

MORMUGAO PORT AUTHORITY
ENGINEERING MECHANICAL DEPARTMENT
ELECTRICAL HEADLAND SECTION

NOTICE INVITING BUDGETORY OFFERS

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|---|---|
| Name of Work | “SITC OF 11 KV RING MAIN UNIT AT HEADLAND SUBSTATION” |
| Date of submission of budgetary quotation | On or Before 07.02.2025 at 15.00 Hrs. |
| Address for communication: | Executive Engineer (E-HL), 1st floor, Electrical Maintenance Cell, Mormugao Port Authority, Admin. Building, Headland sada Vasco-de-Gama Goa - 403804 |
| Contact Details | Phone : (0832), 2594241, 2594271 Email : xene.mgpt@gmail.com |
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EXECUTIVE ENGINEER (E-HL)
MORMUGAO PORT AUTHORITY

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Sub: "SITC OF 11 KV RING MAIN UNIT AT HEADLAND SUBSTATION"

Ref: Budgetary Quotation No. CME/XEN(E-HR)/HL03/2025/01

Mormugao Port Authority intends to carryout work of **"SITC OF 11 KV RING MAIN UNIT AT HEADLAND SUBSTATION"**

As such, it is requested to kindly furnish budgetary quotation for the same (Scope of work, technical specifications are enclosed at Annexure-I and Price Schedule enclosed at Annexure- II.

Your budgetary quotation should reach to this office on or before **07.02.2025** at **1500** Hrs.

Thanking you,

Yours sincerely,

EXECUTIVE ENGINEER (E-HL)

ANNEXURE-I

**TITLE OF WORK: “SITC OF 11 KV RING MAIN UNIT AT HEADLAND
SUBSTATION”**

1. GENERAL

Mormugao Port Authority proposes to replace the existing outdoor RMU at 11 KV substation at Headland, Sada. The existing RMU is of SIEMENS make, Type: 8DJH ST RRL OUTDOOR

2. SCOPE OF WORK

- 2.1** The Scope of work includes supply, installation, testing and commissioning of 11 KV Ring Main Unit (RMU) at Headland Substation.
- 2.2** The contractor shall disconnect, remove the existing installed RMU from foundation and shift it to the MM scrapyard at Baina.
- 2.3** The contractor shall carry out supply, installation, connection, testing and commissioning of new RMU. If existing foundation/plinth is suitable for new RMU, then the contractor can use the same. However, if the foundation/plinth is not suitable for installation of new RMU, then the contractor shall design and provide the necessary plinth foundation at the existing location as per the relevant IE rules.
- 2.4** The offered equipment's shall be complete with all parts and accessories which are necessary for their efficient and satisfactory operations. Tolerances on all the dimensions shall be in accordance with provisions made in the relevant Indian standards and in these specifications.
- 2.5** It is not intended to specify completely herein, all the details of the design and construction of material. However the product shall conform in all respects to high standards of engineering, design & workmanship and shall be performed in continuous operation in a manner acceptable to the purchaser. The offered material shall be complete with all components necessary for their intended purpose. The design, manufacture and performance of equipment shall comply with all currently applicable standards, regulations and safety codes in the locality where the equipment will be installed. Nothing in this specification shall be construed to relieve the vendor of their responsibilities. Moreover, the design and

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components shall be deemed to be within the scope of vendor's supply irrespective of whether those are specifically brought out in this specification and/or the commercial order or not.

2.6 MRT & CEA Approval of Installation and Completion Certificate

- i) The contractor shall arrange for obtaining the necessary approvals of CEA, if applicable, and the inspection charges shall be paid by the contractor. It is the responsibility of the contractor to carry out the works in accordance with the requirements of CEA. Any modification and corrections suggested by CEA on inspection shall also be complied by the contractor free of cost.
- ii) The contractor shall arrange for obtaining the necessary approvals of Electricity Dept/MRT authorities and also pay for the inspection charges. It is the responsibility of the contractor to carry out the works in accordance with the requirements of MRT if applicable. Any modification and corrections suggested by MRT on inspection shall also be complied by the contractor free of cost.
- iii) The contractor shall follow up and coordinate with Electricity Dept. for connection of HT supply and energisation of the Substation. The old dismantled equipment within the substation shall be shifted to MM Stores, Baina and handed over to the Port.

3. TECHNICAL SPECIFICATION:

3.1 11KV SF6 RING MAINS UNIT

The outdoor type SF6 Ring main unit with neutral solidly grounded with earth fault protection should be totally enclosed, free standing, gas tight, vermin and dust proof suitable for tropical climatic use with IP67 protection. The SF6 RMU shall consist of a 3 pole, 12KV, 630 Amp Vacuum circuit breaker unit, with integral fault making/dead breaking earth switch and shall be sealed for life. The enclosure shall meet the "sealed pressure system" criteria. There shall be no requirement to "top up" the SF6 gas. It shall provide full insulation, making the switchgear insensitive to the environment. Thus assembled, the active parts of the switchgear unit shall be maintenance free. The switchgear & switchboard shall be designed so that the position of different devices is visible to the operator on the front of the switchboard & operations are visible as well. The switchboard

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shall be designed so as to prevent access to all live parts during operation without the use of tools. RMU should be tested for internal arc fault test. The body of the RMU unit should be of stainless steel housing of thickness not less than 2mm and should be rust free. The supporting structures shall be made of hot dipped galvanized steel. The assembly shall be equipped with common power Busbars, 2 nos. Load break switches and 1 no. vacuum circuit breaker with Motorized Spring charging options for Circuit Breaker and Load Break Switches as specified.

I. Load Break switches /Isolators:

- The isolator shall be SF6 insulated, triple pole, spring assisted manually operated type with quick break contacts. The isolator shall be contained in sealed SF6 enclosure made of stainless steel. SF6 gas pressure gauge shall be provided for pressure indication purpose.
- The isolators should be designed for 12KV, 3 phase 50 Hz and should have continuous current rating of 100 Amps. All connections including band joints for busbars etc. shall be of ample cross section to cater to the rated load current continuously and shall be suitable for short time rating of 25KA for 3 sec.
- The isolator shall be capable of breaking rated full load current and shall have fault making capacity of 52.5 KA peak.
- The operating handle shall have three positions "ON", "OFF", and "EARTH" which shall be clearly marked with suitable arrangement to padlock in any position. A safety arrangement for locking shall be provided by which the isolator operation shall be prevented from "ON" position to "EARTH" position or vice versa in a single operation.
- Integral cable test terminals and test plug with clear identification mark and with interlocked cover shall be provided. The interlocks shall be so arranged that, the cable test terminals will be accessible only in the 'EARTH' position of the isolator
- To facilitate testing of cables, it shall be possible to bring the isolator to OFF position while the test plugs are kept inserted, but operation to ON position shall be prevented so long the cable testing is in progress.

II. Vacuum circuit breaker with SF6 insulated enclosure:

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The 3 pole 12KV, 630 amps circuit breaker with integral protection system for the protection of Distribution transformers shall be enclosed in the main tank. The circuit breaker shall operate on rotating arc principle and shall have three operating positions i.e. On, Off & Earth. The function shall be naturally interlocked to prevent the main and earth switch from being switched 'ON' at the same time and the CB is not allowed to trip in 'Earth On' position. The selection of the main/earth switch lever on the fascia, which is allowed to move only if the main or earth switch is in the off position. The lever may be padlocked in either the main/off/earth position.

The SF6 circuit breaker shall have rupturing capacity of 350 MVA symmetrical at 12KV three phase voltage.

III. Bus bars: The bus bars shall be SF6 insulated type and shall have continuous rating of 630 amps.

IV. Cable Boxes:

All cable boxes shall be air insulated suitable for dry type cable terminations. The cable at each of the two ring switches shall be suitable for HV cables of size 3C x 185 sq.mm and circuit breaker cable suitable for up to 3C x 185 sq.mm. Necessary Right angle Boot should be supplied to the cable terminations. The internal arc fault test on cable box shall be carried out for 12KV system for 25KA for 3 second. The clearance between phase to phase and phase to earth shall be as per IS. 1 no. Space heater shall be provided in the cable box with separate on/off 'toggle' switch.

3.2 APPLICABLE STANDARDS

- I. IS/IEC 62271 :High-Voltage Switchgear and Controlgear
- II. IS/IEC 62271_Part 102 :High-Voltage Switchgear and Controlgear Part 102 Alternating Current Disconnectors and Earthing Switches
- III. IS/IEC 62271_Part 100 :High-Voltage Switchgear and Controlgear Part 100 Alternating Current Circuit Breakers
- IV. IS 16227_Part 1 :Instrument Transformers Part 1 General Requirements

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- V. IS 16227_Part 2 :Instrument Transformers Part 2 Additional Requirements for Current Transformers
- VI. IS 2705_Part 1 :Current transformers: Part 1 General requirements
- VII. IS 13072-1991 : Specification of Technical Grade Sulphur Hexafluoride SF6 for Use in Electrical Equipment purposes
- VIII. IS/IEC 60273: Characteristic of Indoor and Outdoor Post Insulators for Systems with Nominal Voltages Greater than 1 000 V.
- IX. IS/IEC 60137 : Insulated bushings for alternating voltages above 1000 Volts
- X. IS/IEC 60947_Part 1: Low-voltage switchgear and control gear :Part 1 General rules
- XI. In addition to above, the RMU shall also comply with various relevant provisions of Central Electricity Authority Regulations and Indian Electricity Rules 1956.

3.3 SERVICE CONDITION

The 11 KV SF6 gas insulated switchgear & its accessories to be supplied against this specification shall be required to operate satisfactorily and continuously under the following tropical conditions.

- I. Maximum Ambient Air Temperature: 50° C
- II. Minimum ambient air temperature: 2° C
- III. Average daily ambient air temperature: 40° C
- IV. Maximum Relative Humidity: 80%
- V. Maximum wind speed: 44 m/sec
- VI. Average Annual rainfall: 1000mm
- VII. Seismic Zone: 3
- VIII. Maximum soil thermal resistivity: 150°C cm/watt
- IX. The overall climatic condition is moderately hot, humid, dusty and saline, conducive to rust and fungus growth.

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3.4 SYSTEM DESCRIPTION

The RMU shall be suitable for outdoor installation on 3-phase, 50 Hz, 11KV distribution network. The RMU shall be connected to 11KV Underground network.

- I. System voltage: 11 KV
- II. Nominal system voltage: 12 KV
- III. System frequency: 50 Hz
- IV. System Earthing: Non-effectively neutral earthed system.

3.5 ALLOWABLE POWER SUPPLY VARIATIONS

- I. Voltage: +10% and -10%
- II. Frequency: $\pm 2\%$ (49 Hz to 51 Hz)
- III. Power Factor: Zero (Lag) - Unity - Zero (Lead).

3.6 DESIGN

- I. The 11 KV SF6 Gas insulated RMU shall be fully arc proof, metal enclosed, free standing, floor mounting, consisting of modules assembled into one unit. RMU shall be made of a cubicle sealed-for life with SF6 and contains all high voltage components sealed off from the environment.
- II. SF6 tank of RMU shall be constructed from robotically welded Non Ferrite, Non Magnetic grade of stainless steel (SS-304) with 2.5 mm (min.) thickness to ensure a very high degree of precision in sealing of SF6 tank.
- III. The SF6 tank of RMU shall have a pressure relief device. In case of an internal arc, high pressure hot gases are allowed to be exhausted out from the bottom/top of the RMU. A controlled direction of flow of the hot gas shall be achieved.
- IV. Load breaker switch, Circuit breaker and bus bar assembly shall be contained in a stainless steel tank filled with SF6 Gas. The tank shall be robotically welded to meet the sealed pressure system criterion in accordance with the IEC 62271-200.
- V. The design of RMU shall be such that there shall not be any requirement of refilling of gas throughout the expected operating life of 30 years. Sealed pressure system are completely assembled, filled and tested in the factory. The maximum leakage rate of SF6 gas shall be lower 0.1% of total initial mass of SF6 gas per annum. The filling pressure for the switchgear shall be just above the

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atmospheric pressure so as to reduce the tendency to leak. SF₆ gas used for the filling of RMU shall be in accordance with IEC 60092-376.

- VI. The Ring Main Unit shall be of single bus bar SF₆ gas insulated outdoor, tropicalized and metal enclosed type. The RMU shall be installed in hot, humid, saline tropical atmosphere. All equipment accessories and wiring shall be provided with tropical finish to prevent fungus growth.
- VII. The RMU shall be compact in construction and suitable for outdoor installation with / without any further covers/protection.
- VIII. The RMU shall be complete with all connection and copper bus bar with continuous current carrying capacity of 630A. The bus bar shall be fully encapsulated by SF₆ gas inside the steel tank. There shall be continuity between the metallic parts of RMU and cables so that there is no electric field pattern in the surrounding air, thereby ensuring the safety of people. The earth bus bar should be preferably enclosed in an enclosure to prevent theft/ tampering. The RMU body shall be earthed with 50 mm x 6 mm GI strips.
- IX. The enclosure shall be IP 67 and type tested for weather proof at recognized Test Laboratory.
- X. The RMU shall be tested for Internal Arc as per IEC 622701 - 200 and to have the facility to have a safe evacuation of gases.
- XI. The base of the enclosure shall be made with material of adequate thickness and with proper surface treatment suitable for outdoor installation.
- XII. Suitable temperature rise test on the RMU with enclosure shall be carried out and test reports shall be submitted along with the offer.
- XIII. All live parts except for the cable connection shall be insulated with SF₆ gas.
- XIV. The RMU shall be capable of continuous operation of rated output under the operating conditions of voltage and frequency variations as per statutory limits governed by relevant Indian Standard and its amendments in force.
- XV. The design material construction shall be such that to secure reliability, economy, safe and convenient operation and shall include all specified or unspecified incidental items necessary for similar equipment for convenient working in every respect.
- XVI. All materials used shall be of the best quality suitable for withstanding variations of temperatures and atmospheric conditions without undue deterioration or setting up of undue stresses anywhere. All mountings should be so designed as

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to avoid collection of water anywhere. All connections and contacts shall be of ample cross sections and surface for carrying specified currents continuously without undue heating and shall be secured by nut bolts, screws with adequate loading arrangement.

- XVII. All measurable parameters like including Dimensions, Weight, Electrical Conductivity of Bus bars, Paint thickness etc. shall follow normal distribution curve with average of specified values

3.7 INTERLOCKS

- I. The RMU shall be identified by an appropriate sized label which clearly indicates the functional units and their electrical characteristics. The RMU shall be designed to be temper proof so as to prevent access to all live parts during operation without the use of tools.
- II. All parts of main circuit to which access is required or provided shall be capable of being earthed prior to becoming accessible. This does not apply to removable parts which become accessible after being separated from the switchgear and control gear. The cables shall be earthed by an earth switch with short circuit making capacity in compliance with IEC 62271-102. The earth switch can only be operated when the main load breaker switch/circuit breaker is open. The earth switch shall be fitted with its own operating mechanism and manual closing shall be visible in the closed position through transparent covers. Mechanical interlocking system shall prevent access to the operating shaft to avoid all operator errors such as closing the earth switch when the load break switch is closed or when cable is charged.
- III. In addition to interlocking that prevents access into compartments, the following interlocking shall be provided.
 - A. Operation of load break isolator/circuit breaker cannot be performed when
 - i. Load Break Isolator /Circuit breaker is padlocked.
 - ii. Earthing switch is in the closed position.
 - B. Operation of an earthing switch cannot be performed when the Load Break Isolator/circuit breaker is in closed position.

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- C. Suitable interlocks shall also be provided for cables test terminals on the orifices will be accessible only in circuit “earth” position to prevent operation from “ON” position to “Earth” position or vice versa in a single operation.
- IV. All mechanical interlock of RMU shall be internal part of RMU enclosure so that it cannot be accessed or tampered from outside.

3.9 REMOTE OPERATION OF THE RMU

- I. Remote operation of the RMUs line switches shall be possible using motors fitted to the operating mechanism for the both line-switches and branch circuit-breaker functions in future. It shall be possible to provide the motors to switches / breaker functions with RMU in service condition.
- II. The doors of RMU compartments shall be provided in such a way that operation of RMU switches is not blocked with doors full open.

3.9 SAFETY

- I. Extensive interlocking shall be provided to prevent inadvertent wrong operation.
- II. Each of the switchgears shall be identified by an appropriately sized label, which clearly indicates the functional units and their electrical characteristics.
- III. The Switchgear shall be so designed that the position of the different devices is visible to the operator.
- IV. In accordance with the standards in effect, the switchboard shall be designed so as to prevent access to all live parts during operation without the use of tools.
- V. The SF6 tank of RMU shall 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 are allowed to be exhausted out at the bottom/top of the RMU. A controlled direction of flow of the hot gas shall be achieved.
- VI. All manual/electrical operations will be carried out from front of RMU.

3.10 EARTHING

- I. The RMU shall have a common earth bar. The earth bar shall be bolted to the main frame and located so as to provide convenient facilities for earthing cable sheaths and / or for coupling earth bars of adjacent units. The system earthing shall be such that at least one of the neutral points of a three phase system is

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permanently solidly earthed. It shall not be possible to remove the earth bar during operation.

- II. All panel and access covers or doors etc. rotating about hinges shall be earthed to the adjacent main frames by copper / hot dip galvanized flexible protective bonding conductors.
- III. The frame of each switch shall be provided with reliable earthing terminal having a clamping screw of not less than 12 mm in diameter.
- IV. All the earthing terminals shall be inter-bonded for equal potential and brought to main earthing terminals.
- V. The earthing conductor or strip mainly of copper/ hot dip galvanized steel shall be mechanically protected, anti-corrosive and shall be of adequate size.
- VI. The supplier shall provide specific nut-bolt arrangement inside the cable compartment box for earthing of cable which is directly connected with the earthing strip of RMU.

3.11 LOAD BREAK SWITCHES

- I. The technical particulars of the load break switches are as under:
 - a. Construction per phase :SF6-Single break
 - b. Number of poles :Three
 - c. Current capacity :630A
 - d. Short circuit current making capacity :50 KA(peak)
 - e. Breaking capacity normal load current :630A @ 0.7 PF
 - f. Short time rating :21 KA for 3 Sec
 - g. Short circuit breaking current :20 KA
 - h. Impulse withstand voltage to earth between poles :95 KV Peak
 - i. Power frequency withstand voltage to earth and between poles :38 KV RMS
- II. The Each load break Switch shall be of SF6 gas insulated type with gas both as insulating and interrupting medium.
- III. Each load break Switch shall be of the triple pole, simultaneously operated, with quick break contacts and with integral earthing arrangement.
- IV. The mechanism of the Switch shall be quick-break and quick-make type, the speed of operation being independent of operation force with mechanically operated indicator.

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- V. Each load break Switch shall be fitted with a direct manually operated mechanism having three positions, "ON", "OFF" and "EARTH" provided with mechanical indication and pad locking facility. All operating handles shall be located on the front panel of the Ring Main Unit.
- VI. Each Load Break Switch shall have Interlocks between Load Break Switch to Earth Switch and Earth Switch to Cable Compartment door.
- VII. The operating mechanism shall be maintenance free without the need for any lubrication during its lifetime.
- VIII. Load break switch shall be suitable to install motor for purpose of remote operation in future. However, manual operation of load break switch shall be possible locally.

3.11 CIRCUIT BREAKER

- I. The technical particulars of the circuit breaker are as under:
 - a. Construction :Contact make & break should be in Vacuum Interrupter Bottle place in Hermitically sealed in SF6 Tank.
 - b. Current capacity :630 A
 - c. Rupturing capacity :21 kA
 - d. Making capacity :50 kA
 - e. Short time rating :21 kA for 3 Sec
 - f. Impulse flashover withstand voltage :95kV peak
 - g. Power frequency withstand voltage :38kV (rms)
 - h. Current transformers :03 Nos.
 - i. Class of accuracy for core :5P10
 - j. CT ratio :40-80/1A
 - k. VA burden :2.5 VA
- II. The breaker shall be provided with protection relay with series trip coil and shunt trip coil for protection of distribution transformer.
- III. Relay shall have separate trip contacts for O/C and E/F.
- IV. The protection relay shall be of plug-in type.
- V. The total breaking time for transient fault should not exceed 60-80 ms (CB + Relay+ trip coil).

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- VI. Protection CT shall be preferably bushing mounted.
- VII. The circuit breakers Function shall be provided with interlocks between Disconnector to Breaker, Disconnector to Earth switch and Earth switch to Cable compartment door.

3.12 CABLES AND CONNECTORS

- I. The cable termination shall be suitable for 3-core / 1-core XLPE cables having conductor sizes up to 300 mm². The cable termination shall be bolted type and the height of cable termination shall be 1070 mm.
- II. The cable entry points of the cable termination chambers shall be provided with suitable water sealing arrangement. All additional holes shall be provide and covered with knockout arrangement to prevent the entry of any living creature.
- III. The bidder shall provide adequate cable terminal protectors for cable termination suitable for 3-core / 1-core XLPE cables having conductor sizes up to 300 mm² along with each unit.
- IV. Cable gland base plate of Isolator and Circuit breaker shall be split type, comprise of two plates with one fix plate and the other removable plate. So that, Cable can be removed/Insert horizontally.

3.13 OPERATING HANDLES

- I. An anti-reflex mechanism on the operating lever shall prevent any attempts to reopen immediately after closing of the switch or earthing switch.
- II. All manual operations will be carried out on the front of the switchboard.
- III. The effort exerted on the lever by the operator should not be more than 250 N for the switch and circuit breaker.
- IV. 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° apart.
- V. Mounting arrangement for operating handle of Ring main unit shall be in RMU compartment.

3.14 FRONT PLATE COVER

- I. The front plate shall include a clear mimic diagram which indicates different functions of operation.

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- II. The position indicators shall give a true reflection of the position of the main contacts. They shall be clearly visible to the operator.
- III. The lever operating direction shall be clearly indicated in the mimic diagram.
- IV. The manufacturer's plate shall include the switchboard's main electrical characteristics.
- V. The slots & cutout provided on front plate cover for Load Break Switch and Breaker for insertion of operating handle as well as interlock lever mechanism, SF6 gas level indicator etc. shall be ensured for its proper alignment.
- VI. Proper Indication labels to be provide for each Function's equipment's i.e. Earth Switch, Load break Switch, Breaker and Disconnecter (Off Load Switch).
- VII. Operation Instruction & Dos & Don'ts shall be provided in inner-side of the Front door of enclosure of RMU in English and Hindi language.
- VIII. Pocket type arrangement shall be provided for RMU keys

3.15 DANGER BOARD:

- I. The danger Board plate as per relevant IS shall be riveted on the front plate of the RMU.
- II. Indication marking of "LIVE" with suitable symbol shall be provided on each cable box cover.

3.16 FAULT PASSAGE INDICATOR

- I. RMU shall have individual fault passage indicator for 3 way non-extensible RMU (i.e. One circuit breaker and two load break switches).
- II. These shall facilitate quick detection of faulty outgoing circuit. The fault indication may be on the basis of monitoring fault current flow through the device.
- III. Fault passage indicator shall be plug-in type to enable quick replacement.
- IV. It shall have separate potential free contact for Short circuit, Earth fault indication and shall have remote reset facility by giving 24V DC pulse.

3.17 ENCLOSURES

- I. Inner enclosure (SF6 gas tank).

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SS Tank shall be compatible for exposing in chemical polluted environment. If any additional external paint is to be applied on outer exposed surface then same shall be treated accordingly to ensure the compatibility with Chemical polluted environment.

- II. SF6 gas
 - a. SF6 gas conforming to IEC 60376 should be used for the dielectric medium.
The filling shall be sufficient for lifetime.
 - b. The SF6 shall be tested for purity, dew point, air hydrolysable fluorides and water content as per relevant IEC standards and test certificate shall be furnished along with the delivery of the equipments.
 - c. The switchgear shall be tested according to IEC recommendations. The recommended working pressure and the lowest possible pressure where the switchgear can be operated shall be stated.
 - d. 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.
 - e. The manufacturer shall give guarantee for maximum leakage rate of SF6 gas will be lower than 0.1 % per year.
 - f. 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.
 - g. Manometer/ Density meter shall be provide for monitoring the Gas pressure.
Same shall be visible on front cover plate.

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- h. Manometer/ Density meter shall have the scale for pressure with green and red zone inbuilt Indication. The same shall be provided with potential free contact for SCADA integration.
- i. In case of magnetic coupling type of SF6 gas level indicator, resetting of mechanical flag for gas level indicator shall be possible without opening the front cover plate.
- j. The supplier shall provide NRV (Non-Return Valve) on SF6 tank gas to fill the gas in case of low gas pressure found inside the SF6 tank which shall be accessible only after opening front plate cover.

III. Outer Enclosure

- a. The RMU enclosure (Outer) shall be made up of CRCA of 3 mm thickness or galvanized of 1.6 mm thickness. The complete RMU enclosure shall be of degree of protection IP 54 (Main Door Close) and IP 41 (Main Door open).
- b. The 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 coated with Aztec Grey color. Each switchboard shall be identified by an appropriately sized label which clearly indicates the functional units and their electrical characteristics.

3.18 PADLOCKING ARRANGEMENT

Provision shall be made for padlocking the load break isolator / Circuit Breaker and the Earthing switches in either open or closed position. Also padlocking arrangement shall be provided for the RMU panel.

3.19 TERMINAL CONNECTORS

- I. Terminal connectors to be used for auxiliary and control wiring connections shall be of push in type.

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- II. The test terminal connectors shall be of high grade non-hygroscopic, low tracking property fire resistant, made of high grade engineering plastic have terminal holes and shall be of sufficient size to accommodate suitable size of solid copper conductor.

3.20 AUXILIARY AND CONTROL WIRING

- I. The wiring shall be of high standard and shall be able to withstand the tropical weather conditions. The wiring cable must be standard single-core non-sheathed, Core marking (ferrules), stripped with non-notching tools and fitted with end sleeves, marked in accordance with the circuit diagram with printed adhesive marking strips.
- II. The wiring shall be carried out using multi-strand copper conductor super flexible PVC insulated wires of 1100V Grade for AC Power, DC Control and CT circuits. Terminal should be suitably protected to eliminate sulphating. Connections and terminal should be able to withstand vibrations.
- III. The position of PVC carrying trough and wires should not give any hindrance for fixing or removing relay casing, switches etc., Wire termination shall be made with solder less crimping type of tinned copper lugs. Core identification plastic ferrules marked to correspond with panel wiring diagram shall be fitted with both ends of each wire. Ferrules shall fit tightly on the wire when disconnected.
- IV. The wire number shown on the wiring shall be in accordance with the IS 375.
- V. All auxiliary and control cables shall be of Flame retardant low smoke type confirming to IS 1554-1999.
- VI. All wires for identification of auxiliary and control wiring shall be as per following color codes
Sr. Type of Wiring Size of Wire Color code
1 AC Circuit 1.5 Sq mm, 1.1KV, FRLS, PVC insulated cable Black 5
2 DC circuit 1.5 sq mm, 1.1KV, FRLS, PVC insulated cable Grey
3 Potential Free contacts 1 sq mm, 1.1KV, FRLS, PVC insulated cable White

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- VII. Wiring of Trip circuit shall be identical and shall be provided with Red Sleeves at each ends.

3.21 FASTENERS

- I. All bolts, studs, screw threads, pipe threads, bolt heads and nut bolts shall comply within the appropriate Indian standards for metric threads.
- II. Bolts or studs shall not be less than 6mm in diameter except when used for small wiring terminals.
- III. All nuts and pins shall be adequately locked. Wherever possible bolts shall be fitted in such a manner that in the event of failure of locking resulting in the nuts working loose and falling off, the bolt will remain in position.
- IV. All ferrous bolts, nuts and washers placed in outdoor positions shall be treated to prevent corrosion, by hot dip galvanizing, except high tensile steel bolts and spring washers which shall have electrolytic action between dissimilar metals.
- V. Each bolt shall project at least one thread but more than three threads through the nut. If bolts and nuts are placed so that they are inaccessible by means of ordinary spanners, special spanners shall be provided.
- VI. The length of the screwed portion of the bolts shall be such that no screw thread may form part of a shear plane between members.
- VII. Taper washers shall be provided where necessary.
- VIII. Protective washers of suitable material shall be provided on front and back of the securing screws.

3.22 WARRANTY

- I. The bidder shall stand warranty of one year from the date of commissioning towards design, materials, workmanship & quality of process / manufacturing of

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items under this contract for the due and intended performance of the same, as an integrated product delivered under this contract.

- II. In the event of any defects observed during the period. The bidder shall be liable to undertake to replace/rectify such defects at their own cost within the mutually agreed time frame up to the satisfactory level, failing to which the Port will be at liberty to get it replaced / rectified at bidder's risk and costs. The Port will recover all such expenses plus purchaser's own charges from the bidder's performance bank guarantee, as the case may be.

4. SPECIAL TERMS AND CONDITION:

- I. The contractor at his own cost may visit MPA site, if necessary before quoting for the tender.
- II. Power supply and water shall be provided to contractor free of cost from the nearest available point for execution of the work. However, the supply cable/ necessary pipe has to be arranged by the contractor.
- III. All the material, tools, tackles and equipment required for execution of the work shall be arranged by contractor at his own cost. Crane if available shall be provided by the Port on chargeable basis.
- IV. After completion of the subject work, the contractor shall clear the area of any unwanted scrap while handing over.
- V. Work shall be carried out following all environmental norms.
- VI. Contractor shall follow all safety regulations as per relevant and prevailing standards.

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ANNEXURE-II

Name of the Tender: “**SUPPLY INSTALLATION TESTING COMMISSIONING OF 11 KV RING MEAN UNIT AT HEADLAND SUBSTATION**”

| Sr. No. | Description of work | Unit | Qty. | Rate per Unit (Rs.) | Amount (Rs.) |
|----------------|---|-------------|-------------|----------------------------|---------------------|
| 1. | Design, fabricate, supply, installation, testing and commissioning of 11KV, 630 Amps, outdoor type SF6 RMU with one circuit breaker and two Load Break switch complete including civil work like plinth etc as per the Technical specification. | | | | |
| a | Supply | No. | 1 | | |
| b | Installation, testing and commissioning | No. | 1 | | |
| | Total | | | | |

(In words Rupees _____ only)

Date:

Signature:

Place:

Name:

Address:

Office Seal of firm

Note: The offered rates shall be exclusive of GST.