18:

This includes preparation of earth station with chemical treated back filled compound 80 mm dia Pipe In Pipe GI Type 3 Mtr Depth, Maintenance free including all accessories & Masonry work Enclosure with cover plate.

A cement concrete (ratio 1:4:8) chamber of at least 30 Cm. x 30 Cm. shall be provided just below the surface of ground over the funnel for watering and having RCC/CI cover of suitable size as directed. This also includes removal of extra-excavated earth from the site. The work shall be carried out to entire satisfaction of Engineer-in-charge. This work includes all labour and material as directed by Engineer-in-Charge. The works also include earthing value marking & painting on earth strips & earthing station by suitable paints (Green Color on Strips) and also mentioned the earth value on earth pits.

19. Technical Specification No.19:

This includes supply, Laying & connecting, Hot Dip G.I. strip of size 50 X 6 mm. Coating having minimum 80 Micron galvanized coating on Strip earthing system, connected to two separate and distinct main earth as directed and shall be clamped suitably on wall /floor or buried in the ground/pucca trench as directed. The pieces of GI strips shall be connected using GI nut bolts rigidly and the GI strip shall be laid either on RCC with proper clamping or in the ground minimum 300 mm. below the ground level as the case may & as directed & shall be buried properly or as directed by EIC.

20. Technical Specification No.20:

RCC CABLE ROUTE MARKERS

- 1.0 Manufacturing and supplying of RCC cable route markers slab of size 0.70 Mtr. height, 0.24 Mtr. width and 0.075 Mtr. depth, using reinforced M20 concrete with letters "HT 11 KV UG Cable" with an arrow (→) letter showing distance and depth at which cable is buried engraved in concrete on a smooth and clean finished surface with painting of 2 coats of apex over coat of primer with yellow shade and the letters with contrast red shade. For reference of Route Marker given in figure below.
- 2.0 Fixing the RCC cable route markers of size 0.70 Mtr. height, 0.24 Mtr. width and 0.075 Mtr. depth with PCC (1:3:6) using 20mm down size jelly

3.0 including earth work excavation of 0.30 Mtr. Depth.



HT Cable Route Marker Sample Fig.

CABLE ROUTE MARKERS/CABLE JOINT MARKERS

Permanent means of indicating the position of joints and cable route shall be fabricated, supplied and erected. Route Marker shall be provided at every 200 meter and at the turning points. In addition, markers, if required shall be provided per the field requirement. If the route passes through open fields, markers should be conspicuously visible and above ground surface and particularly along the Road beams except on road & pavements where they may interfere in the movement of traffic or pedestrians. The markers should incorporate the relevant information. The name of the owner, voltage shall be marked on the route marker. The markers shall be of RCC. The design shall be such that it cannot be pulled out. Tile type marker shall be used along the pavement. The RCC markers shall be cut into proper size, covered with cement plaster with engraving of the information required. Any Major activity and query about work related to be intimated to Engineer-in-Charge and finalized as per his directions.

**21. Technical Specification No.21:
Technical Specification for Compact Secondary Substation**

1.0.0 CODE & STANDARDS:

1.1.0 All equipment and material shall be designed manufactured and tested in accordance with the latest applicable IEC standards. The 12KV Package Substation Design must be as per IEC 62271- 202.

1.2.0 The Package Sub-station offered shall in general comply with the latest issues including amendments of the following standards.

Title	Standards
High Voltage Low Voltage Prefabricated Substation	IEC:62271-202
High Voltage Switches	IEC 60265
Metal Enclosed High Voltage Switchgear	IEC 60298/ IEC62271-200
High Voltage Switchgear	IEC 60694
Low Voltage Switchgear and Control gear	IEC 60439
Power Transformers	IEC 60076

2.0.0 DESIGN CRITERIA

2.1.0 Package Sub-station consisting of **11KV Non-Extensible SF6 Ring Main Unit with VCB as protection (2Nos.Manual Load Break Switch + 1nos. HT VCB + Metering) + Transformer + Low Voltage Switchgear** with all connection accessories, fitting & auxiliary equipment in an Enclosure to supply Low-voltage energy from high-voltage system as detailed in this specification. The complete unit shall be installed on a substation plinth (base) as **Outdoor substation** located at very congested places. 11KV Isolators controls incoming-outgoing feeder cables of the 11KV distribution system. The Vacuum Circuit Breaker shall be used to control and isolate the 11kV/433V Distribution transformer. The transformer Low Voltage side shall be connected to Low Voltage switchgear. The connection cables to consumer shall be taken out from the Low Voltage switchgear.

2.2.0 The prefabricated-package substation shall be designed for a) Compactness, b) fast installation, c) maintenance free operation, d) safety for worker/operator & public.

2.3.0 The Switchgear and component thereof shall be capable of withstanding the mechanical and thermal stresses of short circuit listed in ratings and requirements clause without any damage or deterioration of the materials.

2.4.0 For continues operation at specified ratings temperature rise of the various switchgear components shall be limited to permissible values stipulated in the relevant standard and / or this specification.

2.5.0 Service Conditions:

The Package substation shall be suitable for continuous operation under the basic service conditions indicated below

Ambient Temperature: 50 Deg C
Relative Humidity upto 95%
Altitude of Installation upto 1000m

The Enclosure of High Voltage switchgear-control gear, Low Voltage switchgear-control gear & Transformer of the package substation shall be designed to be used under **normal outdoor service condition** as mentioned. The enclosure should take minimum space for the installation including the space required for approaching various doors & equipment inside.

3.0.0 SPECIFIC REQUIREMENT

The main components of a prefabricated- package substation are Transformer, High-voltage switchgear-control gear, Low-voltage switchgear-control gear and corresponding interconnections (cable, flexible, bus bars) & auxiliary equipment. The components shall be enclosed, by either common enclosure or by an assembly of enclosure. All the components shall comply with their relevant IEC standards.

Ratings:

Description	Unit	Value
Rated Voltage / Operating Voltage	kV rms	11
Rated frequency & Number of Phases	Hz. & nos.	50 & 3

Rated maximum power of Substation	kVA	250 KVA Dry type cast Resin type Transformer
Rated Ingress protection class of Enclosure	IP:	IP-34 for Transformer Compartment and IP:54 for LT & HT Switchgear Compartment.
HV Insulation Level		
Rated withstand voltage at power frequency of 50 Hz	kV rms	28
Rated Impulse withstand Voltage	kV peak	75
HV Network & Busbar		
Rated current	Amp	630A
Rated short time withstand Current	kA rms / 3 sec	21
Making capacity for switch-disconnector & earthing Switches	kA peak	50kA
Breaking capacity of Isolators (rated full load)	A	630A
LV Network		As per requirement.

OUTDOOR ENCLOSURE

Outdoor enclosure:

The outdoor enclosure shall be made of galvanized Sheet Steel tropicalized to local weather conditions.

The enclosure shall be of partially modular design of GI sheets fastened by riveting.

The thickness of enclosure shall be 1.5 mm for non-load bearing members & 2mm for loadbearing members.

The enclosure shall be painted with Powder Coating/polyurethane paint.

The metal base shall ensure rigidity for easy transport & installation.

Substation will be used in outdoor application hence to prevent enclosure from rusting/corrosion, welding should be avoided.

The protection degree of the Enclosure shall be IP54 for LT & HT switchgear compartment & IP34 for Transformer compartment. Proper / adequate ventilation aperture shall be provided for natural ventilation by way of Louvers etc.

Considering the outdoor application of the substation the doors shall be provided with proper interlocking arrangement for safety of operator and to avoid corrosion door should have stainless steel hinges. Door should be provided with stoppers.

Interconnection between HT switchgear and transformer shall be using 1Cx3x95 sq.mm al. unarmored XLPE cable and between transformer and LT switchgear shall be using busbar.

Internal Fault: Failure within the package substation due either to a defect, an exceptional service condition or mal operation may initiate an internal arc. Such an event may lead to the risk of injury if persons are present. It is desirable that the highest practicable degree of protection to persons shall be provided. The Design shall be tested as per IEC62271-202. **Typetest report of arcing due to internal fault should submitted with offer. The Compact substation shall be tested for internal arc test –AB for 21KA for 1 sec (A-operator, B- pedestrian)**

Covers & Doors: Covers & doors are part of the enclosure. When they are closed, they shall provide the degree of protection specified for the enclosure. Ventilation openings shall be so arranged or shielded that same degree of protection as specified for enclosure is obtained. Additional wire mesh may be used with proper Danger board for safety of the operator. All covers, doors or roof shall be provided with locking facility or it shall not be possible to open or remove them before doors used for normal operation have been opened. The doors shall open outward at an angle of at least 90° & be equipped with a device able to maintain them in an open position. **The doors shall be lockable type with cylindrical shooting bolt and the locking arrangement shall be covered by magnetic flap.**

The roof of the transformer compartment shall be detachable type to access the transformer for maintenance purpose

Earthing: All metallic components shall be earthed to a common earthing

point. It shall be terminated by an adequate terminal intended for connection to the earth system of the installation, by way of flexible jumpers/strips & Lug arrangement. The continuity of the earth system shall be ensured considering the thermal & mechanical stresses caused by the current it may have to carry. The components to be connected to the earth system shall include:

- a) The enclosure of Package substation,
- b) The enclosure of High voltage switchgear & control gear from the terminal provided for the purpose,
- c) The metal screen & the high voltage cable earth conductor,
- d) The transformer tank or metal frame of transformer,
- e) The frame &/or enclosure of low voltage switchgear,

There shall be an arrangement for internal lighting activated by associated switch for HV, Transformer & LV compartments separately.

Labels: Labels for warning, manufacturer's operating instructions etc. shall be durable & clearly legible.

Cleaning & Painting:

The paints shall be carefully selected to withstand tropical heat and rain. The paint shall not scale off or crinkle or be removed by abrasion due to normal handling. **The enclosure shall be painted with powder Coating.**

TECHNICAL SPECIFICATION OF 11KV SF6 METAL ENCLOSED, INDOOR RING

MAIN UNIT (RMU).

This RMU should be complete with all components necessary for its effective and trouble-free operation along with associated equipment etc. such components should be deemed to be within the scope of supplier's supply.

The RMU should be fixed type SF-6 insulated with Vacuum circuit breakers with O/C & E/F relay for the protection of the transformer. It should be maintenance free equipment, having stainless steel robotically welded IP67 enclosure.

STANDARDS AND REFERENCE DOCUMENTS

Codes and Standards

The **RING MAIN UNIT (RMU)** should be designed, manufactured and tested to the latest version of:

IEC 60694 Common specifications for high-voltage switchgear and control gear standards.

IEC 62271-200: A.C metal-enclosed switchgear and control gear for rated voltages above 1KV and up to and including 72KV and the IEC Codes herein referred.

IEC 60129/ IEC 62271-102: Alternating current disconnections (isolators) and earthing switches
IEC 60529: Classification of degrees of protection provided by enclosures

IEC 60265 High-voltage switches-Part 1: Switches for rated voltages above 1kV and less than 52kV

IEC 60056: Circuit breakers

IEC 60420 High-voltage alternating current switch-fuse combinations
IEC 60185 Current transformers

IEC 60186 Voltage transformers
IEC 60255 Electrical relays

Any other codes recognized in the country of origin of equipment might be considered provided that they fully comply with **IEC standards**.

The design of the switchgear should be based on safety to personnel and equipment during operation and maintenance, reliability of service, ease of maintenance, mechanical protection of equipment, interchangeability of equipment and ready addition of future loads.

Salient Technical feature of “SF-6 RMU.”

11KV SF6 INDOOR, NON-EXTENSIBLE, Ring Main Unit (RMU), comprising of 3 Nos. 630A Loadbreak Switches, 1No. 630 A Vacuum Circuit Breaker with (3 O/C & 1E/F) Relays and Metering Module.

(A) Load break switch (630A)

Load break switch should have the following

- Manually operated 12 KV, 630A Load Break switch and Earthing Switch with making capacity

- “Live Cable” LED Indicators through Capacitor Voltage Dividers mounted on the bushings.
- Mechanical ON/OFF/EARTH Indication
- Anti-reflex operating handle
- Cable testing possible without disconnection of cables.
- Cable boxes suitable for 1 X 3C x 300 sq mm XLPE Cable with right angle Cable terminal Protectors.
- Cable boxes should be Arc Proof and interlocked with respective Earthing Switches. For safety of operator, it should not be possible to open the cable box unless the earth switch is ON.

(B) Circuit Breaker. (630A)

Circuit Breaker should have the following:

- Manually operated 630 A Vacuum circuit breaker and Earthing Switch with making capacity
- Mechanical tripped on fault indicator
- Auxiliary contacts 1NO and 1NC
- Anti-reflex operating handle
- “Live Cable” LED Indicators thru Capacitor Voltage Dividers mounted on the bushings.
- 3O/C + 1E/F self-powered relay with Low and High set for Over current and Earth Fault. Relay should have facility to display the maximum loaded phase current also. Relay should have facility to trip the breaker from remote commands without shunt trip coil.
- Mechanical ON/OFF/EARTH Indication

(C) Metering Module

Air insulated metering module 12kV, 630A should have the following:

- Metering BUS PT- $11KV/\sqrt{3}$ / $110V/\sqrt{3}$ 50VA Class 1.0 Accuracy
- Metering CT: 40/1A 2.5VA Class 1.0 Accuracy
- Digital Multifunction Meter of Class 1.0 Accuracy with RS 485 port Modbus communication

INDOOR RMU

1. Modular design, panel type with front cable access.
2. RMU must be made of robotically welded Non-Ferrite, Nonmagnetic stainless steel with thickness of 2.5 mm with all live parts inside stainless steel tank.
3. Offered RMU must be Non extensible.
4. Maximum Modules can be accommodated in a single robotically welded Stainless steel Tank so as to make it more compact and reliable.
5. Cable covers must be interlocked with Earth switch to have complete safety of operating person.

6. Vacuum interrupter must be of same make as RMU.
7. The cable bushings shall be bolted type design and Cable bushing must be replaceable at site.

DIELECTRIC MEDIUM

SF6 GAS shall be used for the dielectric medium, Arc quenching should take place in vacuum for 11KV RMU's in accordance with IEC376. It is preferable to fit an absorption material in the tank to absorb the moisture from the SF6 gas and to regenerate the SF6 gas following arc interruption. The SF6 insulating medium shall be constantly monitored via a temperature compensating gas pressure indicator offering a simple go, no-go indication.

The RMU should have provision of Gas filling at site, in case there is some leakage of the gas.

GENERAL TECHNICAL REQUIREMENTS

Fixed type Vacuum breakers insulated in SF6 gas.

It should be maintenance free, having stainless steel robotically welded enclosure for INDOOR RMU application.

Low gas pressure devices- 1.4 Bar pressure.

RMU should have full rating with Bargas pressure.

Live cable indicators- High operator safety.

Fully Rated integral earthing switch for Switches and Breakers.

Self powered Microprocessor Based 3O/C + 1E/F self powered relay with Low and Highset for Over current and Earth Fault - Does not require any external source of power.

Units fully SCADA Compatible. Retrofitting at site possible at a later date.

Line Switches (Load break switches) as well as T- OFF circuit Breaker can be operated by remote.

Cable boxes should be front access and interlocked with earth switch. No rear access required.

Cable testing possible without disconnection of cables.

Compact in dimension.

Low pressure, sealed for life equipment,

Cable earthing switch on all switching device-standard, for operator safety.

All live parts should be inside a hermetically sealed Stainless Steel enclosure for indoor RMU.

Indoor unit should be classified as sealed pressure system with gas leak rate of less than 0.1% per year requiring no gas filling for 30+ years of functional life.

TECHNICAL AND GUARANTEED PARTICULARS.

The bidders shall furnish all guaranteed technical particulars as called for this specification.

	Application	250 KVA Cast Resin Dry Type
4.5.1	Service	Indoor inside Enclosure, Step down
4.5.2	Type	Copper Cast Resin Dry Type
4.5.3	Cooling system	Air Natural
4.5.4	No. of Phases	3
4.5.5	Rated output (MVA) With ANAN cooling	250kVA
4.5.6	Rated voltage in KV (Line to Line)	HV-11 kV LV-0.433 kV
4.5.7	Rated frequency	50 Hz
4.5.8	Temperature rises above 40°C	
4.5.9	In winding by resistance	□□□C or above
4.5.1 0	Insulation level	
A	H.V. Power Freq. KV rms	28 kV
B	H.V. (kV peak) Impulse	75 kV
C	L.V. (kV)	-
4.5.1 1	Vector Group	Dyn11
4.5.1 2	Parallel operation	Yes
4.5.1 3	Type of taps provided	Off Load full capacity
A	Taps provided on	H.V. winding
B	Range of taps	±10% in steps of 2.5%
C	Method of Tap Change control	Rotary /sliding Switch
D	Manual load	Yes 'Off Circuit'
4.5.1 4	Percentage impedance at 75 Deg. C	As per IS
4.5.1 5	System earthing	
A	H. V	Solidly earthed
B	L.V	Solidly earthed
4.5.1 6	Transformer-bushing voltage class a) H.V. (kV) b) L.V. (kV)	12kV class 1.1kV class
4.5.1 7	System fault level a) H.V. side b) L.V. side	350 MVA (11 kV) -
4.5.1 8	Short circuit withstand capability duration	1 Sec

DESIGN CRITERIA

Service conditions

The offered switchgear and control gear should be suitable for continuous operation under the basic service conditions indicated below. Installation should be in normal indoor conditions in accordance with IEC 60694.

Ambient temperature -1°C to $+45^{\circ}\text{C}$

Relative humidity up to 95%

Altitude of installation up to 1000m, IEC 60120

General structural and mechanical construction

The offered RMU should be of the fully arc proof metal enclosed, free standing, floor mounting, flush fronted type, consisting of modules assembled into one or more units. Each unit is made of a cubicle sealed-for life with SF₆ and contains all high voltage components sealed off from the environment. The overall design of the switchgear should be such that front access only is required. It should be possible to erect the switchboard against a substation wall, with HV and LV cables being terminated and accessible from the front.

The units should be constructed from robotically welded NON-Ferrite, Non-Magnetic grade stainless steel sheets of 2.5mm thickness to ensure very high degree of precision in sealing of SF₆ tank. The design of the units should be such that no permanent or harmful distortion occurs either when being lifted by eyebolts or when moved into position by rollers.

The cubicle should have a pressure relief device. In the rare case of an internal arc, the high pressure caused by the arc will release it, and the hot gases is allowed to be exhausted out at the bottom of the cubicle. A controlled direction of flow of the hot gas should be achieved.

The switchgear should have the minimum degree of protection (in accordance with IEC 60529)

- IP 67 for the tank with high voltage components
- IP 2X for the front covers of the mechanism
- IP 3X for the cable connection covers

The RMU shall be internally arc tested for 20kA for 1 sec for the gas tank & it should be internally arc tested for cable compartment. Relevant type test reports should be submitted by the manufacturer.

6.0 TECHNICAL DATA

6.1 Ring Main Unit, Electrical data

Electrical data and service conditions

No Rated voltage	KV	12K
		V
1 Power frequency withstand voltage	KV	28
2 Impulse withstand voltage	KV	75
3 Rated frequency	Hz	50
4 Rated current busbars	A	630
5 Rated current (cable switch)	A	630
6 Rated current (T-off)	A	630
Breaking capacities:		
7 active load	A	630
8 closed loop (cable switch)	A	630
9 off load cable charging (cable switch)	A	135
10 earth fault (cable switch)	A	200
11 earth fault cable charging (cable switch)	A	115
12 short circuit breaking current (T-off circuit breaker)	kA	21
13 Rated making capacity	kA	52.5
14 Rated short time current 3 sec.	kA	21
Ambient temperature:		
15 Maximum value	°C + 45	
16 Maximum value of 24-hour mean	°C + 35	
17 Minimum value	°C 0	
18 Altitude for erection above sea level	4m ...1000	
19 Relative humidity	Max 95%	

Ring Main Unit Technical data (11KV)

INDOOR General data, enclosure, and

dimensions

1 Standard to which Switchgear complies	IEC
2 Type of Ring Main Unit	Metal Enclosed, Panel type, Compact
Module.3 Number of phases	3
4 Whether RMU is type tested	Yes
5 Whether facility is provided with pressure relief	Yes
6 Insulating gas	SF6
7 Nominal operating gas pressure	1.4 bar abs. 20° C
8 Gas leakage rate / annum %	0.1% per annum
9 Expected operating lifetime	30 years

- | | | |
|----|-------------------------------------|--|
| 10 | Whether facilities provided for gas | Yes, temperature compensated manometer monitoring can be delivered |
| 11 | Material used in tank construction | Stainless steel sheet |

No Operations, degree of protection and colors

- | | | |
|---|---|------------------------------------|
| 1 | Means of switch operation | separate handle |
| 2 | Means circuit breaker operation | - separate handle and push buttons |
| 3 | Rated operating sequence of Circuit Breaker | - O -3min-CO-3min-CO |
| 4 | Total opening time of Circuit Breaker | approx. 40-80ms |
| 5 | Closing time of Circuit Breaker | approx. 40-70ms |
| 6 | Mechanical operations of switch | CO 1000 |
| 7 | Mechanical operations of CO earthing switch | 1000 |
| 8 | Mechanical operations of circuit breaker | CO 2000 |
| 9 | Principal switch / earth switch | 3 position combined switch |

Degree of protection:

- | | | |
|----|--------------------------|-----------------------|
| 10 | High Voltage live parts, | <u>SF6 tank IP 67</u> |
| 11 | Front cover mechanism | IP 2X for Indoor |
| 12 | Cable covers | IP 3X for Indoor |

Colors:

- | | | |
|----|-------------|------|
| 14 | Front cover | 7035 |
| 15 | Cable cover | 7035 |

7 PANEL CB DESCRIPTION

CIRCUIT BREAKERS

Vacuum bottles should be use as interrupters of the currents. The circuit breaker maincircuit should be connected in series with a three-position disconnect-ear thing switch. The operation between circuit breaker and disconnect ear thing must be interlocked.

1. VCB must self tripping and has a self powered relay
2. The RMU must be nonextensile type
3. Vacuum interrupter must be of same make as RMU.

8 OTHER MAIN FEATURES

Bus bars

Comprising the 3 single phases copper bus bars and the connections to the switch or circuitbreaker. The bus bar should be integrated in the cubicle Bus bars should be rated to withstand all dynamic and thermal stresses for the full length of the switchgear.

Earthing Switch

Earthing switches should be rated equal to the switchgear rating.

Earthing switches should be quick make type capable of making Rated Fault Current. Earthing switch should be operated from the front of the cubicle by means of a removable handle.

The mechanisms

All mechanisms should be situated in the mechanism compartment behind the front covers outside the SF6-tank. The mechanism for the switch and the earthing switch is operating both switches via one common shaft. The mechanism provides independent manual operation for closing and opening of the switch, independent closing of the earthing switch and dependent opening of the earthing switch.

The mechanism for the T-off switch and earthing switch is operating both switches via one common shaft. The mechanism has stored spring energy and provides independent manual operation for closing and opening of the switch, independent closing of the earthing switches and dependent opening of the earthing switch. The mechanism for the vacuum circuit breaker (VCB) and disconnector-earthing switch is operating the VCB and the disconnector earthing switch via two separate shafts. The mechanism for the VCB has stored spring energy and provides independent manual operation for closing and opening of the VCB. The mechanism has a relay with related CT's and/or remote tripping device. The mechanism for the disconnector earthing switch provides independent manual operation for closing and opening of the disconnector, independent closing of the earthing switch and dependent opening of the earthing switch.

Front covers

The front cover contains the mimic diagram of the main circuit with the position indicators for the switching devices. The voltage indicators are situated on the front panels. Access to the cable bushings is in the lower part of each module.

Position indicators

The position indicators are visible through the front cover and are directly linked to the operating shaft of the switching devices.

Voltage indicator

The voltage indicators are situated on the front cover, one for each module, and indicate the voltage condition of each incoming cable. Identification of the phases is achieved with labels L1, L2 and L3 on the front of the voltage indicators. The voltage indicator satisfies the requirements of IEC 61243.

Cable compartment

The Cables access in the RMU shall be from the front. The cable bushings shall be Easily site-replaceable type. It should be possible to terminate up to a 1x 3c x300sqmm core HV cables in each cable compartment. The access to the compartment will be possible by removing the cable cover, hinged to the main frame only when earth switch is ON. Cable Compartments of Indoor RMU should be Arc Proof tested for 20kA for 1sec (the type test report for the same shall be submitted by the vender) and interlocked with respective Earth Switches. Each module has a separate cable compartment that is segregated from each other by means of a partition wall. A partition wall should be fitted to divide the cable compartment from the rear side of the switchgear. In case of an arc inside the tank, followed by the opening of the pressure relief, the partition wall prevents the hot gases flowing out from the pressure relief to enter the cable compartments. All covers are removable. Interconnection between HT switchgear and transformer shall be using 1Cx3x95 sq.mm Al. unarmored XLPE Cable.

8.8. Power connection.

The cables are installed in the dedicated compartment below the mimic front cover. At the bottom of the cable compartment, an earthing bar system made of copper/GI with a minimum cross section of 120 mm² should be fitted. In each compartment the earthing bar should be fitted with 4 screws M10. The earthing system is connected to the tank by a copper/GI bar, which rises up to the connecting point of the tank behind the rear partition wall on the middle of the switchgear.

INTERLOCKING.

The mechanism for the cable switch should be provide a built in interlocking system to prevent operation of the switch when the earthing switch is closed, and to prevent operation of the earthing switch when the switch is in the closed position.

The mechanism for the T-off switch should be provide a built in interlocking system to prevent operation of the switch when the earthing switch is closed, and to prevent operation of the earthing switch when the switch is in the closed position. The mechanism for the VCB and the disconnecter-earthing switch should be has a built in interlocking system to prevent operation of the disconnecter-earthing switch when the VCB is in the closed position.

Further it should not be possible to Open the Cable doors unless the Earthing Switch is Turned ON. In case the Cable door is accidentally left

open a positive interlock shall prevent operation of Load Break Switch and Isolators / Breaker from any operation.

Current Transformers

All current transformers should be complying with IEC 60185.

Current transformers should be of dry type, with ratings and ratios as required.

Cable current transformers used in circuit breaker modules should be maximum 100mm wide. Current transformers used in metering cubicles should be having dimensions according to DIN 42600, Narrow type. Current transformer shall be placed in the cable covers so that it can be easily replaced at site without removing the bushings.

Auxiliaries.

The switchgear should be prepared for options like motor operation, auxiliary contacts and short-circuit indicators. Necessary terminal blocks and wiring etc. should be placed behind the front cover of each module.

Fault Passage Indicators.

These shall facilitate quick detection of faulty section of line. The fault indication may be on the basis of monitoring fault current flow through the device. The unit should be self-contained requiring no auxiliary power supply. The FPI shall be integral part of RMU to avoid thefts. The FPI shall have clear display, automatic reset facility and shall be SCADA compatible.

9 TESTING AND CERTIFICATION.

TYPE TESTS.

Units should be type tested in accordance with IEC standards 60056, 60129, 60265, 60298, 60420, 60529 and 60694. The following type tests should perform on the HT Switchgear and report should submit with offer.

- Short time and peak withstand current test
- Temperature rise tests
- Dielectric tests
- Test of apparatus i.e. circuit breaker and earthing switch
- Arc fault test
- Measurement of resistance of main circuit.

- Mechanical endurance test.
- Duty cycle test.
- Internal arc test for HT chamber.
- Type test reports for above type shall be submitted with the offer.

ROUTINE TESTS.

Routine tests should be carried out in accordance with IEC 60298 standards. These tests should be ensuring the reliability of the unit.

Below listed test should be performed as routine tests before the delivery of units:

- Withstand voltage at power frequency
- Measurement of the resistance of the main circuit
- Withstand voltage on the auxiliary circuits
- Operation of functional locks, interlocks, signaling devices and auxiliary devices
- Suitability and correct operation of protections, control instruments and electrical connections of the circuit breaker operating mechanism.
- Verification of wiring
- Visual inspection
- Time travel characteristics measurement facility for Breaker should be available with the manufacturer to assess the quality of RMU.

Distribution Transformer

10.0 Dry Type Transformer:

Requirement: 11000/433 Volt, 250 KVA Cast Resin Copper Wound Dry type suitable for installation at Indoor enclosure for ground mounting.

Voltage Ratio: No load voltage 11000/433 volts within tolerance as stipulated in IEC.

Rating: The transformer shall have a continuous rating as specified at any of the specified tapping position and with the maximum temperature rise specified.

Temperature Rise: The maximum temperature rises at the specified maximum continuous output shall not exceed 90°C above ambient temperature, not exceeding 40°C daily average or 50°C maximum.

Connections: H.V. Delta and L.V Star connected with neutral brought out on the secondary side for connection to earth; Vector group DYn11 of IS: 2026.

Tapping:

Each transformer shall be provided with **sliding/rotary type tap switch** so as to provide for a voltage adjustment on H.V. from +10% to -10% of rated voltage of 11000 volts in 4 equal steps (5 position) to obtain rated voltage of 433 volts on LV side. Refer clause no:4.5.4 for details of rotary switch. The tapping shall be provided for following voltage ratios at no load.

Cleaning & Painting:

- a) All steel surfaces shall be thoroughly cleaned by sand blasting or chemical agents, as required to produce a smooth surface free of scales, grease and rust.
- b) The internal surfaces in contact with insulating oil shall be painted with heat resistant insulation paint which shall not react & be soluble in the insulating liquid used.
- c) The external Surfaces, after cleaning, shall be given two coats of high-quality epoxy based rust resisting primer followed by filler coats.
- d) The transformer shall be furnished with coats of weather resisting battleship gray epoxy-based enamel paint specially recommended for transformer use.
- e) The paints shall be carefully selected to withstand tropical heat rain, effect of proximity to the sea etc. The paint shall not scale off or crinkle or be removed by abrasion due to normal handling.
- f) Special care shall be taken by the manufacturer to ensure against rusting of nuts, bolts, and fittings during operation. All bushings and current carrying parts shall be cleaned properly after final painting.

Both H.V. and L.V. bushings shall have creepage corresponding to **very heavily polluted atmosphere**.

Phase Marking & Danger Plate: Phase markings in fluorescent paint on small non-corrodible metallic tags shall be permanently fixed for H.V. and L.V sides. Phase markings tags shall be properly fixed with proper alignment. Danger plates shall be provided on the H.V & LV sides, mentioning the Corresponding Voltages.

Power Freq. High Voltage & Insulation Level (Impulse voltage): The distribution transformer shall be designed so that they are capable of withstanding high voltage & impulse voltages as given below:

- a) Impulse Voltage for 11kV winding: 75 kV (1.2/50 Microsecond wave shape).
- b) High Voltage: 28kV rms.

Fittings & Accessories for Corrugated Tank Transformer:

The following accessories shall be provided for 11 kV/0.433 kV, distribution transformer.

Two earthing terminals with copper lugs. The lugs shall be provided in such a way that they shall not obstruct the movements of rollers. The earthing continuity for all the connected equipments shall be properly done.

Two lifting lugs for complete transformer as well as enclosure.

Off circuit tapping switch shall be rotary/sliding type, 3 pole gang operated, top mounting draws out type only. Tap switch shall be suitable for operating voltage of 11kV and above and shall have rated current of 16.53A/26.54A/39.64Amps. Switch shall be provided with externally operating hand wheel handle with indicator and locking device, with direction changing facility and locking arrangement. Bidders shall submit with the bid, technical catalogue for the off-load tap switch for Purchaser's approval.

Rating plate and diagram plate of durable non-corroding metal giving information as required under IEC 76. Rating plate shall also include Transformer **Actual %Z, No-Load Loss & Full-Load Loss at 75° C** along with details like Purchase Order Number, date. The name plate marking shall be done with fluorescent Colour. Each equipment shall carry individual nameplate with proper instructions & affixed with screws.

Four plain rollers fitting so that the transformer can suitably move in any direction along with roller direction changing and locking facility shall be provided.

Skid with Haulage lugs.

Instructions & affixed with screws.

Skid with Haulage lugs.

L.T. Panel System: -

- a) **Declared voltage:** – 3 Phase,400V ($\pm 6\%$) 50 Hz,
- b) **Neutral:** – Solidly earthed at substation.
- c) **Busbar** – Aluminum

General finish: - Tropical, totally enclosed, metal-clad, weather-proof, vermin and dust proof.

Enclosure: - Dead Front type of enclosure shall be able to provide the degree of Protection IP:2X.

Circuit Ways: As per BOQ

- 250 kVA Transformer
- 400Amps 433V 36KA 4P Fixed Manual Type Molded Case (TMD) Circuit Breaker with Thermalbased released overcurrent, short circuit and earth fault protection.
- MCCB will be of 4P, Fixed Manual Type Molded Case (TMD) Circuit
- LT panel should be as following
- Outgoing – 4 Pole MCCB, 250A, 25 kA, 50Hz: 1 No.
- Outgoing – 4 Pole MCCB, 125A, 10kA, C Curve: 2 Nos.
- Outgoing – TPN MCCB, 63A, 10kA, C Curve: 2 Nos.
- Outgoing – TPN MCB, 32A, 10kA, C Curve: 2 Nos.
- Wiring: Internal with complete wiring with suitable size of flexible copper cable for Incoming to Outgoing, suitably bind with proper gap as per IS.
- Digital Timer switch for switching, single phase operated: 1 No.
- Breaker with Thermalbased released overcurrent, short circuit, and earth fault protection.
- Energy meter for measurement of energy.

The design of the LT panel should be type tested for the short circuit, temperature & Ingress protection test and type test report should submit with offer.

Ambient characteristics

- Operating temperature: -25 °C .. +70 °C (ambient temperature)
- Storage temperature: -40 °C .. +70 °C (ambient temperature)
- Maximum relative humidity: 98%
- Maximum altitude: 2000 m above sea level, 5000 m above sea level with derating
- Suitability for being used in hot-humid places.
- Circuit-breakers fitted with electronic trip units must comply with the

prescriptions of the International Standards on electromagnetic compatibility.

13.0 Earthing:

Earthing arrangement shall be provided for earthing each cable, PVC cable gland, neutral busbar, chassis, and framework of the cubicle with separate earthing terminals at two ends. The main earthing terminals shall be suitably marked. The earthing terminals shall be of adequate size, protected against corrosion, and readily accessible. These shall be identified by means of sign marked in a legible manner on or adjacent to terminals.

Neutral bus bar strip shall be connected to Earthing terminal with help of GI strip of suitable capacity & nut-bolt arrangement.

Earthing Strip of Size 50x6mm GI is require for CSS internal Earthing.

TYPE / ROUTINE TEST ON PACKAGE SUBSTATION

14.0. TYPE TESTS FOR THE PACKAGE SUBSTATION:

The Package Substations offered must be type tested as per IEC 62271-202. The copy of type test summary should be submitted along with the tender. CSS manufactured at OEM only be accepted.

Routine Tests: The routine tests shall be made on each complete prefabricated substation.

- a) Voltage tests on auxiliary circuit.
- b) Functional test.
- c) Verification of complete wiring.

Test Witness: Routine test shall be performed in presence of Owner's representative if so desired by the Owner. The Contractor shall give at least fifteen (15) days advance notice of the date when the tests are to be carried out.

Test Certificates:

Certified reports of all the tests carried out at the works shall be furnished in three (3) copies for approval of the Owner.

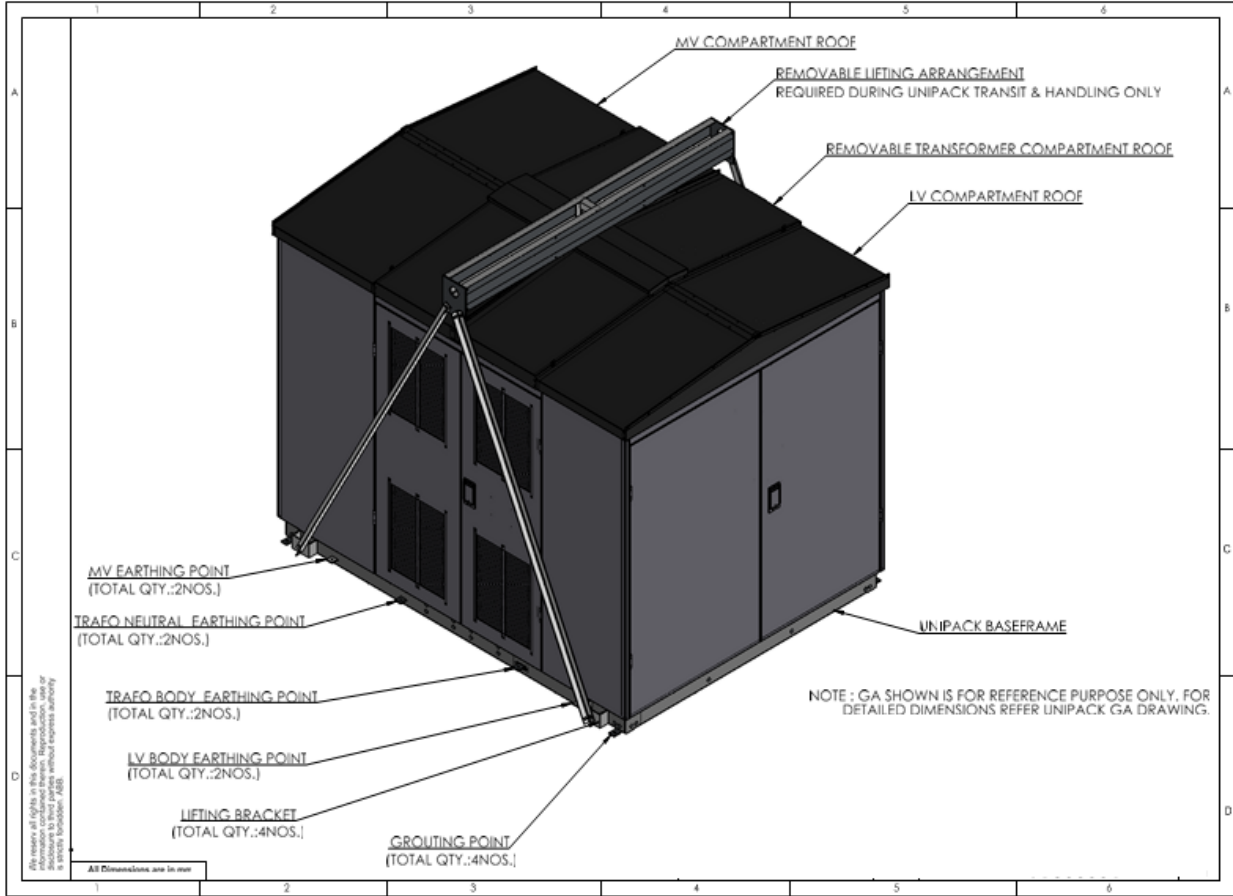
Performance Certificate to Qualify Technical Bid: Manufacturer should submit CSS performance Certificate from Any Utility/Pvt organization/Industry of similar or higher rating.

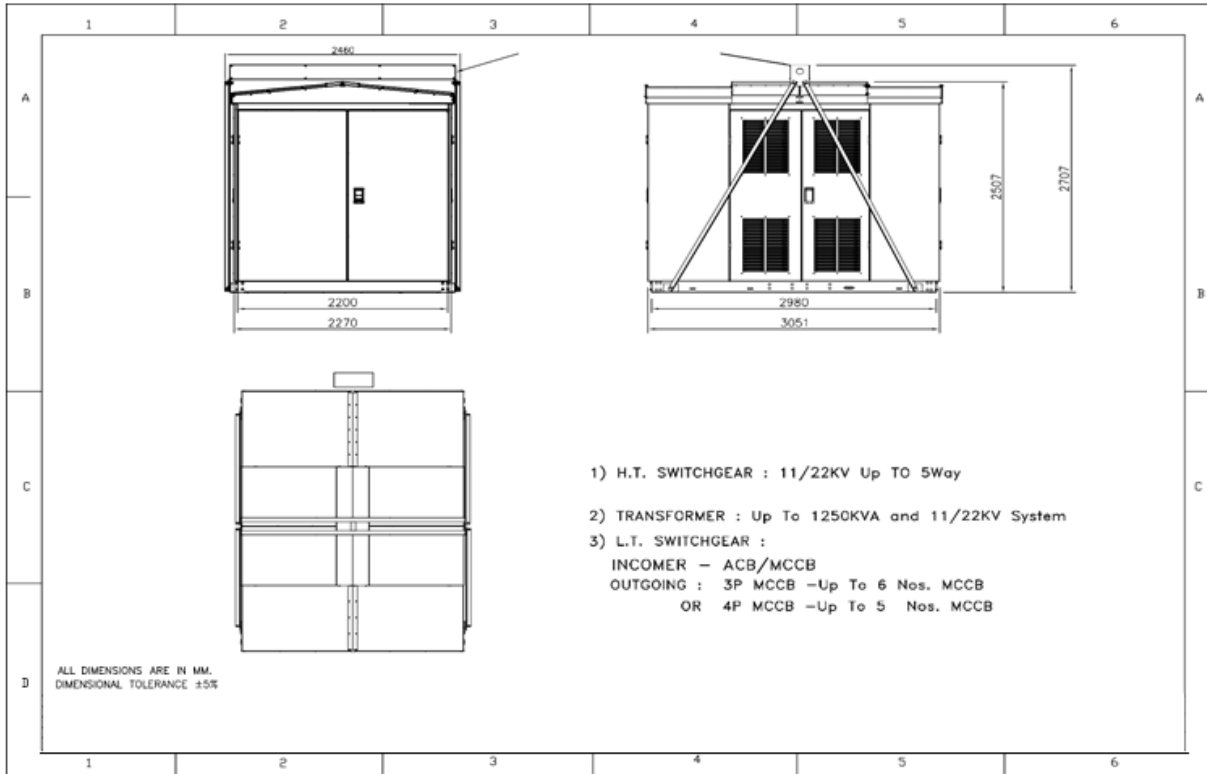
Makes of Compact Substation:

Compact Substation	ABB / SIEMENS / SCHNEIDER (OEM make CSS only)
Transformer Dry	ECS/AMESIMEPX/TMC
Ring Main Unit	ABB/ SIEMENS/SCHNEIDER
Low Voltage Switchgear	ABB/ Siemens/Schneider
CT and PT	Ericon/ECS/Eq
Digital MFM	Secure/Rishabh/Eq

Shad Protection for Compact Substation

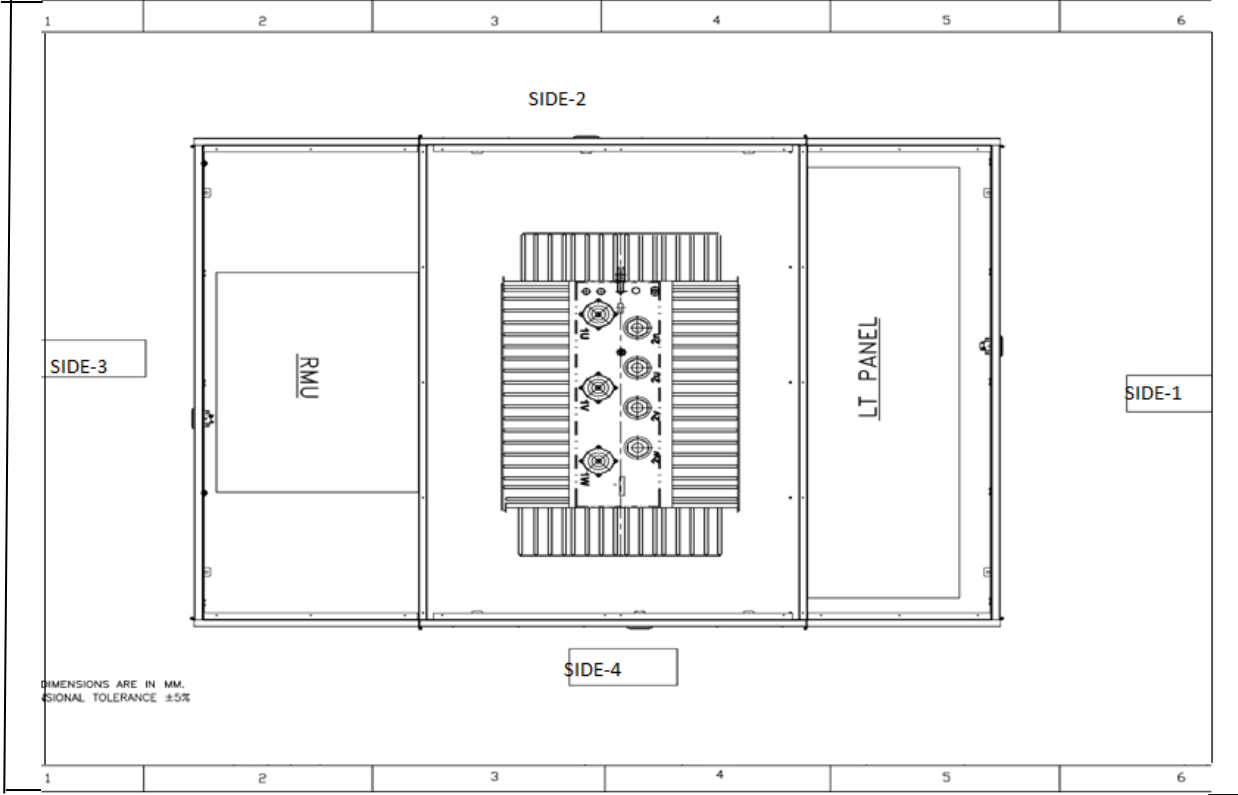
Designing, Supply, installation and erection on 250 KVA Compact Substation to cover with GI Structure with Blue Colored Galvanized Powder Coated Roofing sheets and Painting with GI Structure primer and final color Paint etc. All side cover with sheets along with 1 door arrangement for operation and maintenance work purpose complete Shad with Elevated Foundation, GI Structure design work related all material and other work directed by Engineer in-charge. Elevated Foundation, GI Square / Round Pipe Structure with suitable Strength to remain stable in High Wind Pressures and suitable load capacity of Shade. As pre Suite as site foundation of CSS directed by EIC. CSS foundation drawing attached as below. Galvanized Powder Coated Blue colored Roofing Sheets (Steel Grade: G300 (300 MPa Yield Strength, Hot Rolled, Weather Proof, Corrosion Resistance, Base Metal Thickness of 0.45 mm, Depth 19 mm, Total Coated Thickness of 0.50 mm, Galvanized and White colour Powder Coated) All material before use at site check and Make Approved by Engineer-in-Charge. 1 nos. Fire Extinguisher to be installed before check and verified as directed by Engineer-in-Charge. Any Major activity and query about work related to be discussed with Engineer-in-Charge and finalized as per his directions. **The tentative drawing of the CSS Panels as under:**

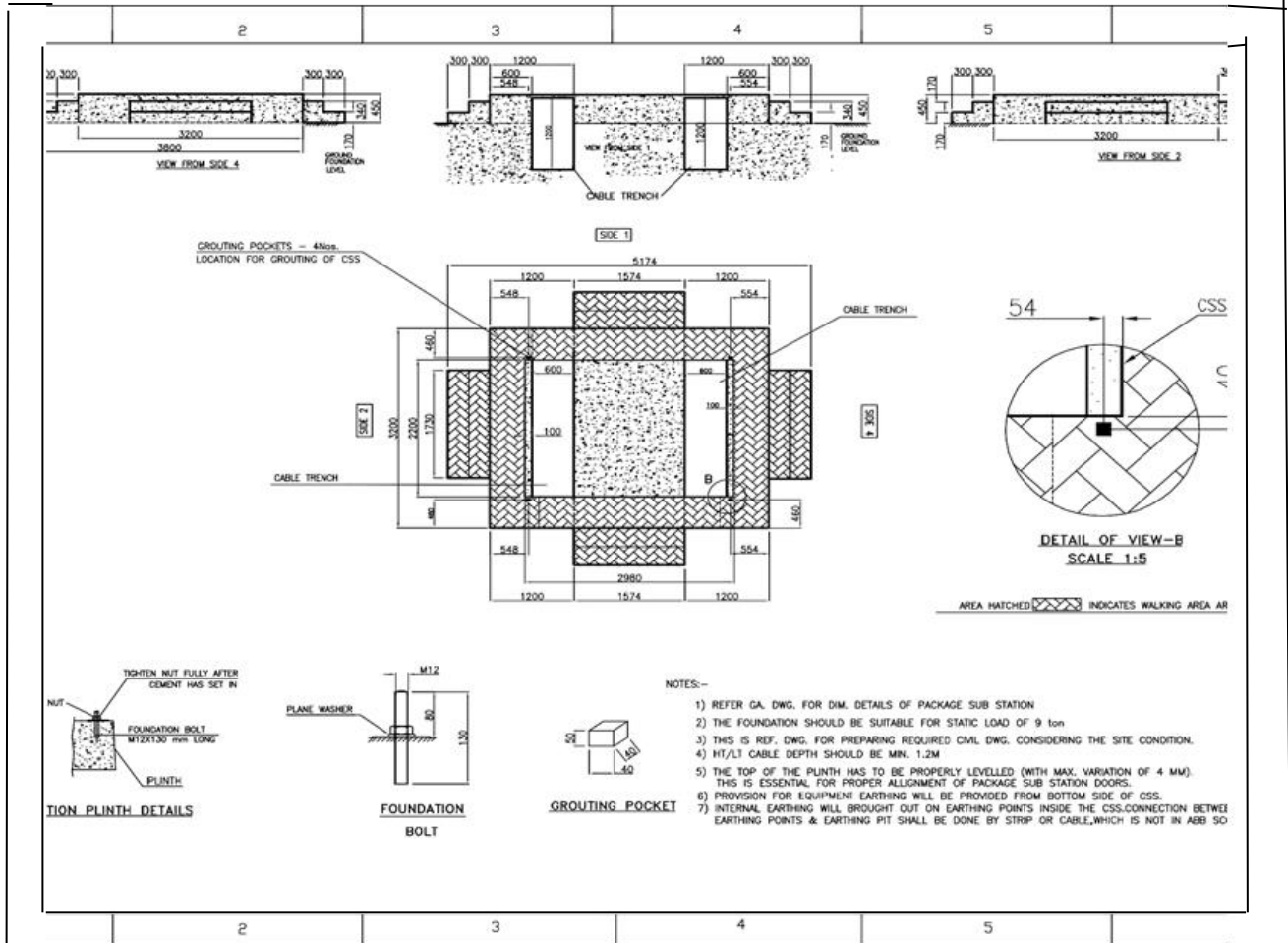




SIDE-1

TOP VIEW





Design, manufacture and supply of Outdoor Mounted Compact Substation of 11KV/415 Volts, equipped with 500KVA Cast Resin Transformer, 3 way 11kV Ring Main Unit consisting of 2 nos. 630A at 11kV fault making load breaking switch with one no tee-off as SF6 Circuit Breaker for the primary side controls & with MV 800A Air Circuit Breaker as secondary side control as detailed below.

The Outdoor Package

- Single integrated metal housing, comprising three compartments accommodating:

MV switchgear (Protection degree of this compartment: IP54)

Transformer (Protection degree of this compartment: IP31)

LV switchgear (Protection degree of this compartment: IP54)

Enclosure of Compact Substation:

The Outdoor enclosure of compact Substation shall be fabricated from Galvanized sheet steel 2mm thick build on heavy channel skid frame tropicalized to local weather conditions.

Four nos. of Lifting lugs to be provided on top to enable lifting total package unit without any problem for site handling / lifting by crane. The metal base shall ensure rigidly for easy transport and installation to withstand the weight of the Transformer, MV & L.V component.

Ventilation openings shall be so arranged or shielded that same degree of specified for enclosure is obtained to reduce the equipment ambient temperature and prevent heating through the roof due to sun radiation the roof is to be made of double layer with foam insulation in between.

The roof should of the CSS should be Removable canopy type made from 2 mm thick Galvanized sheet metal with 10 degree.

Separation between RMU & transformer compartment and Separation between Transformer compartment & L.V compartment should be made from 2mm thick sheet steel.

The covers and door are the part of the enclosures when they are closed they shall provide the degree of the protection specified for the enclosure. All cover, doors or roof shall be providing with locking facility. The doors shall open outward at an angle of at least 90 degrees and to be equipped with a device able to maintain them in an open position.

Gland plate for RMU compartment should be made from 3mm thick M.S plate suitable for 3C x 70Sqmm XLPE cable 2 no's. The gland pate should be Split type.

Gland Plate for LV Compartment should be be made from 3mm thick M.S plate suitable for 8no's / 6 no's outgoing cable. The gland pate should be Split type

The space between Transformer, MV component and LT component shall be provided in accordance with IEC recommendations standard. The enclosure shall be made in such a way that the above components shall be accommodated and the accommodation of components shall be maintained as per IEC recommendation. The enclosure shall be tested by OEM as per Type Test and submit the relevant documents.

a. 11KV Ring Main Unit (RMU):

Ring main unit configuration shall NON extensible Compact Switchgear consist of two load break switch (LBS) + one transformer circuit breaker (TCB) both + one out going feeder LBS shall be electrically operated.

Each Load Break switch, Circuit breaker & earth switch in RMU panel all shall be non-draw out type in fixed position.

Breakers and load switches shall be SF6 gas or Vacuum type (with disconnecter & earth Switch).

RMU Construction.

RMU panel construction shall be metal enclosed framed compartmentalized panel construction. Consisting of 4 no's lifting lugs & cable entry from bottom. The cable gland plate shall be made form 3 mm metallic removable type & split type in two parts.

The bus bar rating 630 Amps. (Copper), PVC sleeved/powder coated with color code supported by insulator made from SMC/DMC resin type. The earth bus bar shall be of copper suitable for rated fault duty for 3 sec and earth bus internal connection to all non-current metal parts by 2.5sq mm copper flexible wire.

Hardware's should be used of Stainless steel except termination nut-bolts which should be brass / tinned copper.

Load Break Switch (ISOLATER)

a)	Type	Load braking and fault making in SF6 tank
b)	Ratted Current	630Amps
c)	Rated Breaking Capacity	630Amps
d)	Fault making Capacity	52.5KA Peak
e)	Short time current for 3 sec	21KA

f)	No of poles	3
g)	Operating Mechanism	Operating handle with ON, OFF, Earth position with arrangement for padlock in each position

The 2 no's of isolators unit are for receiving of 2 No's Incoming 11 KV 3C x 70 Sq.mm XLPE cable from 7th sub-station and also mechanical & Electrical interlocking so that one incomer may be taken on load.

TRANSFORMER CIRCUIT BREAKER.

a)	Type	Three pole operated simultaneously by a common shaft
b)	No of phase	3
c)	Arc interruption in dielectric medium	SF-6
d)	Type of Charging, Mechanism:	Manual (spring assisted) as well as motorized with 230 VAC operated motor
e)	Continuous Rating	630Amp at ambient design 40 deg C
f)	Short Ckt Withstand	21 KA for 3Sec
g)	Fault making Capacity	52.5 KA
h)	Fault Breaking Capacity	21 KA minimum
i)	Current transformer	3 nos. epoxy cast Current Transformers with 15 VA burden STR of 21 KA for 3 second metering accuracy

		Class 0.5 and protection accuracy 10P10 and having of CTR 150/75/5A.
j)	Potential Transformer	3-phase draw out type PT of Ratio 11000/110 Volts of 50 VA burden to meet with auxiliary requirement with Class 0.5 accuracy including HT fuses on both incomer end.
k)	Protection Relay	Numeric type or updated version (Make: SCHNEIDER/ALSTOM/SIEMENS/C&S) with the protection of inverse, definite time, short circuit, over current, instantaneous and earth fault, master trip and trip supervision.
l)	Metering Compartment	Multi-Function meter having digital type (single) with voltage, current, PF, frequency, KW and KWH (Make - ENCRON/L&T / Conzerv)
m)	Accessories	2 sets of operating handle, spring charging handle, spanner set and other required accessories.
n)	Optional	One no. shunt trip and tripping coil operating on 12VDC. 2 nos. of space heater with ON/OFF switch and thermostat in each side of panel & Cable chamber

The SF-6 breaker shall be completed with necessary interconnection with fine wiring, ferruled properly including foundation bolts, earthling etc. The

layout drawing, dimensional drawings and electrical wiring diagram and operation & maintenance manuals shall be supplied with SF-6 Breaker. The SF-6 breaker shall be supplied in conformity with relevant ISS i.e. with up to date amendments along with manufacturers test certificate.

TRANSFORMER:

The transformer shall be fully tested for routine tests, as per BIS-1985. The tenderer shall furnish data regarding adequacy DIN of Transformer capacity.

a)	Transformer capacity	500 KVA (DRY TYPE)
b)	Primary voltage	11 KV +/- 10%
c)	Frequency	50 HZ
d)	No. of Phases	3
e)	Insulation Class	'F'
f)	Cooling	Natural Air
g)	Temperature	Max 115 C by RTD
h)	Percentage Rise	As per IS
i)	In winding	90 degree C
j)	Winding connection	Star/Delta
k)	Impedance	As per IS/BIS/DIN
l)	Vector Group	Dyn 11
m)	Neutral Grounding	HV ungrounded LV Solidly Grounded
n)	Winding material	Copper
o)	Noise Level	As per IEEE 141

p)	Vibration Level	3 G (min.)
q)	Painting	632 Shed of IS:5 or BIS/DIN Standard
r)	Tapping Range	+/- 5%
s)	Losses	Maintain as per IS/BIS/DIN
t)	Make	Siemens/Crompton/BHEL/Schneider

LV SWITCHGEAR.

The L.V side should be designed to equip the following

a) Low voltage Bus bar system

The equipment shall have all the following features -

a)	LV bus bar	From transformer LV bushing to ACB and from ACB to MCCBs
b)	Bus bar size for phase & neutral	Tinned copper busbar, size shall be as per manufacturer design. All the phases and neutral busbar shall be same rating / size. Bus bar size for phase & neutral Suitable spreader to be provided at outgoing side of MCCB to connect 150 Sqmm cable through aluminium lug.
c)	Bus bar support	insulators 1 kV voltage class, SMC epoxy
d)	Bus bar sleeve	insulation Colour coded, for 1kv
e)	Bus bar rated current	Suitable for 800A continuous current rating within the 10K class enclosure @ 400 C ambient temp

f)	Bus bar short circuit	withstand 50 kA for 1 sec
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b. Low voltage switchgear, ACB.

The equipment shall have all the following features -

a)	Rated operational voltage (V) at 50 Hz	440V
b)	Rated frequency (Hz)	50Hz
c)	Current rating Amps (rms)	800Amps
d)	Rated insulation voltage (V) at 50 Hz	1000
e)	Number of poles	4
f)	Rated impulse withstand voltage(kV)	8
g)	Rated Ultimate Short circuit breaking capacity at 415 V, 50 Hz (kA rms) Icu	50
h)	Rated Service Short circuit breaking capacity at 415 V,50 Hz (kA rms), Ics	50
i)	Rated short circuit making capacity at 50Hz (kA peak), expressed as multiples of Icu	105
j)	Rated short time withstand current for1 sec	50

	at 50 Hz (kA rms), I_{cw} , expressed as percentage of I_{cu}	
k)	Category of utilization	B
l)	Shutters on 'Trip' & 'Close' push button with sealing facility	Yes
m)	Accessory mounting	Accessories shall be front accessible plug in type. Accessories namely motor shunt trip & closing coil, UVT etc. should be common for the entire range & shall be suitable for both AC & DC voltages.
n)	Operating mechanism	Spring charging stored energy type , manual & Automatic
o)	Mechanical life (Operating cycles)	20000
p)	Indications	Breaker shall have following mechanical indications: 1. ON, 2. OFF, 3. TRIP 4. SPRING CHARGE STATUS
q)	Sensing	True RMS based
r)	Type	Microprocessor based
s)	Control Terminal	Should be front accessible and minimum NO/NC contacts shall be provided for electrical interlocking.

t)	Protection	<p>Overload protection</p> <p>Pick up 0.4 to 1.0</p> <p>Time delay 0.2 to 40 sec</p> <p>Short Circuit</p> <p>Pick up 2 to 10</p> <p>Time delay 20 to 400 Micro sec</p> <p>Instantaneous Over current</p> <p>Pick up 4 to 16 & OFF</p> <p>Earth Fault</p> <p>Pick up 0.2 to 0.6 & OFF</p> <p>Time delay 100 to 400 msec</p>
u)	Metering required	<p>Multi-Function meter for measuring</p> <p>3 Ph current</p> <p>3 Ph Voltage</p> <p>KWH</p> <p>KVAH</p> <p>Power Factor</p> <p>Max Demand (KVA)</p> <p>Fault History of Minimum Events</p>
v)	Indication	<p>Release shall give individual indication for each type of fault</p>

c. Low voltage switchgear, MCCB.

a)	a) For 630 Amps b) For 400 Amps c) For 250 Amps. d) For 100 Amps	Outgoing feeders – 1 nos Outgoing feeders – 2 nos. Outgoing feeders – 2 nos. Outgoing feeders – 4 nos
b)	MCCB rated voltage & Rated frequency (Hz)	415v +/- 10% at 50Hz
c)	Number of poles	4
d)	Current rating Amps (rms)	630/400/250/125Amps
e)	MCCB rated 3 phase short circuit breaking capacity Ics = Icu Rated impulse withstand voltage(kV)	50/35/25/16 KV minimum at 415v and 50Hz
f)	MCCB rated 3 phase short circuit withstand capacity, Icw	8kA/8KA/8KA /6 for 1sec
g)	Rated insulation voltage (V) at 50 Hz	1000
	MCCB mechanical & electrical Endurance	As per IS 13947 / IEC
h)	MCCB category of duty	B as per IS / IEC 947
i)	MCCB indications	ON, OFF & TRIP
j)	MCCB protection	Adjustable / front accessible thermal and magnetic setting. (Thermal setting for overload adjustable from 70% - 100% of

		the rated current & magnetic setting for short circuit adjustable 4-10 times / 5-10 times).
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5. Safety Devices:

Rubber Mates, Fire Extinguisher & First Aid Box

The rate should be exclusive of GST & inclusive of all taxes, levies, loading at manufacturer's depot, transportation and unloading at the site of work etc.

Technical Specification No.21:

This item includes supply at site FRP ladder type cable tray of following size along with its accessories:

- ❖ Width (W): 200 MM
- ❖ Side channel Height (H): 50 MM
- ❖ Rung Width : ≥ 25 MM
- ❖ Rung Height : ≥ 15 MM
- ❖ Rung C to C: ≤ 300 MM
- ❖ Thickness (T): 3 MM
- ❖ Length (L) : 2500 MM

All accessories viz., Coupler plates, Nuts, bolts & washers shall be of stainless steel SS304 material. The Cable Tray manufacturing shall be preferably ISO 9001:2000. The contractor shall take prior approval of drawing from Engineer in charge before supply of cable tray. The rate shall be inclusive of all taxes (Excluding GST), insurance, Packing, forwarding, transportation, unloading at site as directed by Engineer-In-Charge.

This item includes providing & fixing cable tray support for 200mm width cable tray on the wall/column structure of shed. The cable tray support shall be horizontal strut channel bracket type. The dimension of base plate shall be 120mm (H) x 400mm (W) x 2mm (T). The dimension of the channel bracket shall be 40mm x 40mm x 2mm. The length of the channel bracket 400mm. The material of cable tray support shall be SS304. The Contractor shall supply the cable tray support at site after approval drawing from Engineer-in-charge. The cable tray support shall be rigidly fixed on wall/column structure of shed with two nos of SS304 anchor fasteners of minimum size: M10,x 10mm x 100mm at the height as directed by Engineer-in-charge. This includes all materials, Labour, scaffolding, tools & tackles as directed by Engineer-in-Charge

**Seal & Sign of
Contractor**

**Executive Engineer (E)
Deendayal Port Authority**

Approved Make List for Electrical Items		
Sr. No.	Description	Recommended Makes
1	HV VCB	SIEMENS / CROMPTON GREAVES/ABB/Schneider
1(a)	HV Gas Insulated Breakers	SIEMENS /Schneider/ABB
2	POWER TRANSFORMERS	VOLTAMP/CROMPTON GREAVES /BHARAT BIJLEE/ BHEL/ SIEMENS/ABB/ Schneider/T&R
3	DISTRIBUTION TRANSFORMERS	EMCO/KIRLOSKAR/PATSON/VOLTAMP/ABB/Schneider/ T&R
4	RESIN CAST TRANSFORMERS	
	A) RESIN CAST IMPREGNATED	VOLTAMP / KIRLOSKAR / EMCO
	B) DRY CAST	VOLTAMP/KIRLOSKAR/EMCO
5	HT XLPE CABLES	POLYCAB/TORRENT/RPG ASIAN/ NICCO/GLOSTER/ UNISTAR/ UNIVERSAL
6	LT XLPE CABLES	POLYCAB/TORRENT/RPG ASIAN/ NICCO/ RALLISON/PRIMECAB/ HAVELLS/ UNIVERSAL/ UNISTAR/AVOCAB
7	LT ACB	SIEMENS/L&T/SCHNEIDER/C&S

8	PROTECTION RELAYS	AREVA/L&T/SIEMENS/ABB/C&S
9	LT PANEL	CPRI APPROVED
10	CHANGE OVER SWITCH	SIEMENS/L&T/ABB/C&S/SCHNIDER/ LEGRAND / INDOASIAN
11	SFU FOR MAIN LT DISTRIBUTION PANELS	SIEMENS/L&T/ABB/C&S
12	SFU FOR DISTRIBUTION PANELS & FEEDER PILLERS	SIEMENS/L&T/ABB/C&S/ SCHNEIDER/ LEGRAND/ INDOASIAN/HAVELLS
13	MCCB FOR MAIN LT DISTRIBUTION PANELS	SIEMENS/L&T/ABB
14	MCCB FOR DISTRIBUTION PANELS AND FEEDER PILLERS	SIEMENS/L&T/ABB/C&S/ SCHNIDER/ LEGRAND/ INDOASIAN/HAVELLS
15	MCB/ELCB/RCCB/ RCCBO FOR MAIN LT DISTRIBUTION PANELS	SIEMENS/HAGER L&T/ABB
16	MCB FOR DISTRIBUTION PANELS AND FEEDER PILLERS	SIEMENS/L&T/ABB/C&S/ SCHNEIDER/ LEGRAND/ INDOASIAN/ HAVELLS/ STANDARD
17	MCB DISTRIBUTION BOARD	STANDARD / HENSEL/LEGRAND / INDOASIAN / HAVELLS
18	MULTI FUNCTION DIGITAL METER FOR MAIN LT DISTRIBUTION PANELS/DIGITAL KWH METERS	L&T/ENERCON/SECURE/L&G/ RISHABH
19	ANALOG VOLT/AMPARE METER FOR DISTRIBUTION PANELS AND FEEDER PILLERS	RISHABH/AE/ENERCON/L&T
20	SLECTOR SWITCH FOR VOLTMETER/AMPARE METER	L&T/SIEMENS/C&S
21	POWER CONTACTOR & OVER LOAD RELAYS	L&T/SIEMENS/ABB
22	QUARTZ TIME CLOCK SWITCH	L&T/INDOASIAN/SIEMENS

23	PVC WIRE WITH COPPER CONDUCTOR	RR KABEL/KEI/POLYCAB/MILEX/GUJCAB/ STANDARD/ FINOLEX/ANCHOR
24	FLUSH TYPE SWITCHES, SOCKETS, HOLDERS AND CEILING ROSES & ELECTRONIC REGULATORS	ANCHOR/MK/NORTHWEST/VINAY/PANAMA/HAVELLS
25	DOOR BELLS/CALL BELLS	ANCHOR/LEGEND/MK/NORTHWEST
26	MODULAR SWITCHES, SOCKETS, PLATES & BOXES	ANCHOR / MK / NORTHWEST / LEGRAND /HAVELLS/INDOASIANSIEMENS
27	PVC CONDUIT/OVAL CONDUIT & CASSING CAPPING AND ACCESSORIES	PRECISION/VULCAN/FINOLEX/ GARWARE/RESTOPLAST/SWASTIK/BPI
28	GLS LAMPS & FLUORESCENT LAMPS	PHILIPS / BAJAJ / WIPRO / CROMPTON GREAVES / OSRAM / SURYA ROSHNI /GE
29	HPSV, HPMV & METAL HELIDE LAMPS	PHILIPS / BAJAJ / WIPRO / CROMPTON GREAVES / OSRAM / SURYA ROSHNI /GE
30	IGNITORS FOR HPSV, METAL HELIDE LAMPS	PHILIPS / BAJAJ / WIPRO / CROMPTON GREAVES / OSRAM / SURYA ROSHNI /GE
31	LUMINARIES	PHILIPS/BAJAJ/WIPRO/CROMPTON GREAVES / OSRAM / SURYA ROSHNI /GE
31a	LED Luminaries	Philips /Bajaj/Wipro/CG/Surya/Pyrotech/Syska/Nessa having surge Protection $\geq 10KV$ for fittings & internal Surge rotection for Driver of $\geq 4KV$, LED Chip only OSRAM/CREE/Philips Lumileds/Citizen/Nicia with LM- 79,80 CERTIFICATION
32	CEILING FANS	BAJAJ/ORIENT/USHA/CROMPTON GREAVES / ALMONARD/GEC
33	WALL MOUNTING FANS	BAJAJ/ORIENT/USHA/CROMPTON GREAVES / ALMONARD/GEC
34	EXHUAST FANS	BAJAJ/ORIENT/USHA/CROMPTON GREAVES / ALMONARD/GEC

35	HEAVY DUTY INDUSTRIAL WALL MOUNTING FANS	BAJAJ/ORIENT/USHA/CROMPTON GREAVES / ALMONARD/GEC
36	WATER COOLER	VOLTAS/SHRIRAM USHA/BLUE STAR
37	AIR CONDITIONERS	VOLTAS/CARRIER/BLUESTAR/USHA/ HITACHI/LG/ SAMSUNG/ONIDA
38	REFRIGERATORS	VOLTAS/CARRIER/BLUESTAR/USHA/ HITACHI/LG/ SAMSUNG/WHIRLPOOL
39	VOLTAGE STABILIZER	VEELINE / CAPRI
40	INVERTERS	SUKAM / MICROTEK
41	D.G. SETS A) ENGINE B) ALTERNATOR	CUMMINS/GREAVES/KIRLOSKAR/ CATERPILLAR/ ASHOK LEYLAND/VOLVO STAMFORD/CROMPTON GREAVES /JYOTI/ KIRLOSKAR ELECTRIC
42	ELECTRIC MOTOR	ALSTOM/CROMPTON GREAVES /SIEMENS/ KIRLOSKAR/ABB
43	WATER PUMPS	SWASTIK / KSB
44	WATER GEYSER	BAJAJ/USHA / CROMPTON GREAVES / SPHEREHOT / RACOLD
45	LUGS & CABLE GLANDS	DOWELLS / JAINSON / BRACO

**Seal & Sign of
Contractor**

**Executive Engineer (E)
Deendayal Port Authority**