7.7.1.2.4 D.C System

For D.C. motor driven auxiliaries, tripping, indicating lamps and controls.

Normal battery voltage	...	110V nominal for new sub-stations.
Tolerance on rated voltage	...	+ 10%, -15%
Voltage at various existing sites		30V, 48V, 110V, 220V, 250V.

For Supervisory and Telecommunications

Nominal System Voltage	...	48V
Normal float charge voltage	...	53V
Tolerance on rated voltage	...	+1V, -7V

Climatic Conditions

All plant and equipment supplied under the Contract shall be entirely suitable for the climatic conditions prevailing at site.

The area is close to sea level and is in a tropical climate. The ambient temperature variation is between 5^0C and 40^0C with periods of high humidity.

The area is designated a zone of moderate intensity for earthquakes.

The seismic factor is 0.15 g.

Atmospheric pollution is mid level and special insulator design or washing is not required.
The area is subject to high winds of typhoon strength.

Maximum ambient shade temperature	...	40^0C
Minimum ambient shade temperature	...	5^0C
Maximum daily average temperature	...	35^0C
Maximum annual average temperature	...	25^0C
Maximum wind velocity (3 second gust)	...	160 Km/h
Minimum wind velocity for line rating purposes	...	1.6/3.2 Km/h (33/132kV)
Solar radiation	...	100mW/sq. cm
Rainfall	...	2.5 m/annum
Relative humidity, maximum	...	100%
average	...	80%
Altitude	...	less than 150m
(No ice or snow expected)		
Atmospheric Pollution	...	mid level
Soil type	...	alluvial
Soil temperature (at 1.1m)	...	30^0C
Soil thermal resistivity	...	1.5^0C m/w
Isokeraunic Level (Thunderstorm days)	...	80

The information in this Clause is given solely for the general assistance of Bidders and no responsibility for it will be accepted nor will any claims based on this Clause be considered.

Facilities and Transport to Site

Chittagong is the principal port of entry for material to Bangladesh. Inland transport from Chittagong to Dhaka, Khulna and Barishal area can be by barge, rail or road; barge and rail being the more usual methods employed.

The Contractor is responsible for performing all unloading, inland transportation and obtaining all approvals and consents etc. necessary for the movement of plant (substation) and contractor's equipment from the port to the site.

All necessary access roads, jetties or off-loading points etc. required for the transport of the plant etc. to site will be the Contractors responsibility.

Where heavy loads are to be moved the Contractor shall be responsible for performing surveys of the routes to ensure that all portions have adequate load-bearing capacity.

A comprehensive method statement shall be submitted to the Engineer detailing the proposed transport route(s) and requirements. Plans indicating all bridges, ducts, culverts, railway crossings, overhead lines, water mains etc. their load bearing capacity or clearances as appropriate shall be given together with proposed means of achieving the transportation requirements. Any reinforcement, strengthening, modifications or temporary works required to obtain the necessary capacity shall be the responsibility of the Contractor. The cost of the above is to be included in the Bid price.

No plant is to be consigned to Bangladesh by airfreight without the prior written approval of the Employer.

7.7.1.3 Documentation and Customs Duty

7.7.1.3.1 Documentation

In order for the Employer to obtain the necessary import permits and satisfy the requirements of the customs authorities the following documentation is required.

Within 60 days of the award the Contract the Contractor shall submit a detailed schedule of Plant he is to provide under the contract indicating the type of equipment and the name of the manufacturer. Seven copies of the schedule are to be submitted to the Engineer.

On shipment of plant the following distribution of documentation is required as below:

(a) To the Project Director, EAUPDSP, WZPDCL, Khulna.

- 7 Copies of Commercial Invoices- Endorsed by the Contractor
- 1 Negotiable plus 7 copies of Bill of Lading-Endorsed by the Contractor.
- 7 Copies of Insurance Certification
- 7 Copies of packing lists
- 7 Copies of Freight Account
- 7 Original plus 6 copies of Certificate of origin
- 7 Copies of Insurance Invoice
- 7 Copies of Application for Payment

Exemption of Customs Duty

All Plant and Contractor Equipment imported to Bangladesh by the Contractor will be subject to Bangladesh import and customs duties.

The Contractor shall be responsible for and bear the cost of the payment of all duties and obtaining all permits and licenses for contractors Equipment. Should any plant be transported by air-freight without the prior written approval of the Employer the Contractor shall be responsible for, and bear the cost of all import and customs duties, etc. for the airfreight consignment. It is the Contractor's responsibility to ensure that all negotiable shipping documentation and all necessary import information is forwarded to the Employer so that it is received by him in Bangladesh at least 20 days before arrival of the ship in the Bangladesh port. Demurrage and any other charges resulting from the lack of documents or incorrect documentation received in Bangladesh shall be on the Contractor's account.

Shipping Schedule

After factory material orders are placed the Contractor shall forward to the Engineer a shipping schedule and this schedule shall be continually updated in line with the current manufacturing and shipping programmers and shows planned and actual progress.

7.7.1.4 Standards and Code Not Specified

Where not specified, IEC Standard and Bangladesh National Code (BNBC) shall be applicable

7.7.1.5 Units of Measurement

In all correspondence, in all technical schedules, on all drawings and for all instrument scales, S.I. units of measurement are to be employed. Angular measurement shall be in degrees with 90 degrees forming a right angle.

7.7.1.6 Erection and Checking at Site

As each part of the Works is erected, the Contractor shall seek the Employers approval that the works have been constructed in accordance with the specification and approved drawings.

For purposes of progress payments for site work a monthly and cumulative system of joint measurement of work done for each Section of Work shall be set up by the Contractor in a manner approved by the Employer.

Any works constructed prior to the issue of drawings approved by the Employer for the particular works may not be included in the percentage completion figures.

The Contractor is to provide such protection and watchmen as he may consider necessary to safeguard his materials and stores. The Employer will not accept responsibilities for any loss or damage, which may occur during the execution of the contract.

The carrying out of all the work included in the Contract shall be supervised by a sufficient number of qualified representatives of the Contractor, and full facilities and assistance shall be provided to the Employer to check the Works. The Contractor shall obtain from the Employer details of the works that he proposes to inspect, but such inspection shall in no way exonerate the Contractor from any of his obligations. The Contractor, if required by the Employer, shall open for inspection before erection any equipment, which has been delivered to the site partly assembled.

On completion of the Works the Site shall be left clean and tidy to the satisfaction of the Employer. Any damage done to buildings, structures, plant or property belonging to the Employer shall be made good at the Contractor's expense.

The Contractor shall ensure the correctness of electrical and mechanical connections to all equipment supplied under the Contract before such equipment is commissioned.

During erection and commissioning the Contractor shall provide all temporary scaffolding, ladders, platforms with toe boards and hand-rails essential for proper access of workmen and inspectors, cover or rail off dangerous opening or holes in floors, and afford adequate protection against materials falling from a higher level on a person below.

The maximum personal safety must be afforded to personnel either directly engaged on this Contract or who in the normal course of their occupations find it necessary to utilize temporary works erected by the Contractor or to frequent the working area.

In each and every case involving a connection between the Plant supplied under this Contract and any other existing plant which may or may not be in service, the Contractor must make suitable arrangements as regards the time and manner in which the connection is made subject to the approval of Employer's Representative who is in charge of the existing plant. Where cases arise involving the operation of the plant or work on plant in operation or whenever required by the Employer's Representative, the Contractor must obtain a written "Permit to Work" signed by a person duly authorized by the Employer.

7.7.1.7 Contractor's Responsibilities

7.7.1.7.1 Planning of Works

Within 30 days after acceptance of the Bid, the Contractor shall prepare, in an agreed form, a detailed Manufacture, Delivery and Erection Program Chart for the complete Contract Works, and shall submit the chart to the Employer for approval.

The Manufacture, Delivery and Erection Program Chart shall indicate for each major item of the Contract the various phases of work from the commencement of the Contract to its completion, e.g., design, ordering of materials, manufacture, delivery, installation and commissioning. The program shall include a fully comprehensive drawings production program which shall demonstrate the Contractors intended issue dates for approval.

These presentations shall be in bar chart and precedence critical path analysis format.

The program shall indicate percentage completion points of the various phases which can form the basis of progress reporting.

A cash-flow forecast of the estimated monthly invoice values shall be included in the program. This forecast shall take into account the terms of payment and indicate down-payments, release of retention's, etc. Figures may be rounded to the nearest thousands of the appropriate currency.

The Contractor shall indicate in the program the number, grade and discipline of supervisory and managerial site staff proposed throughout the site construction periods. If specialist erection and commissioning staff are to be employed by the Contractor details of the number, discipline and duration of visit of these staff are to be indicated in the program. The provision of this information will not form any contractual limit on the number of staff to be provided by the Contractor to ensure the timely completion of the contract. Should any incident occur which, in the opinion of the Contractor will result in an over-run of any section of the Works this shall be indicated in the program and brought to the Employers attention.

If, at any time during the execution of the Contract, it is found necessary to modify the approved Manufacture, Delivery and Erection program Chart, the Contractor shall inform the Employer and submit a modified chart for his approval. The submission, and subsequent approval, of a modified

Manufacture, Delivery and Erection program Chart shall not necessarily obviate or diminish the Contractor's responsibilities and liabilities under the Contract. The Chart shall be updated at monthly intervals and submitted to the Employer no later than the middle of each calendar month.

7.7.1.7.2 Progress Reports and Meetings

At monthly intervals after approval of the Plant Manufacture, Delivery and Erection Program Chart, the Contractor shall submit to the Employer updated bar chart programs and precedence critical path analysis networks in triplicate in an approved format indicating the stage reached in the design, ordering of material, manufacture, delivery and erection of all components of plant. In addition the Contractor will compile and submit "S-curves" based upon the approved program indicating programmed and actual percentage completion of the various stages of drawing approval, manufacture, shipping, civil works and erection for each section of the works plus the overall contract.

An updated cash-flow forecast indicating previously forecast and actual, involving levels together with revised future requirements shall be submitted quarterly. A graphical display in the form of an "S-curve" of the actual vs planned payment certification (on & offshore) shall be provided by the Contractor in triplicate on a quarterly basis to supplement the basic cash flow information.

If, during execution of the Contract, the Employer considers the progress position of any section of the work to be unsatisfactory, or for any other reason relating to the Contract, he will be at liberty to call meetings, either in his Head Office or at Site. If required by the Employer, a responsible representative from the Contractor's works is to attend at the Contractor's expense such meetings with sufficient authority to issue instructions or effect an alteration in the works to the satisfaction of the Employer.

Access to the Contractor's and Sub-Contractor's works is to be granted to the Employers representative at all reasonable times for the purpose of ascertaining progress.

7.7.1.8 Sub-contracts and Orders

As soon as practicable after entering into Contract the Contractor may, having obtained the Engineer's consent, enter into the sub-contracts he considers necessary, for the satisfactory completion of the Contract Works. Three un priced copies of the Contractor's sub-orders shall be supplied to the Engineer.

One copy of any drawings where the sub-order shall refer shall also be submitted. Each sub-order and drawing shall contain the following reference and an instruction that the plant is subject to inspection and tests to be witnessed by the Engineer or his agent with sufficient authority to issue instructions, or effect an alternation in the Works to the satisfaction of the Engineer.

Approval by the Engineer of Contractor's sub-orders shall not relieve the Contractor of his responsibilities in meeting this specification. It is the Contractor's responsibility to ensure that a full specification based on the relevant information in the contract is passed to the sub-contractor.

The Contractor will be responsible for progressing the Sub-Contractor's works including visits to the works to ensure the work as to programme, specification, quality and drawings and to witness all necessary routine, sample and type tests. The cost of this Contract control is deemed to be included in the Contract Sum.

7.7.1.9 Training for Employer's Staff

The Contractor, without additional cost will train the Employer's employees in the operation and maintenance of the plant. This training is to be carried out in Khulna as formal instruction courses on each of the various types of plant being provided. The attendance of WZPDCL staff during erection and commissioning works will not be acceptable as an alternative to the formal training courses. Course notes and handbooks as appropriate are to be issued to attendees, and full reference is to be made to the Operation and Maintenance manuals issued by the Contractor.

Importance shall be emphasized on the following particulars but not limited to during training:-

Routine Operation, Maintenance and troubleshooting, Testing and Repair of:-

Switchgear and control equipment

Transformers, including use of oil treatment plant

Control equipment, metering and alarm equipment

Protection equipment

Underground cables, sheaths, etc.

Earthing

Substation Automation System

Building Services

DC and LV AC systems.

In addition, full instruction is required in the stripping down, repair or replacement of components, reassembly, operation testing and re-commissioning of switchgear and transformers.

The employer's operational staffs are to be instructed in operational procedures, i.e., switching fault reporting, sequence of operations following fault occurrence etc. Practical demonstrations and simulated events are to be performed in the control rooms provided, and the contractor is to monitor and advise the employer's attendants during substation energization and initial commercial operation. This training is required to ensure that the Employers staffs are made fully familiar with the plant operational design, maintenance procedures, etc.

The Contractor shall arrange foreign training for (i) 12 (Twelve) Employer's engineers on Protection Scheme as well as offered Protective devices at manufacturer's premises/factory and offered Substation Automation System (SAS) at Automation system manufacturer's premises/factory for a period of 02 (two) weeks (excluding travel time) at manufacturer's premises/factory. The training shall also include the field visit during training for practical

operation. The training program on Substation Automation System (SAS) also includes the installation & configuration of automation software. The full training programme is to be approved by the employer/engineer prior to commencement.

The cost of Air Tickets (both way) from Bangladesh to Manufacturer's Country, Hotel Accommodation, fooding and lodging etc. will be borne by the contractor. Other than this, the contractor will pay a standard amount of pocket money (Euro 100) per day (including journey period). All the cost of this purpose shall be deemed is included in the offered price.

If the country of origin of equipment (Manufacturer Country) is more than one, the training shall be held at prime equipment manufacturer country.

The contractor shall also to arrange a local training program on Substation Automation System and Protection Scheme as well as offered Protective devices for twenty (12) operators for Seven (7) days. This should include training on operation & control of the automation software and protective device. The Contractor is to report on the capability and progress of each trainee at the completion of their training periods. All cost of local training including accommodation, transport and fooding will be bear by the contractor.

7.7.1.10 Packing and Erection Marks

Each item is to be export packed and properly protected for shipment, transport and storage in the port area and for transport to and storage on Site.

All Plant provided under this Contract shall have the packing marked in the following manner.

A green band shall be painted all around each package**.** The band shall be 8" wide or ¼ of the length of the packing whichever is the less. Each package should have the following information printed on it in bold letters: -

(a) Port of Loading

(b) Name of Consignee

(c) Purchase Order Number

(d) Brief description of Stores

(e) Number of Package

(f) Gross, tare and net weight

(g) Measurements

(h) Contractors Name

(i) Contract Tittle

(j) Contract Number

(k) port of Landing

All members comprising multipart assembles, e.g. steel frameworks, are to be marked with distinguishing numbers and/or letters corresponding to those of the approved drawings or materials lists.

Colour banding to and approved code is to be employed to identify members of similar shape or type but of differing strengths or grades.

Cases containing delicate items such as relays and instruments should carry a separate marking:

Sensitive equipment packages shall be opened in the presence of a representative of the Employer.

7.7.1.11 Spares

The Contractor is to propose comprehensive schedules of spare parts requirement for 5 years' service of the Plant.

Those Spare Parts required for routine maintenance are to be provided under this contract.

The Contractor shall provide detailed schedules of those emergency spares he considers that it would be prudent for the Employer to purchase in price schedule: Schedule no. 7 (Recommended Spare Parts) and those will not be included in the Bid Evaluation.

The Contractor shall guarantee and provide certificate from the manufacturers that spare parts for all plant shall be available for a minimum period of 10 years from contract completion.

The local currency element shall include all handling, local transport and delivery to a store or stores nominated by the Employer. Spares shall be handed over to the Employer as soon as they arrive on site, and shall be checked in the presence of the Employer's representative. The Contractor shall obtain a receipt for the material at the time of delivery to the Employer's stores.

Any spare material so ordered shall be strictly interchangeable with the parts which it is intended to replace, packed and treated in such a manner as to be suitable for storage in the climate at the Site for an indefinite period and each part shall be clearly marked for identification purposes, outside the package where applicable.

Schedules of spare materials in triplicate shall be handed over to the Employer arranged for the easy identification and checking of materials at the time of hand over. Prior to the handing over date for Contractor spares, the Contractor shall be responsible for all security arrangements and the safe custody of the spare materials.

In addition to the contract spares listed in Schedule of Price/BOQ the Contractor shall ensure that sufficient stocks of commissioning spares are available on site to enable the rapid correction of any defect discovered during site testing.

The provision of commissioning spares is the Contractors responsibility and the cost of these is to be borne by the Contractor. Contract spares are not be utilized as commissioning spares.

The Contractor shall submit to the Employers Representative, on a monthly basis, a complete schedule of the stock of commissioning spares available on site. In addition, the contractor shall provide a monthly return on all items, which have required replacement from the commissioning spares stock. The Employer or his Representative may require the Contractor to return any item of defective plant to the manufacturer for a report on the cause of failure.

7.7.1.12 Contractor's Local Agent

The Bidder shall state in his Bid the name and address in Bangladesh of his local Agent, if any.

7.7.1.13 Civil Works

7.7.1.13.1 Removal, Transport and Relocation of Existing Equipment.

Where it is necessary to move, dismantle, relocate, adjust, or rehabilitate any existing equipment in order to perform the work specified, the Contractor shall be responsible for performing this work and the cost is deemed to be included in the Contract Sum.

Where existing equipment is surplus to requirements the Contractor shall be responsible for the removal, dismantling, cleaning, coating with protective material to the Engineer's approval, packing and transporting the equipment to the Employer's stores.

Terminal Points

Cables within sub-station

Power and Multicore Cabling between Equipment within Sub-station i.e. 33 kV, 11 kV, LV, dc, etc. cabling between equipment within sub-stations shall be included in this Contract.

33 kV and 11 kV Outgoing Cables

The supply of cable boxes on the switchgear complete with cable lugs shall be provided under this Contract. The outgoing feeders from the 33 kV and 11 KV switchgears will not form part of this Contract unless otherwise specified.

7.7.1.13.2 Civil and Building Works

The civil works on this Contract shall include all demolishing, clearing, levelling, building, building services (small power, lighting, fans, fresh and foul water etc.) indoor and outdoor plant foundations, roads, concrete cable trenches and cable ducts within the site boundary repairing at all roads trenches.

7.7.1.14 Drawings, Diagrams and Calculations

7.7.1.14.1 General

The term "drawing" shall also include diagrams, schedules, performance curves, etc., required for the comprehensive design of the works. The Contractor shall be responsible for the provision of all drawings required for the various stages of the Contract. All drawings, apart from workshop drawings, shall be submitted to the Engineer for his approval, in accordance with an approved programme. The Contractor shall ensure that drawings are submitted for approval in good time such that they may be approved within the specified period by the Engineer prior to the manufacture or construction commencing. Further adequate time must be allowed by the Contractor to permit any comments made by the Engineer to be incorporated. Any works performed prior to approval of drawings by the Engineer will be entirely at the Contractor's own risk including any delays that may result from modifications being found to be necessary by the Engineer.

The Contractor shall be fully responsible for obtaining any drawing or data of existing plant and installations that he requires in order to carry out the works, and shall also be responsible for verifying that any drawings of existing plant and installations are accurate. The Contractor shall provide suitable drafting and other staff on site that he requires investigating and producing any drawings that he requires of existing equipment and installations in order to carry out the works. Any cost associated with these requirements is deemed to be included in the contract price.

Where existing installations have been modified or extended the Contractor shall provide complete new sets of drawings. In this respect the Contractor shall provide drawings detailing both the existing and new works and shall not limit the scope of the drawings to the new works only.

7.7.1.14.2 Format

Drawings are to be submitted for approval on paper prints, folded to A4 size with the project title block and drawing numbers fully visible.

All drawings are to be submitted on "A" series paper to ISO/5457. The maximum size of drawings shall be A1 except for site survey and layout drawings which may be submitted as A0 size sheets, if necessary, to accommodate details on a scale of 1:100. Single line diagrams and schematic drawings shall preferably be on a maximum sheet size of A2. All dimensional drawings shall be to the following scales and fully detailed.

1:1, 1:2, 1:5, 1:10 and factors of 10 thereof.

Drawings symbols shall be in accordance with IEC 117.

All drawings are to be submitted in Auto CAD format in CDR Disk.

Drawing titles shall clearly identify the specific function of the drawings and where appropriate the name of the site(s) to which the drawing applies.

7.7.1.14.3 Drawing Numbering and Revisions

The Contractor shall be responsible for adding the Engineers drawing numbers to all drawings prior to submittal. Following award of the contract the Engineer and Contractor will review the numbering system, familiarize each other with requirements, and agree on the numbering system to be applied.

Comprehensive cross-reference are to be included on drawings and the Contractor shall include the Engineer drawing number in the cross-references.

At each and every issue of a drawing the revision shall be raised, and details given in revision boxes on the drawings. Comprehensive details of revisions are to be given and phrases such as "REVISED", "UPDATED", "MODIFIED" or similar are not acceptable.

Reference to any drawing in communications shall include the Engineer's drawing number.

7.7.1.15 Operating and Maintenance Manuals

7.7.1.15.1 General

The Contractor shall be responsible for compiling operation and maintenance (O&M) manuals for each section of the Works.

Drafts of the manuals are to be submitted to the Engineer at least six weeks prior to the commencement of pre-energization commissioning checks on Site. Following examination the Engineer will forward copies of his comments to the Contractor to action prior to issuing Final O&M manuals. Final O&M manuals are to be available on site prior to the issue of Taking over Certificate.

Handling, installation, storage and transit instructions, in accordance with Clause 7 of BS 4884 part 1, which shall form part of the manuals, are to be available on site prior to the arrival of the Plant.

In addition to the compiled manuals, the contractor shall submit copies of brochures and other explanatory literature with drawings of the plant, which will assist the Engineer in approval of the drawings.

7.7.1.15.2 Contents

Operation and Maintenance manuals shall be prepared for the equipment supplied for substation. The content and presentation of the manuals shall conform in full with BS 4884 parts 1 and 2.

The O&M manuals are also to contain a complete drawing list appropriate to the individual section of the works**.** The drawing list shall include the Engineer's drawing numbers**.**

Maintenance instructions for all plant shall cover preventive and corrective maintenance procedures. For electronic or solid state control, protection equipment etc. details shall be provided to enable individual circuit cards to be checked for correct operation and faults to be traced, and repaired.

The Contractor shall provide proformas of the required maintenance record sheets for all plant, which shall include cross-reference to the appropriate section of the O&M manuals which detail how to perform the tasks required. Any other record sheets suitable for the monitoring of the plant shall also be designed and provided.

7.7.1.15.3 Binders, Presentation

The information will be provided on A4 pages, with diagrams on throw-clear pages where required to enable the text and diagrams to be refereed to simultaneously.

The front cover and spine of the manuals shall give the following information:

Project Title

Employer's name

Contract number

Identification of the Section of the Works

Volume number and total number of volumes applicable

(e.g. volume 3 of 5 volumes)

Contractor's company logo and name

The above shall also be provided on a flysheet inside the front cover of each volume. Draft O&M manuals may be presented in unprinted covers.

Four copies of draft O&M manuals are to be provided to the Engineer; following approval 8 copies are to be provided to the Engineer or Engineer's site Representative for each section of the works.

7.7.1.16 Site Storage Facilities

The Contractor shall provide lockable cabinets in each of the individual substations, which are to contain the following:

(a) One set of paper prints of the complete record drawings for the section of the work. These shall be arranged in a logical sequence in accordance with the drawing list contained in the O&M manuals. Record drawings are to be grouped into labeled pockets or binders to minimize disturbance in locating specific drawings. As-built drawings are to be stored in these locations prior to the issue of record drawings.

(b) Two complete sets of O&M manuals

(c) Volumes of factory and site test reports/certificates

(d) Copies of maintenance log sheets, record sheets etc.

(e) Space for stationery an operators' log books

These cabinets shall match other furnishings being provided in the substation and the location as such items is to be included in the design of the substation layout.

7.7.1.19.3 Test Carried after erection

7.7.1.19.3 Electrical Equipment

4.1.19.3.1 General

A general check of all the main switchgear and ancillary equipment shall be made and shall include a cheek of the completeness, correctness and condition of earth connections, labeling, arcing ring and horn gaps, clearances, painted surfaces, cables, wiring, pipe work, valves, blanking plates and all other auxiliary and ancillary items. Checks shall be made for oil and gas leaks and that insulators are clean and free from external damage. A check shall be made that loose items which are to be handed over to the employer e.g. blanking plates, tools, spares, are in order and are correctly stored or handed over.

The following general tests are to be carried out on electrical equipment **after erection at site:-**

Routine high voltage tests to the appropriate IEC Standard. Where no relevant standard exists, tests shall be agreed with the Engineer.

Insulation resistance tests on all electrical equipment.

Continuity and conductivity resistance tests.

Test operation of alarm and tripping, devices to local and remote.

Rotational tests on all motors.

Polarity tests on CTs and VTs.

Oil tests.

Grounding system and electrode tests.

Ratio, Vector Grouping and magnetizing current tests on each transformer.

Calibration of winding and oil temperature devices.

Vector group and phasing tests on VT Circuits.

Magnetization current/voltage tests and winding resistance tests on all current transformers.

Primary and secondary injection tests on relays, protection devices and equipment.

7.7.1.19.3.2 Circuit-Breakers

Circuit-breakers shall be given a visual inspection.

In the case of gas type circuit-breakers testing will be required on the gas system to prove the gas pressure, quantity, dryness and dielectric strength.

Contact resistance tests shall be carried out. In the case of multi-interrupter circuit-breakers resistance tests will be required at each interrupter or pair of interrupters as well as through the series of interrupters on each pole.

Operational tests shall include local and remote trip/close. Timing tests shall be carried out on all circuit-breakers, except those which are below 66kV and which are neither assembled at Site a nor have mechanically ganged pole operation.

Local air components associated with pneumatic operation, including air compressors, shall be tested and air loss measurements and pressure and alarm settings checked. Tests shall be made also on mechanical and hydraulic operation systems.

7.7.1.19.3.3 Disconnectors and Earth Switches

Manual operation of disconnectors and earth switches shall be subject to operational tests to confirm contact pressures, contact resistances, simultaneous operation of all phases and the ease of operation.

Motorised operation of disconnectors and earth switches shall be tested to prove the motor operation, including local and remote operation, and timing tests shall also be carried out. Motor protection shall be tested.

Checks shall be made on interlocks, local and remote indications and operation of auxiliary contacts.

Earth switches shall be tested to confirm the opening and closing sequences and checks shall be made on interlocks, indications and manual locking devices.

7.7.1.19.3.4 Busbars and Connections

Flexible busbars and connections shall be tested to ensure that the correct tensions, sags and clearances will be maintained over the range of environmental conditions and loads without stress to other equipment. If dynamometers are used to check the sags and tensions, they shall be checked both before and after use.

Rigid busbars and connections shall be tested to ensure that the busbars will not cause overloading of the supporting insulators under load conditions and under the range of climatic variations applicable to the site and that expansion and contraction of the equipment is fully accommodated by flexible connections.

Conductivity tests shall be carried out on all connections and joints which are made on site, without exception.

7.7.1.19.3.5 Earthing System

Tests shall be made on the effectiveness of the bonding and earthing which will include conductivity tests on selected joints, on the main earthing system, and at the connections to equipment and structures. Checks shall also be made on precautions taken to avoid corrosion attack on the earthing system.

Test probes at approximately 300 and 600 meters separation will normally be required to effectively test the earthing system. The use of transmission line conductors may be arranged to simplify test testing procedures.

The earth resistance shall be measured during the installation and on completion as follows:-

of each earth rod after driving

of the earth grid after completion and back-filling of the trenches

of each group of earth rods or earth point after completion of the connection from the test link terminal.

Of the completed installation without any connections outside the substation

The tests shall be carried out by a method and with equipment approved by the Engineer. All tests are to be witnessed and the equipment and method used recorded with the test results.

The Contractor may also be called upon to provide assistance in the measurement of earth resistance after earth connections to the system have been completed.

7.7.1.19.3.6 Control Relays and metering Panels, Instruments and Protective Devices

(a) Wiring

After complete erection and cabling, all circuits shall be subjected to the high voltage test specified in the relevant IEC or approved standard.

The insulation resistance of all circuits shall be measured before and after any high voltage tests.

For AC secondary injection tests a substantially sinusoidal test supply shall be used.

The operation and resetting level (current and/or voltage) and timing of all relays shall be measured over an agreed range of settings for all relays.

For directional relays phase-shifting transformers shall be used to determine the maximum torque angle and the boundaries of operation/restraint.

Other relays shall be fully tested in accordance with the manufacturer's recommendations.

All DC elements of protection relays shall be tested for operation at 70% rated voltage.

All d/c supplies shall be checked for severity of current inrush when energized by switching on or inserting fuses or links.

(b) Mechanical Inspection

All panel equipment is to be examined to ensure that it is in proper working condition and correctly adjusted, correctly labeled and that cases, covers, glass and gaskets are in good order and properly fitting.

(c) General

Sufficient tests shall be performed on the relays and protection schemes to:

Establish that the equipment has not suffered damage during transit.

Establish that the correct equipment has been supplied and installed.

Confirm that the various items of equipment have been correctly interconnected.

Confirm performance of schemes designed on the bases of calculation e.g. differential protection.

To provide a set of figures for comparison with future maintenance values allowing the condition of the equipment to be determined.

(d) Secondary Injection

Secondary infection shall be carried out on all AC relays, using voltage and current of sinusoidal wave form and rated power frequency to confirm satisfactory operation and range adjustment.

The polar characteristic of all distance protections shall be recorded at a minimum of 30 degree intervals.

For circulating current protection employing high impedance voltage operated relays, the points of injection for relay voltage setting tests shall be across the relay and stabilizing resistance.

The fault setting for the type of protection is to be established by secondary injection, where it is impracable to ascertain this value by primary injection. Injection is to be made across the appropriate relay bus wires with all associated relays, setting resistors, and CT's connected.

(e) Primary Injection

All current operated relays shall be tested by injection of primary current to record the actual relay setting and as a final proof of the integrity of all secondary connections.

The stability of all differential schemes shall be checked by injection of primary current.

Primary current injection tests are to be carried out by the contractor and the methods employed for a particular installation are to be agreed with the Engineer.

Tests are to be carried out as follows :

Local primary injection to establish the ratio and polarity of current transformers as a group, care being taken to prove the identity of current transformers of similar ratio.

Overall primary injection to prove correct interconnection between current transformer groups and associated relays.

Fault setting tests, where possible, to establish the value of current necessary to produce operation of the relays.

(f) DC Operations

Tests are to be carried out to prove the correctness of all DC polarities, the operating levels of DC relays and the correct functioning of DC relay schemes, selection and control switching, indications and alarms. The correct functioning of all isolation links and fuses shall also be checked.

(g) Tests on Load

Tests on load shall also be done to demonstrate stability and operation of protection relays as required by the Engineer.

All tripping, control, alarm and interlocking circuits shall be functionally tested to prove satisfactory and full proof operation and/or resetting. The functional and safety aspects of all shorting and/ or isolation links, fuses and switches devices shall be proved.

The total burdens connected to all voltage transformer circuits shall be measured and recorded.

The total capacitance of all wiring and apparatus connected to the negative pole of each main tripping battery shall be measured and recorded; the value shall not exceed 10 microfarad.

The continuous current drain of all trip circuit supervision relays shall be measured and shall not be greater than half the minimum current required for tripping. The supervision current shall be measured with the circuit-breaker (or other device) both open and closed.

7.7.1.19.3.7 Batteries and Chargers

Tests shall be carried out on the batteries and chargers to confirm the charger ratings and adjustment, the battery and charger alarm systems and battery capacity.

The open-circuit cell voltages of the batteries when fully charged shall be recorded.

The insulation to earth of the complete DC installation shall be tested.

7.71.19.3.8 Power Cables

Each completed circuit shall be tested for continuity and insulation resistance.

7.7.1.19.3.9 Current Transformers

A Magnetization curve shall be obtained for each current transformer in order to:-

Detect damage in transit or installation

Prove that the correct cores have been wired out to the relevant terminals

For high impedance relay schemes, to confirm that correct relay settings have been calculated.

The DC resistance of each current transformer secondary winding shall be measured and also the transformers and connection leads, each item being recorded separately.

The insulation resistance of all secondary circuits shall be measured at 1000 volt and recorded.

Primary current injection tests shall be conducted on all current transformers using adequate primary current to prove correct ratio, polarity and, for differential protection schemes, to prove the correct relative polarities of all current transformers of each scheme.

7.7.1.19.3.10 Voltage Transformers

The transformer ratio and polarity shall be checked using a primary voltage high enough to give a clearly measurable secondary voltage or by using rated primary voltage and comparison with an already proven voltage transformer. The phasing and phase rotation shall be checked. For three phase voltage transformers a test shall be conducted to show that energizing each primary winding produces an output from only the correct phase secondary winding. The residual voltage of any open delta or broken delta winding shall be measured with rated primary voltage applied.

7.7.1.19.3.11 Control and Instrumentation Equipment

The following general tests shall be performed on control and instrumentation equipment at site.

High voltage testing of all circuits, as specified in the relevant IEC or approved standard.

Insulation resistance testing of all circuits.

Functional tests for all tripping, control, alarm and interlocking circuits.

The testing of all equipment in accordance with the manufacturer's instructions or as advised by the Engineer.

7.7.1.19.3.12 Transformers and Ancillary Equipment

The following tests shall be performed.

- Insulation resistance tests on bushings.
- Insulation resistance test at 500V between core and core clamping structure.
- Voltage withstand tests on insulation oil to BS 148.
- Ratio.
- Phase relationship
- Magnetization characteristics of current transformers of winding temperature devices.
- Calibration of winding temperature devices.
- Tap Selector and Diverter Switch alignment.
- Calibration of automatic voltage control equipment.

- Proving tests as necessary on control schemes.
- Measurement of winding resistance on all taps and phases.
- Where applicable the above tests shall also be carried out on Earthing Transformers.

7.7.1.20 Inspection Plan and Procedures

7.7.1.20.1 Measuring and Testing Equipment's

At prescribed intervals, or prior to each use, all measuring and testing equipment used in inspection shall be calibrated and adjusted against certified equipment having a known valid relationship to nationally recognized standards. Where no national standards exist, the basis employed for calibration shall be approved by the Engineer.

The manufacturer shall prepare a calibration schedule showing equipment type, identification number, location, frequency of checks, method of checking and action to take when results are unsatisfactory.

Each piece of equipment shall be labeled with its identification and current calibration status.

Calibration records for each piece of equipment shall be maintained at least for life of that piece of equipment and shall be available for examination by the Engineer.

7.7.1.20.2 Re-inspection Following Non-Conformance

If a non-conformance report is issued as Clause 7.2.25.2 above or plant rejected as in 7.2.26.2 below, the Contractor shall reimburse the Engineer for all costs (including time costs, travel, accommodation etc.) for both attending discussions on remedial matters and any re-inspection that the Engineer may deem to be necessary.

7.7.1.21 Plant Performance

7.7.1.21.1 Guarantees

Bidders shall state and guarantee the technical particulars listed in the Schedules of Technical Particulars and Guarantees. These guarantees and particulars shall be binding and shall not be departed from without the written permission of the Engineer.

The Bidder shall further guarantee that all equipment supplied complies with the Contract Documents.

The tolerances permitted in the IEC or other Standard shall apply unless otherwise stated.

7.7.1.21.2 Rejection

If the guarantees are not met and/or if any items fails to comply with the requirements of this Specification in any respect whatsoever at any stage of manufacture, test, erection or during the maintenance period, the Engineer may reject the item, or defective component thereof, whichever he considers necessary, and after adjustment or modification as directed by the Engineer, the Contractor shall submit the item for further inspection and/or test. The repair procedure shall be to the Engineer's approval**.** In the event of a defect on any item being of such a nature that the requirements of this Specification cannot be fulfilled by adjustment or modification, such item shall be replaced by the Contractor, at his own expense to the entire satisfaction of the Engineer. Any item of plant repaired to an approved procedure shall not be accepted as a part of the Works as a permanent solution or replacement unless the Contractor guarantees in writing that the repaired plant or component shall have the same service life and efficiency as the component originally manufactured.

7.7.1.23 Site Pre-commissioning Checks and Commissioning Procedures.

7.7.1.23.1 General

The Contractor shall be responsible for the safe and efficient setting to work of the whole of the plant and equipment. The methods adopted shall be to the approval of the Engineer or his representative on Site, and shall be in accordance with any safety and permit regulations in force by the Employer on the Site.

At least two months before commencing the commissioning of any plant or equipment, the Contractor shall submit for approval fully comprehensive schedules of pre-commissioning checks as applicable to each item of the plant and equipment provided. These schedules shall then be used during pre-commissioning as a guide to the methods to be followed and to record the actual activities carried out with the appropriate date, together with details of all work yet to be completed, variations and modifications to design conditions.

In addition the Contractor is to submit with the schedules to the Engineer's representative proforma test sheets (to be used by the Contractor during testing and commissioning) for all tests he proposes to carry out and those required by the Engineer's Representative.

Each activity on the schedules, when completed to the satisfaction of the Engineer's Representative, shall be signed and dated by the Contractor. The schedules shall be countersigned by the Engineer's Representative as necessary. If during the performance of the pre-commissioning checks the Engineers representative considers that additional tests are necessary to prove the system or plant the Contractor shall perform such additional tests to the Engineer's satisfaction.

The Contractor shall also submit for approval schedules of commissioning procedures that the proposes to follow when bringing into service groups of plant items during the commissioning period. These schedules shall detail the tests necessary to ensure the complete and satisfactory commissioning of each section of plant and shall detail all operational limitations. The schedules shall be used during commissioning which shall only commence when the relevant pre-commissioning check schedules have been completed.

Each activity on the commissioning procedure schedules when completed to the satisfaction of the Engineer's Representative, shall be signed and dated by the Contractor and shall be countersigned by the Engineer's Representative as necessary.

The commissioning procedures shall ensure that the commissioning of any section of the Works does not interrupt the normal commercial operation of any previously commissioned section(s).

21 days prior to commencing commissioning checks the Contractor is to agree with the Engineer's Representative the method and sequence of performing the commissioning tests. Following agreement the Contractor shall submit a detailed program indicating the testing sequence to permit advance notice to be given to the Employer in order that the Employer's Representatives may also witness testing if so desired.

When the commissioning of each section of the Works is complete the Contractor shall carry out such preliminary tests as are necessary to establish that the plant is functioning correctly and efficiently, and shall make any adjustments required.

The Contractor is to supply all test equipment, tools chemicals, lubricating oils and greases and other materials required for the aforementioned operations.

For the purposes of this Contract, the provisions of this section will apply to plant supplied from nominated subcontractors.

7.7.1.23.2 Contractor's Site Supervisory Staff

During the commissioning and subsequent testing of any item of plant the Contractor is to provide for the services of any special supervisory staff necessary for the purpose of ensuring proper commissioning and the satisfactory completion of all tests. The cost of such services is deemed to be part of the Bided price for Erection of Plant.

7.7.1.23.3 Commissioning of Modified Circuits

Where the scope of works has included the diversion, relocation or variation of any existing circuit the Contractor is deemed to have included for all pre-commissioning checks on existing equipment. Where this work includes overhead line or cable circuits the Contractor is responsible for carrying out full pre-commissioning and on-load checks at the remote end of the circuit including the injection testing and re-setting of relays if required.

All and any such work associated with the re-commissioning of existing equipment is deemed to be included in the contract price.

Test Equipment

The Contractor is responsible for providing all equipment, power, etc. necessary to carry out all tests on site. Following award of contract, the successful Contractor shall submit a detailed schedule of the test equipment etc., he intends to provide for carrying out this portion of the Works. Should the Engineer require additional or alternative test equipment to be provided to enable full site testing to be performed in accordance with the requirements of the Specification the Contractor shall supply such equipment at no extra cost.

7.7.2 GENERAL TECHNICAL REQUIREMENTS

7.7 .2.1 Civil and Building Works

Where items of mechanical plant are mounted on foundations, which are part of the civil engineering works, the Contractor shall carry out suitable leveling and adjustment of the plant on the foundations, before the plant is secured in position. The Contractor shall check the alignment, leveling or positioning of the mechanical plant in question, before and after grooving. The Contractor shall make records of the alignment, leveling or positional measurement and shall maintain such records until his activities at site are concluded.

The building steel work shall be designed to carry the loads/forces imposed by pipe work, cables and associated fittings which also form part of the works, and all necessary supports and fixing shall be shown on the relevant drawings.

Such supports and fixings may be secured to the steel work by bolting welding or clamping.

No other supports or fixings shall be subsequently attached to the steel work nor may any other drilling, cutting or welding be carried out without the prior permission of the Engineer.

7.7.2.2 Design and Construction Requirements and Interchangeability

7.7.2.2.1 General Requirements

The Works shall be designed to operate safely, reliably and efficiently in accordance with the Design and Operating Requirements stated in this Specification.

No departure from the Specification shall be made subsequent to the Contract without the written approval of the Employer.

The design shall conform to the best current engineering practice. Each of the several parts of the Plant shall be of the maker's standard design, provided that this design is in general accordance with the Specification.

The design, dimensions and materials of all parts shall be such that they will not suffer damage as a result of stresses under the most severe service conditions. The materials used in the construction of the Plant shall be of the highest quality and selected particularly to meet the duties required of them. The plant shall be designed and constructed to minimize correction. Workmanship and general finish shall be of the highest class throughout.

All plant items and corresponding parts forming similar duties shall be interchangeable in order to minimize the stock of spare parts.

All equipment shall be designed to minimize the risk of fire and damage, which may be caused in the event of fire.

7.7.2.2.2 Specific Requirements

The choice of plant and design of the installation is to meet the following criteria.

Sub-station layouts are to utilize the minimum of land area.

All equipment is to facilitate the installation of all circuits indicated as "future" with the minimum of disruption. All cabling schemes, D.C. and A.C. equipment etc. shall be designed to accommodate all such future circuits, loads, etc.

The plant and installation shall be designed for a minimum service life of 25 years.

All plant is to have a minimum of 2 years satisfactory and proven service record of high durability and reliability in a similar environment. Documentary evidence in support of the choice of any item of plant will be provided by the Contractor if requested by the Engineer.

Each sub-station is to be designed such that the failure or removal of any one item of plant for maintenance or repair shall not impair the operational integrity of the sub-station.

The design and layout of the sub-stations shall ensure the safety of personnel concerned with the operation and maintenance of the plant.

7.7 .2.3 Units of Measurement

The Contract shall be conducted in the Systems International 'Units (SI) system of units in accordance with the provisions of ISO 31 and ISO 1000.

7.7.2.4 Plant and Equipment Identification

7.7.2.4.1 Identification on Drawings

The Contractor shall prepare comprehensive Plant or Equipment identification Schedules. The Schedules shall include the respective flow sheet or Drawing/Diagram identification Numbers.

7.7.2.4.2 Labels and Nameplates

The Contractor shall supply and install all labels, ratings, instruction and warning plates necessary for the identification and safe operation of the Works.

Nameplates of labels shall be non-hygroscopic material with engraved lettering of a contrasting colour or, alternatively in the case of indoor circuit-breakers, starters, etc. of plastic material with suitably coloured lettering engraved thereon.

All the above labels and plates shall be securely fixed to items of plant and equipment with stainless steel rivets, plated self-tapping screws or other approved means. The use of adhesives will not be permitted.

The language of labels, plates and notices shall comply with the requirements of the Contract.

Individual plant items and all relevant areas within the contract works where a danger to personnel exists shall be provided with plentiful, prominent and clear warning notices.

These warning notices shall draw attention to the danger or risk with words which attract attention and summarize the type of risk or danger. The notices shall also carry a large symbol which graphically depicts the type of risk.

All equipment within panels and desks shall be individually identified. The identification shall correspond to that used in schematic and wiring diagrams.

Each circuit breaker panel, electrical control panel, relay panel etc., shall have circuit designation label mounted on the front and rear. Corridor type panels shall additionally have circuit designation labels within the panels.

All equipment and apparatus mounted there on shall be clearly labeled in an approved manner. The function of each relay, control switch, indicating lamp, MCB, link etc. shall be separately labeled.

The Contractor shall be responsible for the relocation, or replacement of all labels on existing plant, which became inaccurate as a consequence of the contract works.

7.7.2.5 Safety and Security

7.7.2.5.1 Interlocks

A complete system of interlocks and safety devices shall be provided so that the following requirements and any other condition necessary for the safe and continuous operation of the plant are provided:

Safety of personnel engaged on operational and maintenance work on the plant.

Correct sequence of operation of the plant during starting up and shutting down periods.

Safety of the plant when operating under normal or emergency conditions.

Interlocks shall be preventive, as distinct from corrective in operation.

Where plant supplied under this Contract forms the whole or a part of a system for which one of more interlocking schemes are required, the Contractor shall be responsible for all interlocking schemes for the Engineer's approval**.** General descriptions of interlocking requirements are given in the Specifications but the Contractor shall include for any other interlocks he considers necessary.

7.7 .2.5.2 Locks, Padlocks, and Key Cabinets

The Contractor shall provide padlocks, locks, chains or other locking devices for the locking of all equipment cubicles, electrical isolating switches, selector switches, valves, etc. to the approval of the Engineer.

All locking devices and chains shall be manufactured from corrosion resistant material. All mechanisms shall be provided with a cover to minimize entry of water or dust.

Locks shall conform to a master keying feature system to be agreed with the Engineer for groups of equipment.

All locks shall have individual high integrity locks and shall be provided with (two) keys.

Each key shall be provided with a label as specified.

The Contractor will supply and fit key cabinets equipped with labelled hooks, each Identified with its appropriate key. Every cabinet shall be provided with a nameplate identifying the cabinet with its respective item or items of plant. Sufficient cabinets will be provided to store all keys supplied under this Contract and cater for future extensions.

The Contractor shall provide comprehensive lock and key schedules to readily permit identification with equipment and doors. Such schedules are not required for loose padlocks.

Where modifications are performed to existing sites the Contractor shall provide a system identical to that existing.

7.7 .2.6 Spare Parts

7.7 .2.6.1 Commissioning Spares

in addition to the spare parts being provided for the Employer, the Contractor is responsible for ensuring that he has access to a stock of commissioning spares. Spares provided for the Employer are not to be utilized as commissioning spares, without written approval, in which case the Contractor shall immediately replace the contract spare at his own expense.

All commissioning spares are considered as Contractors equipment.

7.7 .2.7 Consumable Items

7.7 .2.7.1 Chemicals and other Consumable

The Contract includes for the provision of all chemicals, resins, and other consumables required for testing, commissioning and setting to work of each section of the works.

Unless otherwise stated, the Contractor shall provide all such chemicals and other consumables required for the efficient operation and maintenance of the plant at full load 24 hours per day for a period of 12 months for each section of the works from the date of the final certificate.

The Contractor shall prepare a list of these consumables giving quantities necessary for each section of the works and the recommended suppliers.

7.7 .2.8 Painting and Cleaning

Immediately following the award of a Contract, the Contractor shall submit the names of the proposed paint supplier and applicator together with a quality assurance program for approval. All paints for a contract shall be provided by one manufacturer and preferably shall be manufactured in one country to ensure compatibility

The painting of the plant shall be carried out in accordance with the appropriate schedule. The work is generally covered by the schedules but where particular items are not referred to specifically, they shall be treated in a manner similar to other comparable items as agreed with the Engineer.

The schedule indicates standards of surface preparation and painting which is intended to give a minimum service life of 10 years in a coastal industrial environment, with need for minor remedial work only during the intervening period.

Steel sections and plate shall be free from surface flaws and laminations prior to blast cleaning and shall not be in worse condition than Pictorial Standard B, Swedish Standard SIS 05 5900.

The Engineer is prepared to consider alternative paint schemes to meet the requirements of fabrication using modern automated materials handling systems, provided they offer the same standards of surface protection and service life as those intended by the schedules.

All paints shall be applied by brush or spray in accordance with the schedule, except for priming coats for steel floors, galleries and stairways where dipping is permitted.

Where paint is to be applied by spray, the applicator shall demonstrate that the spray technique employed does not produce paint films containing vacuoles.

Where paint coatings are proposed for the protection of surfaces of equipment exposed to corrosive conditions, such as plant items exposed to brines or sea water immersion in liquid, or wet gases, the coatings shall be formulated to the suitably corrosion resistant and shall be high voltage spark tested at works and/or at Site prior to commissioning. The test procedure shall be based on the use of a high voltage direct current. The voltage used shall be 75% of the breakdown voltage of the coating. This breakdown voltage shall first be separately determined using test plates coated with the specified coating formulation and thickness. The coating on the test plate shall also be micro-sectioned by the applicator to show that it is free from vacuoles and other defects likely to invalidate the test procedure.

If the defects revealed by the above test procedure do not exceed one per 5 m^2 of coating surface, the coating need not be re-tested after the defects have been repaired. If the defects exceed one per 5 m^2 of coating surface, the repairs shall be resettled after any curing is completed, and this

procedure shall be repeated until the defects are less than one per 5 m^2 of coating surface. After repair of these defects, the equipment can be placed in service without further testing.

All coating proposed for the internal protection of domestic water storage tanks and WZPDCL lination plants shall be certified by an approved independent Authority as suitable for use in potable water installations and shall meet the non-painting requirements of BS 3416.

All plain shed and bright parts shall be coated with grease, oil or other approved rust preventive before dispatch and during erection and this coating shall be cleaned off and the parts polished before being handed over.

Where lapped or butted joints form part of an assembly which is assembled or part assembled prior to final painting, the jointed surfaces shall be cleaned free from all scales, loose rust, dirt and grease and given one brush applied coat of zinc phosphate primer before assembly.

Paint shall not be applied to surfaces which are superficially or structurally damp and condensation must be absent before the application of each coat.

Painting shall not be carried out under adverse weather conditions, such as low temperature (below 4^0C) or above 90% relative humidity or during rain or fog, or when the surfaces are less than 3^0C above dew point, except to the approval of the Engineer or his duly appointed representative.

Priming coats of paint should not be applied until the surfaces have been inspected and preparatory work has been approved by the Engineer or his duly appointed representative.

No consecutive coats of paint, except in the case of white, should be of the same shade. Thinners shall not be used except with the written agreement of the Engineer.

On sheltered or unventilated horizontal surfaces on which dew may linger more protection is needed and to achieve this additional top coat of paint shall be applied.

The schedules differentiate between 'Treatment at Maker's Works' and 'Treatment at Site after Completion of Erection' but the locations at which different stages of the treatments are carried out may be modified always providing that each change is specifically agreed to by the Engineer and the painting is finished at Site to the Engineer's satisfaction**.**

All paint film thickness quoted are minimum and refer to the dry film condition. All thickness shall be determined by the correct use of approved commercial paint film thickness measuring meters.

The Contractor shall ensure that precautions are taken in packing and crating to avoid damage to the protective treatment applied before shipment, during transport to the site.

Structural bolts shall be galvanized, sheradised or cadmium plated and painted as for adjacent steelwork.

All structural timber that does not require to be painted (timber joists, flooring, etc) shall be treated with two coats exterior grade approved timber preservative.

The requirements of this clause and the schedules shall be interpreted in accordance with the requirements and recommendations of BS 5493 and CP 231, 3012 and the paint manufacturer's special instructions where applicable.

Colour shall be in accordance with BS 1710 and BS 4800 or equivalent material standards.

7.7 .2.9 Galvanized Work

All galvanizing shall be carried out by the hot dip process (and unless otherwise specified, shall conform in all respects with IEC's).

Attention shall be paid to the detail of members, (in accordance with IEC's). Adequate provision for filling venting and draining shall be made for assemblies fabricated form hollow sections. Vent holes shall be suitably plugged after galvanizing.

All surface defects in the steel, including cracks, surface laminations, laps and folds shall be removed (in accordance with IEC's). All drilling cutting, welding, forming and final fabrications of unit members and assemblies shall be completed before the structures are galvanized. The surface of the steelwork to be galvanized shall be free from welding slag, paint, oil, grease and similar contaminants.

The coating shall be as specified in BS 720 or equivalent National standard. Structural steel items shall initially grit blasted to BS 4232, second quality (SA2.5) and the minimum average coating weight on steel sections 5 mm thick and over shall be as specified in the table below:

THICKNESS OF STEEL SECTION	THICKNESS OF SIZE COATING	MINIMUM AVERAGE COATING WEIGHT
mm	microns	g/m^2
5	80 – 90	600
10	100 – 120	750
20	120 – 150	900

With intermediate values on a pro rata basis.

On removal from the galvanizing bath the resultant coating shall be smooth, continuous, free from gross surface imperfections such as bare stops, lumps, blisters and inclusions of flux, ash or dross.

Galvanized contact surfaces to be jointed by high strength friction grip bolts shall be roughened before assembly so that the required slip factor (defined in BS 3294. Part BS 4606 part 1 and I) is achieved, care shall be taken to ensure that the roughening is confined to the area of the faying surface.

Bolts, nuts and washers, including general grade high strength friction grip bolts (referred to in BS 3139 and BS 4395 part 1) shall be hot dip galvanized and subsequently centrifuged (according to BS 729). Nuts shall be tapped up to 0.4 mm oversize after galvanizing and the threads oiled to permit the nuts to be finger turned on the bolt for the full depth of the nut. No lubricant, applied to the projecting threads of a galvanized high strength friction grip bolt after the bolt has been inserted through the steelwork shall be allowed to come into contact with the faying surfaces.

During off-loading and erection, nylon slings shall be used. Galvanized work which is to be stored in works on site shall be stacked so as to provided adequate ventilation to all surfaces to avoid wet storage staining (with rust).

Small areas of the galvanized coating damaged in any way shall be brought to the attention of the Engineer who shall authorize repair by:

Cleaning the area of any weld slug and though wire brushing to give a clean surface.

The application of two coats of zinc rich paint or the application of low melting point zinc alloy repair rod or power to the damage area, which is heated to 300---C.

After fixing, bolt heads, washes and nuts shall receive two coats zinc rich paint.

7.7 .2.10 Mechanical Items

All screw threads shall be of the ISO metric form and the diameters and pitch of thread for all bolts studs and nuts shall conform to the ISO Standards as stated in BS 3692 or BS 4190 or equivalent National Standard.

It is recognized that in a number of applications such as instrument, machine components and pipe, other thread forms may be used.

7.7.2.10.1 Pipe work

All piping shall be designed, manufactured and tested in accordance with British Standards or equivalent Nationals Standards approved by the Engineer. In particular, pipework should meet the requirements of the following standards or their equivalents. Dimensions shall comply with Table 1 of BS 1600. The minimum wall thickness of carbon steel pipes excluding any allowance for corrosion shall be as shown in British Standards:

DIAMETER	MINIMUM WAL THICKNESS
0 - 100 mm	Table 2 BS 1387:1967
150 - 200 mm	4.87 mm
250 - 600 mm	6.35mm

Drains and air vents shall be provided as required by the physical arrangement of the pipe work and shall be via valves with the drain and vent pipe work led to drain points to the approval of the Engineer.

Screwed pipe work systems shall be provided with adequate unions to enable valves and fittings to be removed if required with minimum disturbance to the rest of the pipe system.

7.7.2.10.2 Bolts, Studs, Nuts and Washers

All bolts, and nuts shall conform dimensionally to the requirements of BS 3092 or BS 4190 or equivalent National Standard.

The Material of all bolts, studs and nuts for piping systems shall conform to the requirements of BS 4505 or equivalent National Standard.

The threaded portion of any bolt or stud shall not protrude more than 1.5 threads above the surface of its mating nut.

When fitted bolts are used they shall be adequately marked to ensure correct assembly.

Bolts, nuts, studs and washers in contact with sea water or used on pipe work systems containing sea water shall be of the same material as flanges etc.

The use of slotted screws shall be avoided; hexagon socket screws or recessed type heads being preferred.

7.7.2.11 Metal Clad Bus-Bars and Connections

Bus-bars and connections shall comply with BS 159 and shall be electrolytic copper, unless otherwise agreed with the Engineer.

The bus-bars, assembles and connections of equipment for services up to 33 kV shall be of a type which does not rely solely on air for insulation purposes. The covering material shall be non-deteriorating at the rated short-time maximum temperature of the bus-bars and shall have such thickness as is required to withstand rated line to line voltage between bus-bar and a conducting object on the exterior of the covering material for a period of not less than 60 seconds.

The bus-bars and their connections, and insulation materials as appropriate shall be capable of withstanding, without damage, the thermal and mechanical effects of a through fault current equivalent to the short-time rating of the switchgear.

Facilities to the approval of the Engineer shall be provided to accommodate thermal extension of the bus-bars and associated components including the insulating medium if appropriate.

Bus-bars shall be contained in a separate compartment within the general casing of switchgear. Bus-bars barriers shall be provided between switchgear equipment to prevent the spreading of ionized gases in the event of a fault.

Access to bus-bars and the connections directly connected thereto shall be gained only by the removal of covers secured by bolts or screws. Such covers shall be clearly and indelibly marked "DANGER-BUSBARS".

Bus-bars shall be extensible at both ends, such extension shall entail the minimum disturbances to bus-bar compartments.

Bus-bars shall be of uniform cross-sectional area throughout their length.

7.7 .2.12 Insulators and Bushings

Porcelain or glass insulators and bushings shall comply with the requirements of IEC 168, IEC 137, IEC 305, IEC 273, IEC 433 and IEC 815.

Porcelain for insulating purposes shall comply with the requirements of BS 1598. Each porcelain insulator shall bear the manufacturers mark and batch identification, which shall be applied before firing. The clamping surfaces of all porcelain insulators shall be accurately grounded and shall be free of glaze.

Insulators and bushings shall satisfy the test requirements of IEC 168-Post, IEC 233-Hollow, IEC 383-Overhead Line. The design of insulators shall be such as to minimize radio interference (RFI), and tests will be required as proposed in IEC 437 or equivalent to limit RFI to CISPR or CCITT recommended limits, or equivalent National Standards or Regulations.

Insulators and bushings of organic moulded or resin-bonded material shall comply with the requirements of IEC 660 as appropriate. They shall have a durable non-hygroscope surface finish with a high anti-tracking index. Precautions shall be taken during manufacture and assembly of insulators of this type to exclude all moisture.

The Comparative Tracking Index (C.T.I.) shall be determined on all organic material insulators, and other insulating material as directed by the Engineer. The test method on any electrical materials intended for use outdoors or in servers ambient conditions shall be in accordance with IEC 587, and materials not exposed to such conditions shall be tested in accordance with IEC 112.

Insulator and bushings of moulded or resin bonded material shall be identified with the manufacturers mark and batch identification. Such marking shall not impair the electrical properties of the surface finish.

Insulators and bushings, shall be mounted, and the method of attaching connections be such, that there is no likelihood of their being mechanically overstressed during normal tightening of the mounting and connection fixings. Similar provision shall be made to accommodate expansion and contraction of the connections having regard in the temperature likely to be attained during fault conditions. Mountings shall be of sufficient strength and rigidity to withstand the forces created by the passage of maximum prospective short-circuit current with full asymmetry, without permanent damage or permanent deflection sufficient to reduce electrical performance of insulation strength.

7.7.2.13 Electrical Insulation

Insulating materials shall be suitably finished so as to prevent deterioration of their qualities under the specified working conditions. Account shall be taken of the IEC 85 and IEC 505 recommendations.

Ebonite, synthetic resin-bonded laminated material and bituminized asbestos cement-bonded panels shall be of suitable quality selected from the grades or types in the appropriate British, IEC, or approved National Standard.

All cut or machined surfaces and edges of resin-bonded laminated materials shall be cleaned and then sealed with an approved varnish as soon as possible after cutting.

Linseed oil and untreated materials of fiber, leatheroid, presspahn, asbestos or other similar hygroscope types of materials shall not be used for insulation purposes. Untreated leatheroid and presspahn may be used for mechanical protection of winding insulation.

Wherever practicable, instrument, apparatus and machine coil windings, including wire wound resistors, with the exception of those immersed in oil or compound, shall be thoroughly dried in a vacuum or by other approved means and shall then be insulating varnish. Varnish with a linseed oil base shall not be used.

No material of a hygroscope nature shall be used for covering coils. Where inter-leaving between windings in coils is necessary, only the best manila paper, thoroughly dried, which permits penetration by the insulating varnish or wax, shall be used.

7.7.2.14 Insulating Oil

Insulating oil shall comply with the requirements of IEC 296. Insulating oil shall be provided by the Contractor for all oil-filled apparatus and 10% excess shall be provided for topping up purposes in sealed drums. The Contractor shall satisfy himself that suitable oil treatment facilities are available at Site for his use. If the Contractor is unable to obtain written assurances to this effect he shall provide such oil treatment facilities as required to meet the specification, at no additional cost.

7.7 .2.15 L.V. Circuit Protection

Fuses are not to be used for protection of circuits below 1000V phase-to-phase, (Low Voltage).

All low voltage and dc circuit protection is to be provided by moulded case, or miniature circuit breakers.

Link carriers and bases shall be of an approved manufacture and of such form and material so as to protect persons from shock and burns in normal service and maintenance. Links, and fixed contacts shall be shielded to prevent inadvertent contact with live metal whilst the link is being inserted or withdrawn.

The labeling of carriers and bases shall comply with IEC 269 Identification labels fixed to panels, boards and desks for MCBs and links shall describe their duty, voltage and rating.

7.7.2.15.1 Miniature Circuit Breakers

All miniature circuit breakers (MCBs) shall comply with IEC 157 and be fitted with over-current releases of both the thermal and instantaneous type. All MCBs supplied on this contract shall be to short circuit category P2 of IEC 157.

Single, two or three pole breakers may be used where appropriate and a trip of one pole shall cause a complete trip of all associated poles. In addition, the rating given of MCBs supplied shall be confirmed as that appropriate to the enclosure provided.

The Contractor shall ensure satisfactory time and current grading with other associated miniature circuit breakers or MCCBs.

7.7.2.15.2 Distribution Boards And Isolators

Distribution boards shall be provided throughout the plant for local distribution of lighting, small power and air conditioning supplies. The lighting and small power circuits may use a common distribution board.

Distribution boards shall be of 1 kV a.c., 1.2 kV d.c. rating and conform to IEC 439. All distribution boards shall be of the weatherproof enclosure type and shall be arranged so that the door or cover can be locked in the closed position.

All triple pole and neutral boards shall provide satisfactory cable entry for all cables which could be required for the number of circuit facilities provided and shall have the neutral bar drilled for the full number single phase ways.

Each distribution board supplied from a remote location shall have a load breaking/fault making incoming isolating switch mounted adjacent to or as part of the distribution board. Each distribution board shall have removable top and bottom (undrilled) gland plates.

Each circuit in every distribution board shall be numbered and identified by means of a schedule attached to the interior of the door or cover of the board. The schedule shall be legible and durable to the Engineer'' approval**.**

Twenty-five percent spare ways shall be provided for future use.

7.7.2.16 Electrical Equipment, Instruments and Meters

All instruments and meters shall be fitted with glasses of low reflectivity and shall not cause pointer deflection due to electro-static charging through friction.

All indicating instruments shall be of the flush mounted pattern with dust and moisture proof cases complying with BS. 2011, Classification 00/50/04, and shall comply with BS. 89:1977 or IEC. 51.

Unless otherwise specified, all indicating instruments shall have 95mm square cases to DIN standard or equivalent circular cases.

Instrument dials in general should be white with black markings and should preferably be reversible where double scale instruments are specified.

Scales shall be of such material that no peeling or discoloration will take place with age under humid tropical conditions.

The movements of all instruments shall be of the dead beat type.

Instruments shall be provided with a readily accessible zero adjustments.

The mounting height of the centre of all indicating instruments shall not exceed 2000mm.

A.C. ammeters for transformer, feeder or inter connector circuits, and D.C ammeter for all load circuits except motors, shall have linear scales commencing at zero.

A.C and D.C ammeters for motor circuits shall have scales commencing at zero and with a compressed overload portion for reading of the associated minor starting current.

D.C. ammeters for the main battery circuit of D.C systems shall have scales with positive and negative ranges, labeled charge and discharge respectively.

Voltmeters for feeders and transformer circuits shall have expanded scales to display the nominal service voltage ± 20%.

Wattmeter for feeders shall have linear positive and negative reading scales to be approved.

Varmeters for all circuits shall have linear positive and negative reading scales to be approved.

Frequency meters shall be of the pointer type, scaled approximately 45-55Hz, and biased to swing to one end of the scale on loss of voltage.

Synchronizing voltmeters shall be scaled in per unit values only, to correspond to the above expanded voltmeter scales.

Synchro scopes should be continuously rated, but if not then at least 30 minute rated with an individual on/off switch.

The synchro scopes shall indicate synchronism between two circuits with the pointer at the "12'0'clock" position only, and shall have arrows on the face to show that the frequency of the "incoming" supply is fast or slow with respect to the "running" supply**.** The synchro scope switch shall disconnect both supplies to the instrument and the instrument pointer shall move at least 45^0 from the vertical position when either or both supplies are removed and shall then remain stationary without any tendency to creep.

In addition all synchro scopes shall include two synchronizing lamps**.** These lamps shall be "bright" for synchronized conditions, but are to act solely as a supplementary indication that may be used by the operation with caution in the event of failure of the synchro scope.

Integrating metering shall be provided where indicated on the specification drawings. These meters shall be of the withdrawable flush mounted type and comply with the relevant parts of IEC 521 and BS 5685, Class 1.0 accuracy and BS 37, Part 9. The meters shall include cyclometer dial type registers.

Approved test terminal blocks of the three-phase type shall be provided for connecting in circuit with each meter a portable testing meter.

Recording instruments shall be of an approved type, and unless otherwise specified, shall have two chart speeds of 25 mm and 50 mm per hour available for selection by means other than changing connections**.** They shall be complete with sufficient charts and inks for two years' working**.**

All instruments, meters, recorders and apparatus shall be capable of carrying their full load currents without undue heating. They shall not be damaged by the passage of fault currents within the rating of the associated switchgear through the primaries of their corresponding instrument transformers.

All instruments, motors and apparatus shall be back connected and the metal cases shall be earthed.

All voltage circuits to instruments shall be protected by a fuse in each unearthed phase of the circuit placed as close as practicable to the main connection.

All power-factor indicators in 3-phase circuits shall have the star point of their current coils brought out to a separate terminal which shall be connected to the star point of the instrument current transformer secondary windings.

All instruments and meters associated with multi-ratio CT's shall be provided with sets of scales etc. appropriate to each CT ratio. It shall be possible to replace the scales of instruments without dismantling the instruments or interfering with any tropicalization finish.

The Contractor shall provide electrical instrument and meter schedules to include, manufacturer, type, designation, current and voltage rating, accuracy class and circuit designation.

7.7.2.17 Control and Selector Switches

Control switches shall be of the three-position type with a spring return action to a central position (and without a locking feature).

Circuit breakers shall have control switches which shall be labeled open/N/close or (O/N/I and arranged to operate clockwise when closing the circuit breakers and anti-clockwise when opening them, and shall be of the pistol grip type.

Control switches of the discrepancy type shall be provided where specified, i.e. mimic panel. Such discrepancy control switches shall be arranged in the lines of the mimic diagram. Such switches shall include lamps and be of the manually operated pattern, spring loaded such that it is necessary to push and twist the switch past its indicating position for operation. The lamp shall be incorporated in the switch base and shall flash whenever the position of the circuit breaker is at variance with the position indicated by the control switch. Hand dressing of the control switch to the correct position shall cause the lamp to extinguish.

Selector switches shall be of the two or more position type as required, and have a stay-put action to remain in any selected position which shall be lockable (separate padlocks each with duplicate keys should be provided). Each position of the selector switches shall be suitably labeled to signify their function. The switch handle shall be of the pistol grip type to the approval of the Engineer.

It shall not be possible at any time to operate any switchgear equipments from more than one location simultaneously, and suitable lockable selector switches shall be provided to meet this requirement.

The contacts of all control and selector switches shall be shrouded to minimize the ingress of dust and accidental contact, and shall be amply rated for voltage and current for the circuits in which they are used.

7.7.2.18 Auxiliary Switches

Auxiliary switches shall be to approval and contacts shall have a positive wiping action when closing.

All auxiliary switches, whether in service or not in the first instance, shall be wired up to a terminal board and shall be arranged in the same sequence on similar equipment's.

Auxiliary switches mechanically operated by the circuit breakers, contactors, isolators, etc. shall be to approval and contacts mounted in accessible positions clear of the operating mechanism of the circuit breaker, contactor, isolator, etc., and they shall be adequately protected against accidental electrical shock.

Auxiliary switches shall be provided to interrupt the supply of current to the trip coil of each circuit breaker and contactor immediately the breaker or contactor has opened. These auxiliary switches shall make before the main contacts, during a closing operation.

A minimum of four spare auxiliary switches, two normally open, two normally closed shall be provided for each circuit breaker, and contactors and also for isolators.

7.7.2.19 Transistorized Electronic Equipment

Transistorised electronic equipment shall comply with the BS 9000 series or equipment National specification and be adequately sized and derated to suit the local climatic condition.

Wiring boards shall comply with BS 4584 part 2. Unless otherwise approved, epoxy resin-bonded fiberglass boards shall be used. The conductors shall be not less than 0.4 mm with the standard spacing for voltage 0.5 to 4 volts (Peak)

External connections from the boards shall be soldered, crimped or through plug and socket connections to approval.

The identification of components in boards shall comply with BS 9000 or equivalent National specification and the identification of individual boards shall be agreed with the Engineer.

Where boards are mounted in racks they shall conform to 483 mm wide module unless otherwise agree. The location of individual boards within the racks shall follow a logical pattern, boards for similar duties being arranged in similar order.

7.7.2.20 Alarm Equipment

Where an alarm system is specified, it shall consist of an initiating device, a display unit and push buttons mounted on the front of the appropriate control panel, together with a continuously rated audible warning device flasher unit and relays. The relays shall wherever possible, be mounted inside the same panel; where the number of alarms to be displayed makes this impracticable, a separate alarm relay cubicle or cubicles will be considered as an alternative.

Where it is necessary to differentiate between the urgency of alarms then various approved alarm tone devices shall be provided in this Contract. In addition, and where specified an alarm beacon to the approval of the Engineer shall be provided.

The display unit shall consist of a rectangular frame or bezel enclosing the required number of individual facias, each of which shall be preferably approximately 32mm x 25mm in size. Each facia shall be in the form of a window inscribed with the specified legend, describing the fault condition to be indicated. Lamps shall not illuminate adjacent windows.

At least 3 spare ways shall be provided on each display unit. All unused ways in a display unit shall be fully equipped and the alarm system designed to enable these ways to be utilized at a future date.

Alarm relays shall be of a type to the approval of the Engineer, arranged to plug into fixed bases, either singly or in groups and have positive means of retaining them securely in the service position, the bases being mounted on racks or frames which shall be hinged to allow them to be swung clear of the sides of the panel or cubicle in which they are installed in order to provide ready access.

The type of wiring used for internal connections between alarm facias and their relays and between relays and terminal blocks, shall generally comply with these requirements with the following exceptions:-

(i) Single-strand wire, not less than 0.85 mm in diameter may be used.

Soldered terminations will be acceptable

External connections for alarm circuits will in general be run in multi-core cables having a larger core size than that referred to above. This will necessitate special terminal blocks, if soldered terminations are used, in which case the internal and external terminations of each pair shall be joined by a removable link. Samples of the type of wire and terminal block to be used for alarm connections shall be submitted for the Engineer's approval.

The operation of the alarm system shall be as follows: -

When an external alarm indicating contact closes the audible warning shall sound continuously and the appropriate facia shall be illuminated by a flashing light at a frequency which allows the inscription to be easily road.

An 'Accept' push-button shall be provided on or near the display unit, which when pressed, shall silence the audible signal and cause the facia to remain illuminated steadily.

The alarm circuit shall be designed to retain the indication after the re-opening of the initiating contact, requiring a separate 'Reset' push button to be pressed before the alarm is cancelled.

A 'Test' push button shall be fitted close to the 'Accept' and 'Reset' buttons, to illuminate all the facias on the associated display unit for as long as the 'Test' button is held depressed.

The operation of the 'Accept' button shall not preclude the receipt of further indications giving more audible alarm and visual indications as the result of the operation of other sets of alarm contacts.

Relays shall not be continuously energized when the alarm system is at rest.

For all alarm indication initiating device a spare set of voltage-free contacts shall be provided (this may be by the use of auxiliary relays) and connected by cable to a suitable, approved marshalling cubicle. These spare contacts will provide for the transmission of the alarm indication signals to the remote Grid Control Centre.

The Contractor shall be responsible for providing all the alarms required for the safe and efficient operation of the plant. General descriptions of alarms requirements are given in the specification, and the Contractor shall include any other alarms that are necessary due to the type of equipment and design of the plant to the Engineer's approval.

7.7 .2.21 Current Transformers (CTs).

The current transformer rated current ratio shall match the connected load circuit and secondary circuit requirements.

Current transformers shall be capable of withstanding without damage the full load, peak and rated short time currents of their associated equipment.

Where space within a current transformer chamber permits dedicated current transformers shall be used for protection, instrumentation and metering.

Current transformers for protective and protective/indication purposes shall be designed to suit the particular requirements of the associated protection, which in general shall be in accordance with the recommendations given in BS 3938 or approved equivalent.

Class 5p current transformers shall be used for inverse time over-current and/or earth fault protection. The rated accuracy limit current shall be equivalent to the maximum symmetrical three

phase fault current or earth fault current of the protected circuit or equivalent tot he switchgear breaking capacity unless otherwise approved by the Engineer. The current transformers shall be capable of meeting the 5p error classification at rated accuracy limit current over the full range of relay settings, unless otherwise approved by the Engineer.

Current transformers used for indication/metering purposes shall be designed to saturate at a value of primary current sufficiently low to protect the secondary circuit from damage at all possible values of primary fault current up to the associated primary short time thermal rating.

Current transformers for protection using high impedance relays shall be of the low reactance type and their performance shall be stated in terms of the Class X parameters of BS 1938. (Low reactance current transformers may be shown to be low reactance by virtue of their construction as defined in Clause 4.4.2.21. of BS 3938.

If all the constructional requirements are not met then type tests will be required to prove that the current transformers are low reactance; the primary test current shall not be less than the through fault (stability) current of the protection scheme.

The rated volt-amp output of each current transformer shall not be less than 110% of the connected burden as installed in service, the burden of cable connections being taken into account.

The secondary windings of each set of current transformers shall be earthed at one point only via an accessible bolted disconnecting link, preferably located within the relay cubicle.

Where double-ratio secondary windings are specified provided a label shall be provided at the secondary terminals of the current transformer indicating clearly the connections required for either tap. The connections and the ratio in use shall be indicated on all connection diagrams.

Design magnetization curves and d.c resistance values shall be submitted before manufacture for each current transformer used for protective purposes and shall be subsequently verified by works routine tests and also by site commissioning tests.

Where current transformers have to operate or be mounted on apparatus provided under other contracts, the Contractor shall be responsible for ensuring design and installation compatibility with other Contractors and for keeping the Engineer informed.

Metal clad switchgear current transformers shall be located on the non-bus-bar side of the circuit breaker except where current transformers are provided on both sides of the circuit breaker for protection zone overlap. The primary conductors shall be accessible for primary current injection treating on site.

7.7.2.22 Voltage Transformers (VTs)

Voltage transformers shall comply with the requirements of IEC 60044-2 with amendments and supplements and shall be of:-

Class 3p accuracy for protection/indicating instruments

Class 0.2 accuracy for tariff metering or acceptance efficiency testing.

For tariff metering voltage transformers, the Contractor shall check the total installed secondary burden and if necessary shall install dummy burdens to achieve the calibrated accuracy.

Voltage transformer secondary circuit shall be earthed at one point only and metal cases shall be separately earthed. The transformers core, where accessible, shall also be separately earthed.

All voltage transformers in the system at a given voltage level shall be earthed in the same manner.

Where it is required to earth the primary neutral of a metal clad three- phase voltage transformer, the neutral earthing connection shall be insulated and brought out separately from the tan earthing connection. Means shall be provided to maintain the tank earthing connection while the voltage transformer is being withdrawn.

Where three single-phase voltage transformers are supplied for protection purposes, star connected secondary windings shall have the star point formed by insulated connections and shall be earthed at a common point.

Where possible primary windings shall be connected through fuses with current limiting features.

Secondary MCB's shall be provided as close as possible to each voltage transformer and labeled to show their function and phase colour. The secondary circuits shall be monitored individually to detect and alarm individual fuse failure or MCB trip and to block protection operation if required.

Voltage transformers shall be designed that saturation of their cores does not occur when 1.732 times normal voltage is applied to each winding.

Magnetization curves shall be submitted for approval for each type of voltage transformer.

The standard secondary voltage between phases shall be 110 volts unless special circumstances dictate otherwise, and are approved by the Engineer.

Secondary circuits from different voltage transformers, or separate windings of the same transformer, shall not be connected in parallel.

Voltage transformers shall be connected on the non-busbar side of circuit breakers unless otherwise approved by the Engineer.

7.7 .2.23 Panels, Desks, Kiosks and Cubicles

7.7 .2.23.1 General Requirements

Unless otherwise specified, panels, desks and cubicles, shall be of floor-mounted and free-standing construction and be in accordance with the specified enclosure classification. All control and instrumentation panels shall be identical in appearance and construction.

Panels shall be rigidly constructed from folded sheet steel of adequate thickness to support the equipment mounted thereon, above a channel base frame to provide a toe recess. Alternatively a separate kicking plate shall be provided.

Overall height, excluding cable boxes, shall not exceed 2.5 m. operating handless and locking devices shall be located within the operating limits of 0.95m and 1.8m above floor level. All panels shall be fitted with padlocks. The minimum height for indicating instruments and meters shall be 1.5m unless otherwise specified.

All panels' desks and cubicles shall be vermin and insect proof. All cable entries to equipment shall be sealed against vermin as soon as possible after installation and connecting-up of the cables to the approval of the Engineer.

Ventilation shall be provided for natural air circulation. All control equipment shall be designed to operate without forced ventilation.

For outdoor equipment, metal to metal joints shall not be permitted and all external bolts or screws shall be provided with blind taped where a through hole would permit the ingress of moisture. All

metal surfaces shall be thoroughly cleaned and particular care taken during painting to ensure that both internally and externally a first-class cover and finish is achieved. For harsh environments, all nuts, bolts and washers shall be plated.

Door sealing materials shall be provided suitable for the specified site conditions. Doors shall be fitted with handles and locks. The doors shall be capable of being opened from within the panel without the aid of a key after they have been locked from the outside. Hinges shall be of the life-off type. Seals shall be continuous or with only one joint.

The bottom and/or top of all panels shall be sealed by means of removable gasketed steel gland plates and all necessary glands shall be supplied and fitted within the Contract.

Panels shall be suitably designed to permit future extension wherever appropriate or specified without the need to dismantle the existing panels.

Each panel shall include rear access doors and door-operated interior lamp, and be clearly labeled with the circuit titled at front and rear, with an additional label inside the panel. Panels sections accommodating equipment at voltages higher than 110 V shall be partitioned off and the voltage clearly labeled. Each relay and electronic card within panels shall be identified by labels permanently attached to the panel and adjacent to the equipment concerned. Where instruments are terminated in a plug and socket type connection both the plug and the socket shall have permanently attached identifying labels.

Instrument and control devices shall be easily accessible and capable of being removed from the panels for maintenance purposes.

For suites of panels inter-panel bus wiring shall be routed through apertures in the sides of panels and not via external multi-core cabling between the panels.

All panels, whether individually mounted or forming part of a suit, shall incorporate a common internal copper earthing bar onto which all panel earth connections shall be made. Suitable studs of holes to the Engineer's approval shall be left at each end of the bar for connection to the main station earthing system.

Earth connection between adjacent panels shall be achieved by extending the bar through the panel sides and not by interconnecting external cabling.

Cubicles and cubicle doors shall be rigidly constructed such that, for example, door mounted emergency trip contacts can be set so that mal-operation will not be possible due to any vibrations or impacts as may reasonably be expected under normal working conditions.

7.7.2.23.2 Indicating Lamps

All new indicators shall have a minimum continuous burning guaranteed life of 10000 hrs, at their rated voltage.

Indicators shall be of the filament lamp, LED or preferably Neon type and shall be approved by the Employer.

Indicators shall be easily replaceable from the front of the panel and. shall be adequately ventilated. LED indicators shall operate at not less than 20mA and red LED indicators shall be of the high brightness types.

The lamps shall be clear and shall fit into a standard form of lamp holder. The rated lamp voltage should be ten percent in excess of the auxiliary supply voltage, whether AC or DC. Alternatively, low

voltage lamps with series resistors will be acceptable, however resistors shall be dimensioned to avoid damage due to heat.

The lamp glasses shall comply with BS. 1376 and BS. 4099 or equivalent National Standard and shall be in standard colours, red, green, blue, white and amber. The colour shall be in the glass and not an applied coating and the different coloured glasses shall not be interchangeable. Transparent synthetic materials may be used instead of glass, provided such materials have fast colours and are completely suitable for use in tropical climates.

Normally energized indicating lamps, if employed, shall in general be energized from the station LVAC supply.

Lamps and relays incorporated in alarm facia equipment shall be arranged for normal operation from the station battery, subject to the approval of the Engineer.

Lamp test facilities shall be provided so that all lamps on one panel can be tested simultaneously by operation of a common push-button. Where alarm facias are specified, all alarm and monitoring indications (apart from circuit-breaker and disconnector position indications) shall be incorporated in the facia.

Where specified every circuit breaker panel shall be equipped with one red and one green indicator lamp, indicating respectively circuit closed and circuit open and an amber lamp for indicating 'auto-trip'. Where specified in the lines of mimic diagrams, indicating lamps may be of the three-lamp single-aspect type.

All lamps shall be renewable from the front of panels without the use of special tools.

The variety of indicating lamps provided shall be rationalized to reduce maintenance and spares requirements.

7.7 .2.23.3 Anti-Condensation Heaters

All switchboards, panels, cubicles, motor control center and the like shall incorporate electric heaters capable of providing movement of sufficient heated air to avoid condensation. The power supply to the heaters shall be manually switched by a two pole switch with red lamp. All heaters on multi-panel equipment shall be controlled from a single point. The related equipment shall be designed to accept the resulting heat input.

Bus wiring shall be incorporated in switchboards for supplying the heaters.

7.7 .2.24 Panel Wiring and Terminal Boards

7.7 .2.24.1 General

All electrical equipment mounted in or on switchgear, panels, kiosks, and desks, etc. shall have readily accessible connections and shall be wired to terminal blocks for the reception of external cabling.

All wiring shall be of adequate cross-sectional area to carry prospective short-circuit currents without risk of damage to conductors, insulation or joints.

All cabling shall be of type CR or CK to BS 6231 unless the design of the plant requires the cabling to withstand more onerous operating conditions in which case cabling shall be suitable for these conditions. The minimum cross section of wire shall be 2.5 sq.mm. for all secondary wiring associated with current transformers of nominal secondary rating of 0.5 A or greater. The size of wiring for circuits other than CT secondary wiring shall be not less than 1.5 sq.mm. Cross-sectional area, save as permitted in the specification.

The minimum strand diameter of copper or tinned copper flexible conductors shall be 0.20 mm for flexible and the minimum cross-sectional area shall be 0.5 sq.mm. for all cables. For wiring within panels on circuits not directly associated with circuit breaker protection and control, and having a continuous or intermittent, load current of less than 1 amp, the use of smaller line down to 0.25 sq. mm. will be permitted subject to Engineer's Approval.

Where an overall screen is used, this shall be metallic screen or low resistance tape, with drain wire as above.

Wiring shall be supported using an insulated system which allows easy access for fault finding and facilitates the rapid installation of additional cables.

Small wiring passing between compartments which may be separated for transport shall be taken in terminal blocks mounted near the top of each compartment, separately from those for external cable connections.

Both ends of every wire shall be fitted with ferrules of insulating material complying with BS 3858 or equivalent National Standard and engraved in black. The identification numbering system used for the ferrules shall be to the approval of the Engineer. Where new equipment must interface with existing equipment double ferruling shall be employed if the two numbering system are not compatible.

Connections to apparatus mounted on doors, or between points subject to relative movement, shall be made in cable type CK to BS 6231, arranged so that they are subjected to torsion rather than bending.

7.7 .2.24.2 Identification of Cable Cores

Where a wire a multi-core cable passes from one piece of equipment to another, e.g. from a circuit breaker to a remote control panel, the Contractor shall ensure that the identity of the wire is apparent at both ends and intermediate marshalling points by the use of ferrules, which shall permit identification of the cable in accordance with the schematic diagrams. The ferruling system to be adopted shall be a composite marking method to IEC 391 and BS 3858 as appropriate, giving both functional information on the purpose of the individual conductor plus dependent both-end marking.

Should the Contractors normal practice be at variance with the requirements of this Clause he may submit details of the scheme proposed for consideration by the Engineer. The engineer is not obliged to accept the Contractors proposal.

Each core of multi-pair wiring shall be identified by colour and terminal block identification together with an identification tracer per bundle.

Permanent identification of all terminals, wires and terminal blocks shall be provided. Each individual terminal block shall have independent terminals for incoming and outgoing cabling.

7.7 .2.24.3 Terminals and Terminal Boards

Terminal Assemblies shall be of the unit form suitable for mounting on a standard assembly rail, to give the required number of ways. The units shall be spring retained on the assembly fail. Each individual terminal block shall have independent terminals and outgoing cabling.

End barriers or shields shall be provided for open sided patterns.

It shall be possible to replace any unit in an assembly without dismantling adjacent units. Moulding shall be mechanically robust and withstand the maximum possible operating temperatures and torque which may be applied to terminal screw. All live parts shall be recessed in the moulding to prevent accidental contact.

Terminals shall be of the screw clamp type for lower current rating which compress the conductor or termination between two plates by means of a captive terminal screw. Contact pressure of screw clamp terminations shall be independent of each other. For higher current ratings bolted type terminals are permitted. Current carrying parts shall be non-ferrous and plated.

All terminals for 'incoming' cabling shall have testing facilities, which permit the examination of the state of the circuit without disconnecting the associated cabling. Terminal blocks for current transformer secondary shall be fitted with shorting/disconnect facilities.

Terminal blocks for voltage transformers secondaries shall be isolatable.

Terminal blocks in telemetry marshalling cubicles shall be isolatable. The means of isolation shall be fixed and give visual identification of the status of the terminal.

Not more than 1 wire shall be connected to each terminal and cross-connection facilities shall be provided where numerous cores are to connected together.

Each terminal block, and every individual terminal shall be identified. The terminal identification number shall be included on associated schematic and wiring diagrams.

The mounting rail may only be used to provide an earth connection, when firmly bonded to the earth bar and to be approved by the Employer.

The Contractor shall submit samples of the terminal blocks/mounting rail assemblies together with details of his proposed cabling/termination system to the Engineer for approval.

Adjacent terminals to which wires of different voltage, polarity or phase are connected shall be separated by a protruding insulating barrier; this requirement also applies to terminals carrying wires of the same voltage but originating from different sources.

Wires shall be grounded on the terminal boards according to their functions. Terminal blocks for connections exceeding 110V shall be fitted with insulting covers.

Terminal blocks shall be mounted not less than 150 mm from the gland plates, and spaced not less than 100 mm apart, on the side of the enclosure.

Sufficient terminals shall be provided to permit all cores on multicore cables to be terminated. Terminals for spare cores shall be numbered and be located at such position as will provide the maximum length of spare core. At least 10% spare terminals shall be provided in all cases.

The tails of multi-core cables shall be bound and routed so that each tail may be traced without difficulty to its associated cable. All spare cores shall be made off to terminals.

When two lengths of screened cable are to be connected at a terminal block (i.e. junction box) a separate terminal shall be provided to maintain screen continuity.

Should the terminal block manufacturer recommend that specific types of terminal tools are used (eg parallel sided screw/drivers) the Contractor shall provide three sets of these at each sub-station site. In addition, the Contractor shall provide 8 numbers, test leads of minimum 1500 mm length

which can be inserted into the test terminals of the terminal blocks, at each sub-station. The test leads shall be capable of being 'jumpered' together for multi-instrument use.

The use of pre-formed factory tested cable connections to field mounted marshalling boxes shall be to the Engineer's approval.

7.7.2.25 Cable Boxes and Glands

Electrical equipment supplied under this Contract shall be fitted with all necessary cable boxes and glands which shall be complete with all required fittings. Boxes shall be of adequate proportions to accommodate all cable fittings, including stress cones or other means of cable insulation grading, and designed in such a manner that they can be opened for inspection where appropriate without disturbing the gland plate of incoming cable.

Glands for termination of cables to outdoor equipment or indoor areas liable to water spray, hosing or flooding shall incorporate provision for sealing against ingress of moisture or dust, and shall comply with the requirements of BS 6121 for sealing.

Removable gasketed steel gland plates shall be provided for multi-core cables and shall be supported from the sides of the enclosures, as near to the floor or roof as possible while allowing adequate space both above and below the plate for manipulation of the cable and gland. Gland plates for marshalling boxes shall be in the form of removable gasketed steel plate, forming part of the underside of the box.

The terminals for 3 phase cables shall be clearly marked with the phase colours (approved designations) to enable the cables to be terminated in the correct sequence.

Filling and venting plugs where required, shall be positioned so as to avoid the possibility of air being trapped internally and adequate arrangements shall be made for expansion of compound etc. There shall be no possibility of oil entering the cable box from an associated oil filled compartment. Cable sealing ends, shall be arranged to project at least 25mm above the gland plate to avoid moisture collecting in the crutch.

Any chamber which is to be compound filled, shall be clean and dry and at such a temperature before filling that the compound does not solidify during the filling process. Filling orifices shall be sufficiently large to permit easy and rapid filling.

All cable boxes shall be designed to withstand the high voltage d.c. cable tests prescribed in BS 6346, BS 6480 and IEC 55 as appropriate.

Cable boxes for paper-insulated cables shall be complete with universal tapered brass glands (insulated from the box in an approved manner and including an island layer for testing purposes.

Even single core cables are used, particularly for currents in excess of 500 A, adequate steps must be taken to minimize the effects of eddy currents in the gland and bushing-mounted plate.

Cable glands for extruded solid dielectric insulated cables (PVC, EPR, and XLPE) shall be of the compression type and as specified in BS 6121.

Approved glands shall be used on MICC cables

Glands for armored or screened cables above 240 sq.mm. shall be provided with an integral heavy-duty earthing lug capable of carrying the full earth fault current for a period not less than 1 second without deterioration.

Cable lugs and terminations for the receipt of all power control and instrumentation cable cores shall be provided.

Cable boxes for the termination of elastomeric cables up in 33 kV nominal service voltage shall be designed and dimensioned to provide adequate insulation in air for cables. Clearance and creepage distances shall be adequate to withstand the specified alternating current voltages and impulse voltages for service under the prevailing site conditions. The performance is to be met without the use of insulating 'boots' shrouds or any other material fitted over or between the cable terminations apart from permanently fitted barriers forming part of the switchgear or cable box.

Means shall be provided for preventing accumulation of dirt, dust, moisture, vermin or insects such as to maintain the anticipated life of the equipment. The Contractor shall ascertain the means by which elastomeric cables are to be terminated and shall provide such information or instructions as necessary to any other contractor or sub-contract or to ensure compliance with this Clause.

The cable crutch within a cable box or equipment panel shall be protected by the use of a heat-shrink plastic 'udder' places over the conductors and crutch.

7.7.2.26 Joints and Gaskets

All joint faces are to be flat and parallel to the approval of the Engineer and arranged to prevent the ingress of water or leakage of oil with a minimum of gasket surface exposed to the action of oil or air.

Oil-resisting synthetic rubber gaskets are not permissible, unless the degree of compression is accurately controlled. For gaskets of cork or similar, oil resisting synthetic rubber may be used as a bonding medium.

7.7.2.27 Junction, Termination Marshalling Boxes, Operating Cubicles etc.

All junctions, termination and marshalling boxes shall be of substantial sheet steel construction, having enclosure classification in accordance with Section 4.4.17.9 and fitted with external fixing lugs and finished in accordance with this Specification for cleaning, painting and finishing.

The boxes shall allow ample room for wiring, with particular regard to the deployment of wires from the point of entry.

Outdoor boxes shall have internal anti-condensation heaters and stay bars fitted to doors. Indoor boxes shall be designed such that any condensed water cannot affect the insulation of the terminal boards or cables. No cables shall be terminated into the top of outdoor boxes unless specifically approved by the Engineer.

Each box shall be complete with suitably inscribed identification labels.

Any outdoor boxes, cubicles etc containing instruments or meters shall have glazing suitable to permit the visual examination of these.

Covers shall be arranged for padlocking and padlocks with keys shall be supplied. Cast iron boxes shall have bolted lids requiring the use of special keys or spanners for removal.

All boxes shall be provided with adequate earthing bars and terminals.

Notwithstanding information supplied by the Engineer, the Contractor shall, as each box is completed or at intervals as requested by the Engineer, supply to the Engineer copies of accurate termination or destination charts showing the as-fitted arrangement of cables and cores in each box. The Contractor shall, following the Engineer's approval, fit one plastic laminated copy of the appropriate chart to the interior of each box.

7.7.2.28 Conduit and Accessories

Conduit, accessories and trunking installation shall comply with the latest issue of the Institution of Electrical Engineers Regulations for the Electrical Equipment of Buildings, unless otherwise approved by the Engineer. In addition, installation shall also comply with all local electricity regulations.

Unless otherwise approved, all conduit and conduit fittings shall be galvanized, of heavy gauge steel, screwed, solid drawn or weld type complying with IEC 423 and IEC 614.

No conduit smaller than 19mm outside diameter shall be used.

Standard circular boxes or machined face heavy-duty steel adaptable boxes with machined heavy type lids shall be used throughout. For outdoor mounting all boxes shall be galvanized, weatherproof and fitted with external fixing lugs.

Conduit terminations shall be fitted with brass bushes.

The use of running threads, solid elbows and solid tees will not be permitted.

Conduit ends shall be carefully reamed to remove burrs. Draw-in boxes shall be provided at intervals not exceeding 10m in straight-through runs.

Conduit runs shall be in either the vertical or horizontal direction unless otherwise approved and shall be arranged to minimize accumulation of moisture. Provision for drainage shall be made at the lowest points of each run.

Conduits shall be supported on heavy galvanized spacer saddles so as to stand off at least 6 mm from the fixing surface.

Provision shall be made for the support of internal conductors in instances where the length of the vertical run exceeds 5m.

All conduits run in any circuit are to be completed before any cables are pulled in.

Flexible metallic conduit shall be used where relative movement is required between the conduit and connected apparatus, and a separate copper connection provided to maintain earth continuity.

The maximum number of cables in any conduit shall be in accordance with the latest issue of the IEE Regulations for the Electrical Equipment of Buildings.

7.7.2.29 Trunking

Steel trunking etc. may be used for running numbers of insulated cables or wires in certain positions to the approval of the Engineer. The trunking thickness shall not be less than 1.2 mm.

7.7.2.30 Push-Buttons and Separately Mounted Push-Button Stations.

Push-buttons shall be shrouded or well recessed in their housings in such a way as to minimize the risk of inadvertent operation.

The colour of push-buttons shall be black unless otherwise required by the Engineer.

Push-button stations supplied as loose equipment shall be of the metal clad weatherproof type suitable for wall or bracket mounting.

Each push-button station shall be clearly labeled showing the duty or drive to which it is applicable.

7.7 .2.31Standards

In the technical specification reference have been made to various clauses of IEC; BS; ISO and ASTM standards. Where any standard referred to in this specification has been superseded by a new standard the reference shall be deemed to be to such superseding standards. Notwithstanding the standard numbers mentioned in the technical specification the Bidders are directed to apply the latest published editions of these standards.

Deviations from the specified standards referred to above shall be given in the Schedule of Proposed Standards at section – 7 and shall have to be accepted by the Engineer before contract placement.

7.7 .2.32 Nominal Safety Clearance

Nominal voltages between phases	33 kV	11 kV
Minimum clearance between live Part and earth	381	200
Minimum clearance between live Fixed metal of different phases	432	250
Minimum total air gap between Terminal of the same pole of Disconnectors	432	250
Minimum safety clearance between Live metal and positions to which Access is permissible with other Equipment alive	2740	2590
Clearance from ground to nearest Part not at earth potential of an Insulator supporting live Conductor	2440	2440

SECTION 7.8
Inspection, Testing of the Equipment

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SECTION 7.8: INSPECTION, TESTING OF THE EQUIPMENT

Six (6) Engineering Teams (nominated by the Purchaser) will participate on the quality acceptance test (QAT) for the offered equipment at the manufacturer's plant and confirm their quality as per specification. The Purchaser's nominated "Engineering Team" consists of at least 03 (three) Engineers in each team shall have the witness of the QAT of the goods on the manufacturer's premises. The WZPDCL Engineering Team will be as follows:

Teams	Nos. of Engineers	Name of Equipment
Team-1	3	Power Transformer and Station Auxiliary Transformer
Team-2	3	33 KV GIS Switchgear, 33kV outdoor VCB and 33kV PCM for GIS & AIS Substation,
Team-3	3	11kV GIS & AIS Switchgear with PCM.
Team-4	3	33kV & 11kV CT, 33kV & 11kV PT, 33kV & 11kV Isolator, 33kV LA and Mandatory Spare Parts
Team-5	3	Battery & Battery Charger, 33 KV & 11 KV Power Cable, AC/DC Distribution Panel
Team-6	3	Substation Automation System

7.8.1 INSPECTION AND TESTING OF 33 GIS SWITCHGEAR, 33KV Outdoor VCB AND PCM

Inspection and testing before and after shipment/ supply shall be in accordance with the relevant IEC standard.

7.8.1.1 Technical Orientation and Quality Test Witness (Acceptance test):

The Purchaser shall have the right to inspect/test the goods/materials to confirm their conformity to the specification. The purchaser shall be entitled at all reasonable time during manufacture to inspect, examine and test of goods/materials at the manufacturers' premises, workmanship and performance.

The following tests (not limited to) shall be carried out as per latest version of IEC Standard unless otherwise mentioned at the manufacturer premises or other places where the test facilities are available: -

a) Dielectric test on the main circuit

b) Tests on auxiliary and control circuits

c) Measurement of the resistance of the main circuit

d) Tightness test

f) Design and visual (physical) checks

g) Electrical and mechanical operation test/Functional test

h) Gas pressure leakage test

i) Partial discharge test

The Supplier shall, after consulting the purchaser, give the Purchaser reasonable notice in writing of the date on and the place at which any material or equipment will be ready for testing as provided in the contract and unless the purchaser shall attend at the place so named on date, which the supplier has stated in his notice, the supplier may proceed with the tests, which shall be deemed to have been made in the purchaser's presence, and shall forth with forward to the purchaser duly certified copies of test readings.

When the purchaser intends to attend the test he shall promptly inform the supplier accordingly in writing, so that he can take action. The purchaser shall give the supplier timely notice in

writing of his intention to attend the test. The contractor shall submit the factory test report to the engineer for check and verification at least 15 days prior to inspection

Where the supplier provides for tests on the premises of the supplier or of any manufacturer of the supplier, except where otherwise specified, shall provide free of charge such assistance, labor, materials, electricity, fuel, stores, apparatus and instruments as may be requisite and as may be reasonably demanded to carry out such test efficiently. These test shall be performed as per relevant IEC Standard or equivalent IEEE standard or BS standard only routine tests as agreed upon, will be performed.

As and when the purchaser is satisfied that any materials/equipment shall have passes the tests referred to in this clause, purchaser shall notify the contractor in writing to that effect. Should any inspected/tested goods fail to conform to the specification, the Purchaser shall have the right to reject any of the item or complete batch if necessary. In that case Supplier have to replace the Equipment and to make good of them without any financial involvement to the Purchaser. In case any of the Equipment found not conforming with the specification at the time of post landing Inspection, the supplier will in no way be relieved from the responsibility of replacing them on making them good at their own cost, despite the Equipment were found good at the time of Factory Acceptance Test. Nothing in this clause shall in any way release the supplier from any warranty or other obligations under the contract.

WZPDCL's Inspection Team of 03 Engineers as per TDS shall have to conduct Technical Orientation and Quality Test Witness at the manufacturer's factory premises. The cost incurred for this purpose shall be borne by the contractor and shall be deemed the cost in this regard is included in the offered price.

The cost of Air Tickets (both way) from Bangladesh to Manufacturer's Country (place of Technical Orientation and Quality Test Witness), Hotel Accommodation, fooding and lodging etc. will be borne by the contractor. Other than this the contractor will pay a standard amount of pocket money (Euro 100) per day (including journey period). The period for this purpose is more or less 07 (Seven) working days (Excluding Journey time). All the cost of this purpose shall be deemed is included in the offered price.

No goods shall be packed, prepared for shipment/delivery unless it has been approved and written instruction have been received by the Purchaser.

The bidder has to mention the place of Technical Orientation and Quality Test Witness in the following table: -

Sl. No.	Item	Period of Technical Orientation and Quality Test Witness	Place & Country of Technical Orientation and Quality Test Witness

7.8.1.2 Post Landing Inspection:

Post landing inspection shall be done immediately after arrival of the goods/materials at the designated store of WZPDCL/project office/ site; the quality witness team along with the engineers shall conduct Post Landing Inspection in presence of the representative of Supplier.

The inspection team shall conduct the following test

i) Design and visual (physical) inspection and quantity checks

The program of such inspection shall be intimated to the representative of Supplier by WZPDCL upon arrival of the materials at WZPDCL store/project office of the Inspector(s) to be selected for test witnessing. Any defect or damage have been found at post-delivery inspection, the defective or damaged panels/ materials/ goods to be repaired/ replaced by the Bidder/ supplier at his own cost. The goods/materials shall be under the custody of the contractor for installation. Contractor shall be responsible for the safety and security of the equipment.

7.8.2 INSPECTION AND TESTING OF 11KV GIS & AIS SWITCHGEAR (with PCM)

Inspection and testing before and after shipment/ supply shall be in accordance with the relevant IEC standard.

7.8.2.1 Technical Orientation and Quality Test Witness (Acceptance test):

The Purchaser shall have the right to inspect/test the goods/materials to confirm their conformity to the specification. The purchaser shall be entitled at all reasonable time during manufacture to inspect, examine and test of goods/materials at the manufacturers' premises, workmanship and performance.

The following tests (not limited to) shall be carried out as per latest version of IEC Standard unless otherwise mentioned at the manufacturer premises or other places where the test facilities are available: -

a) Dielectric test on the main circuit

b) Tests on auxiliary and control circuits

c) Measurement of the resistance of the main circuit

d) Tightness test

f) Design and visual (physical) checks

g) Electrical and mechanical operation test/Functional test

h) Gas pressure leakage test (one for GIS)

i) Partial discharge test

The Supplier shall, after consulting the purchaser, give the Purchaser reasonable notice in writing of the date on and the place at which any material or equipment will be ready for testing as provided in the contract and unless the purchaser shall attend at the place so named on date, which the supplier has stated in his notice, the supplier may proceed with the tests, which shall be deemed to have been made in the purchaser's presence, and shall forth with forward to the purchaser duly certified copies of test readings.

When the purchaser intends to attend the test he shall promptly inform the supplier accordingly in writing, so that he can take action. The purchaser shall give the supplier timely notice in writing of his intention to attend the test. The contractor shall submit the factory test report to the engineer for check and verification at least 15 days prior to inspection

Where the supplier provides for tests on the premises of the supplier or of any manufacturer of the supplier, except where otherwise specified, shall provide free of charge such assistance, labor, materials, electricity, fuel, stores, apparatus and instruments as may be requisite and as may be reasonably demanded to carry out such test efficiently. These test shall be performed as per relevant IEC Standard or equivalent IEEE standard or BS standard only routine tests as agreed upon, will be performed.

As and when the purchaser is satisfied that any materials/equipment shall have passes the tests referred to in this clause, purchaser shall notify the contractor in writing to that effect. Should any inspected/tested goods fail to conform to the specification, the Purchaser shall have the right to reject any of the item or complete batch if necessary. In that case Supplier have to replace the Equipment and to make good of them without any financial involvement to the Purchaser. In case any of the Equipment found not conforming with the specification at the time of post landing Inspection, the supplier will in no way be relieved from the responsibility of replacing them on making them good at their own cost, despite the Equipment were found good at the time of Factory Acceptance Test. Nothing in this clause shall in any way release the supplier from any warranty or other obligations under the contract.

WZPDCL's Inspection Team of 03 Engineers as per TDS shall have to conduct Technical Orientation and Quality Test Witness at the manufacturer's factory premises. The cost incurred for this purpose shall be borne by the contractor and shall be deemed the cost in this regard is included in the offered price.

The cost of Air Tickets (both way) from Bangladesh to Manufacturer's Country (place of Technical Orientation and Quality Test Witness), Hotel Accommodation, fooding and lodging etc. will be borne by the contractor. Other than this the contractor will pay a standard amount of pocket money (As per TDS) per day (including journey period). The period for this purpose is more or less 07 (Seven) working days (Excluding Journey time). All the cost of this purpose shall be deemed is included in the offered price.

No goods shall be packed, prepared for shipment/delivery unless it has been approved and written instruction have been received by the Purchaser.

The bidder has to mention the place of Technical Orientation and Quality Test Witness in the following table:-

Sl. No.	Item	Period of Technical Orientation and Quality Test Witness	Place & Country of Technical Orientation and Quality Test Witness

7.8.2.2 Post Landing Inspection:

Post landing inspection shall be done immediately after arrival of the goods/materials at the designated store of WZPDCL/project office/ site; the quality witness team along with the engineers shall conduct Post Landing Inspection in presence of the representative of Supplier.

The inspection team shall conduct the following test

i) Design and visual (physical) inspection and quantity checks

The program of such inspection shall be intimated to the representative of Supplier by WZPDCL upon arrival of the materials at WZPDCL store/project office of the Inspector(s) to be selected for test witnessing. Any defect or damage have been found at post-delivery inspection, the defective or damaged panels/ materials/ goods to be repaired/ replaced by the Bidder/ supplier at his own cost. The goods/materials shall be under the custody of the contractor for installation. Contractor shall be responsible for the safety and security of the equipment.

7.8.3 INSPECTION AND TESTING OF SUBSTATION AUTOMATION SYSTEM (SAS)

Inspection and testing before and after shipment/ supply shall be in accordance with the relevant IEC standard.

7.8.3.1 Technical Orientation and Quality Test Witness (Acceptance test):

The employer / purchaser shall have the right to inspect/test the automation system to confirm their conformity to the specification. The purchaser shall be entitled at all reasonable time during manufacture to inspect, examine and test of automation system at the manufacturers' premises, workmanship and performance.

The following test shall be carried out as per latest version of IEC or equivalent standard unless otherwise mentioned at the manufacturer premises or other places where the test facilities are available: -

- Routine tests

The Supplier shall, after consulting the purchaser, give the Purchaser reasonable notice in writing of the date on and the place at which any material or equipment will be ready for testing as provided in the contract and unless the purchaser shall attend at the place so named on date, which the supplier has stated in his notice, the supplier may proceed with the tests, which shall be deemed to have been made in the purchaser's presence, and shall forth with forward to the purchaser duly certified copies of test readings.

When the purchaser intends to attend the test, he shall promptly inform the supplier accordingly in writing, so that he can take action. The purchaser shall give the supplier timely notice in writing of his intention to attend the test.

Where the supplier provides for tests on the premises of the supplier or of any manufacturer of the supplier, except where otherwise specified, shall provide free of charge such assistance, labor, materials, electricity, fuel, stores, apparatus and instruments as may be requisite and as may be reasonably demanded to carry out such test efficiently. These tests shall be performed as per relevant IEC Standard or equivalent and only routine tests as agreed upon, will be performed.

As and when the purchaser is satisfied that any materials/equipment shall have passes the

tests referred to in this clause, purchaser shall notify the contractor in writing to that effect.

Should any inspected/tested goods fail to conform to the specification, the Purchaser shall have the right to reject any of the item or complete batch if necessary. In that case Supplier have to replace the Equipment and to make good of them without any financial involvement to the Purchaser. In case any of the Equipment found not conforming with the specification at the time of post landing Inspection, the supplier will in no way be relieved from the responsibility of replacing them on making them good at their own cost, despite the Equipment were found good at the time of Factory Acceptance Test. Nothing in this clause shall in any way release the supplier from any warranty or other obligations under the contract.

WZPDCL's Inspection Team of 03 Engineers as per TDS shall have to conduct Technical Orientation and Quality Test Witness at the manufacturer's factory premises. The cost incurred for this purpose shall be borne by the contractor and shall be deemed the cost in this regard is included in the offered price.

The cost of Air Tickets (both way) from Bangladesh to Manufacturer's Country (place of Technical Orientation and Quality Test Witness), Hotel Accommodation etc. will be borne by the contractor. Other than this the contractor will pay a standard amount of pocket money per day (Excluding journey period).

The period for this purpose is more or less 07 (Seven) days. All the cost of this purpose shall be deemed is included in the offered price.

No goods shall be packed, prepared for shipment/delivery unless it has been approved and written instruction have been received by the Purchaser.

The bidder has to mention the place of Technical Orientation and Quality Test Witness in the following table: -

Sl. No.	Item	Period of Technical Orientation and Quality Test Witness	Place & Country of Technical Orientation and Quality Test Witness

7.8.3.2 Post Landing Inspection:

Post landing inspection shall be done immediately after arrival of the goods/materials at the designated store of WZPDCL/project office/ site; the quality witness team along with the engineers shall conduct Post Landing Inspection in presence of the representative of Supplier.

The inspection team shall conduct the following test

i) Design and visual (physical) inspection and quantity checks

The program of such inspection shall be intimated to the representative of Supplier by WZPDCL upon arrival of the materials at WZPDCL store/project office of the Inspector(s) to be selected for test witnessing. Any defect or damage have been found at post-delivery inspection, the defective or damaged panels/ materials/ goods to be repaired/ replaced by the Bidder/ supplier at his own cost. The goods/materials shall be under the custody of the contractor for installation. Contractor shall be responsible for the safety and security of the equipment.

7.8.4 INSPECTION AND TESTING OF POWER TRANSFORMER AND AUXILIARY TRANSFORMER

Inspection and testing before shipment/ supply shall be in accordance with the relevant IEC standard.

7.8.4.1 Technical Orientation and Quality Test Witness (Acceptance test)

The purchaser shall have the right to inspect, examine and test the materials to confirm the conformity to the specification at all reasonable time before and during manufacture at the manufacturer's premises. The Purchaser or its representative maximum 2 (two) times may inspect the goods during the manufacturing process and shall also request for the purchase/ import/ shipping documents of copper, oil and transformer core material and shall check in accordance with Guaranteed Technical Particulars (GTP).

An inspection team will be formed by WZPDCL immediate after signing of the contract to control the quality and monitoring the manufacturing process of the transformer. The manufacturer will allow inspection team to inspect the manufacturing process and quality control and progress of the work at any time need by WZPDCL's inspection team. This team will witness the Factory test at the manufacturer's plant. The Manufacturer shall have facilities to carry out all tests at its premises.

Tests shall be performed in accordance with the relevant IEC & other relevant standards and as per contract shall be complied with offered technical particulars and guarantees of the contract. All expenses for such tests shall be borne by the bidder.

WZPDCL's Inspection Team will witness the following test of not less than 20% of total quantity ready for delivery on random sampling basis (sample selected by the Inspection Team) during factory test in manufacturer's factory premises:

1. Measurement of turn ratio test;
2. Vector group test;
3. Measurement of winding resistance;
4. Measurement of insulation resistance;
5. Measurement of no load loss & no-load current;
6. Measurement of impedance voltage & load loss;
7. Dielectric withstands Tests;
8. Transformer oil test;
9. Temperature rise test. (5% of total quantity)

Besides WZPDCL's Inspection Team will perform some physical test of at least 1 (one) Transformer of each batch on random sampling basis during factory test:

1. Transformer tank sheet thickness (top bottom & side);
2. Hot dip galvanization test as per standard BS-729/EN:ISO-1461:2009 of all bolts & nuts connected with transformer tank, conservator, radiator etc.;
3. Dimension of bolted type bimetallic connector for H.T. and L.T. bushing;
4. Dimension of tanks;
5. Dimension of core dia, height and measurement of weight of active parts as per
6. demand of WZPDCL's inspection team;
7. Checking of Creepage distance of HT/LT bushings.

The dimension and weight must be as per the approved Technical Specifications/ Technical Guaranteed Data and Drawings.

The manufacturer shall have all testing facilities at the manufacturer's premises to carry out the tests in accordance with the relevant IEC/BS/ ANSI Standards. If, any test(s) pending due to lack of testing facilities at the manufacturer's premises, then the Inspection team shall select transformer(s) as sample and sent the selected sample transformer(s) to an independent testing lab to carry out the test(s). All cost of testing of transformers including carrying, loading, un-loading etc. will be borne by the Bidder.

The Tenderer/ Manufacturer shall submit with the bid the testing procedure & list of testing/ measuring equipment, meters etc. used for Factory test witness.

The Tenderer/Manufacturer shall submit the valid Calibration Certificate from competent authority of the testing/ measuring equipment's, meters etc. used for Factory test with the tender. The Supplier/Manufacturer shall also submit the following documents along with the request letter for Pre-delivery inspection:

I. Updated valid Calibration Certificates of the testing/ measuring equipment's, meters etc. used for Factory test.

II. The factory test report (Routine test report) of each transformer to be supplied under the contract.

Failing to submit the above documents, the inspection team will not perform the Pre-delivery Inspection and all the liabilities along with delay (if any) will be borne by the Supplier/Manufacturer.

It is noted that at the time of Factory Test witness WZPDCL's Inspection team will check the calibration seal/ certificate of the testing/ measuring equipment, meters etc. by the competent authority. If the calibration seal/ certificate of the testing/ measuring equipment, meters etc. are not found and the calibration not done within the due date then WZPDCL's Inspection team will not witness the test. In that case the Bidder/ Manufacturer shall complete the calibration of the testing/ measuring equipment, meters etc. from the competent authority within a reasonable period without any delay in delivery period.

WZPDCL's Inspection Team of 03 Engineers as per TDS shall have to conduct Technical Orientation and Quality Test Witness at the manufacturer's factory premises. The cost incurred for this purpose shall be borne by the contractor and shall be deemed the cost in this regard is included in the offered price.

The cost of Air Tickets (both way) from Bangladesh to Manufacturer's Country (place of Technical Orientation and Quality Test Witness), Hotel Accommodation, fooding and lodging etc. will be borne by the contractor. Other than this the contractor will pay a standard amount of pocket money (As per TDS) per day (including journey period). The period for this purpose is more or less 07 (Seven) working days (Excluding Journey time). All the cost of this purpose shall be deemed is included in the offered price.

No goods shall be packed, prepared for shipment/delivery unless it has been approved including factory Test reports and written instructions has been issued by the Purchaser.

7.8.4.2 POST-LANDING INSPECTION AND TESTING:

The Supplier shall inform the purchaser immediately after arrival of the goods at the designated store of WZPDCL (as per delivery schedule). An Inspection team of WZPDCL shall perform the post-landing inspection in presence of supplier's representative. The Supplier shall arrange the program of post-landing inspection. Any defect or damage have been found at post-landing inspection, the defective or damaged materials/ goods to be replaced by the supplier at his own cost within the stipulated time.

The purchaser's right to inspect, test (where necessary) and reject the goods after delivery at the designated store of WZPDCL shall in no way be limited or waived by reason of the goods having previously been inspected, tested and passed by the purchaser prior to the good's delivery.

The Inspection team will check the physical conditions and quantity of the goods delivered. If necessary, the inspection team will select the sample of good(s) and sent the selected sample goods to CERS, WZPDCL or BUET/ CUET/ KUET /RUET (as selected by the inspection team) to carry out the test(s) as per contract to confirm the conformity to the approved Technical Specifications, Guaranteed Technical Particulars (GTP), drawings and relevant standards. If the tested sample(s)

fail to confirm the specifications in tests, the full consignment will be rejected. All cost of testing of Materials/ Goods including carrying, loading, un-loading etc. will be borne by the supplier.

7.8.5 INSPECTION AND TESTING OF 33 POWER CABLE:

Inspection and testing before shipment/ supply shall be in accordance with the relevant IEC standard.

7.8.5.1 Technical Orientation and Quality Test Witness of 33 Power Cable:

The Purchaser shall have the right to inspect/test the goods/materials (33KV power cable of all size such as 500rm, 300rm, 95rm, 125rm in the contract) to confirm their conformity to the specification. The purchaser shall be entitled at all reasonable time during manufacture to inspect, examine and test of goods/materials at the manufacturers' premises, workmanship and performance.

At least the following test along with routine test shall be carried out as per latest version of IEC Standard or equivalent IEEE standard or BS standard unless otherwise mentioned at the manufacturer premises or other places where the test facilities are available: -

1. Measurement of Electrical Resistance of conducts.
2. High voltage test
3. Partial discharge test
4. Capacitance test
5. Voltage test on cable serving
6. Measurement of dimension of insulation and conductor

The Supplier shall, after consulting the purchaser, give the Purchaser reasonable notice in writing of the date on and the place at which any material or equipment will be ready for testing as provided in the contract and unless the purchaser shall attend at the place so named on date, which the supplier has stated in his notice, the supplier may proceed with the tests, which shall be deemed to have been made in the purchaser's presence, and shall forth with forward to the purchaser duly certified copies of test readings.

When the purchaser intends to attend the test he shall promptly inform the supplier accordingly in writing, so that he can take action. The purchaser shall give the supplier timely notice in writing of his intention to attend the test. The contractor shall submit the factory test report to the engineer for check and verification at least 15 days prior to inspection.

Where the supplier provides for tests on the premises of the supplier or of any manufacturer of the supplier, except where otherwise specified, shall provide free of charge such assistance, labor, materials, electricity, fuel, stores, apparatus and instruments as may be requisite and as may be reasonably demanded to carry out such test efficiently. These tests shall be performed as per

relevant IEC Standard or equivalent IEEE standard or BS standard only routine tests as agreed upon, will be performed.

As and when the purchaser is satisfied that any materials/equipment shall have passes the tests referred to in this clause, purchaser shall notify the contractor in writing to that effect. Should any inspected/tested goods fail to conform to the specification, the Purchaser shall have the right to reject any of the item or complete batch if necessary. In that case Supplier have to replace the Equipment and to make good of them without any financial involvement to the Purchaser. In case any of the Equipment found not conforming with the specification at the time of post landing Inspection, the supplier will in no way be relieved from the responsibility of replacing them on making them good at their own cost, despite the Equipment were found good at the time of Factory Acceptance Test. Nothing in this clause shall in any way release the supplier from any warranty or other obligations under the contract.

WZPDCL's Inspection Team of 03 Engineers as per TDS shall have to conduct Technical Orientation and Quality Test Witness at the manufacturer's factory premises. The cost incurred for this purpose shall be borne by the contractor and shall be deemed the cost in this regard is included in the offered price.

The cost of Air Tickets (both way) from Bangladesh to Manufacturer's Country (place of Technical Orientation and Quality Test Witness), Hotel Accommodation, fooding and lodging etc. will be borne by the contractor. Other than this the contractor will pay a standard amount of pocket money (As per TDS) per day (including journey period). The period for this purpose is more or less 07 (Seven) days. All the cost of this purpose shall be deemed is included in the offered price.

No goods shall be packed, prepared for shipment/delivery unless it has been approved and written instruction have been received by the Purchaser.

The bidder has to mention the place of Technical Orientation and Quality Test Witness in the following table: -

Sl. No.	Item	Period of Technical Orientation and Quality Test Witness	Place & Country of Technical Orientation and Quality Test Witness

7.8.5.2 Post Landing Inspection:

Post landing inspection shall be done immediately after arrival of the goods/materials at the designated store of WZPDCL/project office/ site; the quality witness team (pre-delivery inspection team) along with the engineer shall conduct Post Landing Inspection in presence of the representative of Supplier.

The inspection team shall conduct the following test

i) Design and visual (physical) inspection and quantity checks

The program of such inspection shall be intimated to the representative of Supplier by WZPDCL upon arrival of the materials at WZPDCL store/project office of the Inspector(s) to be selected for test witnessing. Any defect or damage have been found at post-delivery inspection, the defective or damaged panels/ materials/ goods to be repaired/ replaced by the Bidder/ supplier at his own cost. The goods/materials shall be under the custody of the contractor for installation. The contractor shall be responsible for all types of safety and security of the inspected materials

7.8.6 INSPECTION AND TESTING OF 11KV POWER CABLE:

Inspection and testing before shipment/ supply shall be in accordance with the relevant IEC standard.

7.8.6.1 Technical Orientation and Quality Test Witness of 11 Power Cable:

The Purchaser shall have the right to inspect/test the goods/materials (11KV power cable of all size such as 300rm, 185rm, 95rm, 125rm in the contract) to confirm their conformity to the specification. The purchaser shall be entitled at all reasonable time during manufacture to inspect, examine and test of goods/materials at the manufacturers' premises, workmanship and performance.

At least the following test along with routine test shall be carried out as per latest version of IEC Standard or equivalent IEEE standard or BS standard unless otherwise mentioned at the manufacturer premises or other places where the test facilities are available: -

1. Measurement of Electrical Resistance of conducts.
2. High voltage test
3. Partial discharge test
4. Capacitance test
5. Voltage test on cable serving
6. Measurement of dimension of insulation and conductor

The Supplier shall, after consulting the purchaser, give the Purchaser reasonable notice in writing of the date on and the place at which any material or equipment will be ready for testing as provided in the contract and unless the purchaser shall attend at the place so named on date, which the supplier has stated in his notice, the supplier may proceed with the tests, which shall be deemed to have been made in the purchaser's presence, and shall forth with forward to the purchaser duly certified copies of test readings.

When the purchaser intends to attend the test he shall promptly inform the supplier accordingly in writing, so that he can take action. The purchaser shall give the supplier timely notice in writing of his intention to attend the test. The contractor shall submit the factory test report to the engineer for check and verification at least 15 days prior to inspection.

Where the supplier provides for tests on the premises of the supplier or of any manufacturer of the supplier, except where otherwise specified, shall provide free of charge such assistance, labor, materials, electricity, fuel, stores, apparatus and instruments as may be requisite and as may be reasonably demanded to carry out such test efficiently. These test shall be performed as per relevant IEC Standard or equivalent IEEE standard or BS standard only routine tests as agreed upon, will be performed.

As and when the purchaser is satisfied that any materials/equipment shall have passes the tests referred to in this clause, purchaser shall notify the contractor in writing to that effect. Should any inspected/tested goods fail to conform to the specification, the Purchaser shall have the right to reject any of the item or complete batch if necessary. In that case Supplier have to replace the Equipment and to make good of them without any financial involvement to the Purchaser. In case any of the Equipment found not conforming with the specification at the time of post landing Inspection, the supplier will in no way be relieved from the responsibility of replacing them on making them good at their own cost, despite the Equipment were found good at the time of Factory Acceptance Test. Nothing in this clause shall in any way release the supplier from any warranty or other obligations under the contract.

WZPDCL's Inspection Team of 03 Engineers as per TDS shall have to conduct Technical Orientation and Quality Test Witness at the manufacturer's factory premises. The cost incurred for this purpose shall be borne by the contractor and shall be deemed the cost in this regard is included in the offered price.

The cost of Air Tickets (both way) from Bangladesh to Manufacturer's Country (place of Technical Orientation and Quality Test Witness), Hotel Accommodation, fooding and lodging etc. will be borne by the contractor. Other than this the contractor will pay a standard amount of pocket money (As per TDS) per day (including journey period).The period for this purpose is more or less 07 (Seven) days. All the cost of this purpose shall be deemed is included in the offered price.

No goods shall be packed, prepared for shipment/delivery unless it has been approved and written instruction have been received by the Purchaser.

The bidder has to mention the place of Technical Orientation and Quality Test Witness in the following table: -

Sl. No.	Item	Period of Technical Orientation and Quality Test Witness	Place & Country of Technical Orientation and Quality Test Witness

7.8.6.2 Post Landing Inspection:

Post landing inspection shall be done immediately after arrival of the goods/materials at the designated store of WZPDCL/project office/ site; the quality witness team(pre-delivery inspection team) along with the engineer shall conduct Post Landing Inspection in presence of the representative of Supplier.

The inspection team shall conduct the following test

Design and visual (physical) inspection and quantity checks

The program of such inspection shall be intimated to the representative of Supplier by WZPDCL upon arrival of the materials at WZPDCL store/project office of the Inspector(s) to be selected for test witnessing. Any defect or damage have been found at post-delivery inspection, the defective or damaged panels/ materials/ goods to be repaired/ replaced by the Bidder/ supplier at his own cost. The goods/materials shall be under the custody of the contractor for installation. The contractor shall be responsible for all types of safety and security of the inspected materials

7.8.7 INSPECTION AND TESTING OF BATTERY, BATTERY CHARGER, AC/ DC DISTRIBUTION PANEL:

Inspection and testing before shipment/ supply shall be in accordance with the relevant IEC standard.

7.8.7.1 Technical Orientation and Quality Test Witness

The Purchaser shall have the right to inspect/test the goods/materials (DC Distribution panel, AC distribution Panel, Battery and battery charger) to confirm their conformity to the specification. The purchaser shall be entitled at all reasonable time during manufacture to inspect, examine and test of goods/materials at the manufacturers' premises, workmanship and performance**.**

At least the following Routine test shall be carried out as per latest version of relevant IEC (IEC 60146-1-1)/ BS or RELEVANT international standards as mentioned in the contract at the manufacturer premises or other places where the test facilities are available.

Insulation tests of Battery charger (PCE)

1. A.C. or D.C. voltage test
2. Duration of the A.C. or D.C. voltage test
3. Voltage test levels
4. Insulation resistance
5. Functional test
6. Rated current test
7. Over-current capability test
8. Measurement of the inherent voltage regulation
9. Measurement of Losses and power factor etc.

The Supplier shall, after consulting the purchaser, give the Purchaser reasonable notice in writing of the date on and the place at which any material or equipment will be ready for testing as provided in the contract and unless the purchaser shall attend at the place so named on date, which the supplier has stated in his notice, the supplier may proceed with the tests, which shall be deemed to have been made in the purchaser's presence, and shall forth with forward to the purchaser duly certified copies of test readings.

When the purchaser intends to attend the test, he shall promptly inform the supplier accordingly in writing, so that he can take action. The purchaser shall give the supplier timely notice in writing of his intention to attend the test. The contractor shall submit the factory test report at least 07 days prior to inspection.

Where the supplier provides for tests on the premises of the supplier or of any manufacturer of the supplier, except where otherwise specified, shall provide free of charge such assistance, labor, materials, electricity, fuel, stores, apparatus and instruments as may be requisite and as may be reasonably demanded to carry out such test efficiently. These tests shall be performed as per relevant IEC Standard or equivalent IEEE standard or BS standard only routine tests as agreed upon, will be performed.

As and when the purchaser is satisfied that any materials/equipment shall have passes the tests referred to in this clause, purchaser shall notify the contractor in writing to that effect. Should any inspected/tested goods fail to conform to the specification, the Purchaser shall have the right to reject any of the item or complete batch if necessary. In that case Supplier have to replace the Equipment and to make good of them without any financial involvement to the Purchaser. In case any of the Equipment found not conforming with the specification at the time of post landing Inspection, the supplier will in no way be relieved from the responsibility of replacing them on making them good at their own cost, despite the Equipment were found good at the time of Factory Acceptance Test. Nothing in this clause shall in any way release the supplier from any warranty or other obligations under the contract.

If the offered goods are manufactured outside the purchaser's country then WZPDCL's Inspection Team of 03 Engineers in each team shall have to conduct Technical Orientation and Quality Test Witness at the manufacturer's factory premises. The cost incurred for this purpose shall be borne by the contractor and shall be deemed the cost in this regard is included in the offered price.

The cost of Air Tickets (both way) from Bangladesh to Manufacturer's Country (place of Technical Orientation and Quality Test Witness), Hotel Accommodation, fooding and lodging etc. will be borne by the contractor. Other than this the contractor will pay a standard amount of pocket money (Euro 100) per day (including journey period). The period for this purpose is more or less 07 (Seven) days. All the cost of this purpose shall be deemed is included in the offered price.

No goods shall be packed, prepared for shipment/delivery unless it has been approved and written instruction have been received by the Purchaser.

The bidder has to mention the place of Technical Orientation and Quality Test Witness in the following table: -

Sl. No.	Item	Period of Technical Orientation and Quality Test Witness	Place & Country of Technical Orientation and Quality Test Witness

7.8.7.2 Post Landing Inspection:

Post landing inspection shall be done immediately after arrival of the goods/materials at the designated store of WZPDCL/project office/ site; the quality witness team along with the Engineer shall conduct Post Landing Inspection in presence of the representative of Supplier.

The inspection team shall conduct the following test: -

i) Design and visual (physical) inspection and quantity checks

The program of such inspection shall be intimated to the representative of Supplier by WZPDCL upon arrival of the materials at WZPDCL store/project office of the Inspector(s) to be selected for test witnessing. Any defect or damage have been found at post-delivery inspection, the defective or damaged panels/ materials/ goods to be repaired/ replaced by the Bidder/ supplier at his own cost. The goods/materials shall be under the custody of the contractor for installation. The contractor shall be responsible for all types of security and safety of the inspected materials.

7.8.8 INSPECTION AND TESTING OF 33KV & 11KV CT, PT, LA, ISOLATOR

Inspection and testing before shipment/ supply shall be in accordance with the relevant IEC standard.

7.8.8.1 Technical Orientation and Quality Test Witness

The Purchaser shall have the right to inspect/test the goods/materials (33kV CT, 11kV CT, 33kV PT, 11kV PT, 33kV LA, 11kV LA and 33kV & 11kV Isolator) to confirm their conformity to the specification.

The purchaser shall be entitled at all reasonable time during manufacture to inspect, examine and test of goods/materials at the manufacturers' premises, workmanship and performance.

The Supplier shall, after consulting the purchaser, give the Purchaser reasonable notice in writing of the date on and the place at which any material or equipment will be ready for testing as provided in the contract and unless the purchaser shall attend at the place so named on date, which the supplier has stated in his notice, the supplier may proceed with the tests, which shall be deemed to have been made in the purchaser's presence, and shall forth with forward to the purchaser duly certified copies of test readings.

When the purchaser intends to attend the test, he shall promptly inform the supplier accordingly in writing, so that he can take action. The purchaser shall give the supplier timely notice in writing of his intention to attend the test. The contractor shall submit the factory test report at least 07 days prior to inspection.

Where the supplier provides for tests on the premises of the supplier or of any manufacturer of the supplier, except where otherwise specified, shall provide free of charge such assistance, labor, materials, electricity, fuel, stores, apparatus and instruments as may be requisite and as may be reasonably demanded to carry out such test efficiently. These tests shall be performed as per relevant IEC Standard or equivalent IEEE standard or BS standard only routine tests as agreed upon, will be performed.

As and when the purchaser is satisfied that any materials/equipment shall have passes the tests referred to in this clause, purchaser shall notify the contractor in writing to that effect. Should any inspected/tested goods fail to conform to the specification, the Purchaser shall have the right to reject any of the item or complete batch if necessary. In that case Supplier have to replace the Equipment and to make good of them without any financial involvement to the Purchaser. In case any of the Equipment found not conforming with the specification at the time of post landing Inspection, the supplier will in no way be relieved from the responsibility of replacing them on making them good at their own cost, despite the Equipment were found good at the time of Factory Acceptance Test. Nothing in this clause shall in any way release the supplier from any warranty or other obligations under the contract.

If the offered goods are manufactured outside the purchaser's country, then WZPDCL's Inspection Team of 03 Engineers in each team shall have to conduct Technical Orientation and Quality Test Witness at the manufacturer's factory premises**.** The cost incurred for this purpose shall be borne by the contractor and shall be deemed the cost in this regard is included in the offered price.

The cost of Air Tickets (both way) from Bangladesh to Manufacturer's Country (place of Technical Orientation and Quality Test Witness), Hotel Accommodation, fooding and lodging etc. will be borne by the contractor. Other than this the contractor will pay a standard amount of pocket money (Euro 100) per day (including journey period). The period for this purpose is more or less 07 (Seven) days. All the cost of this purpose shall be deemed is included in the offered price.

No goods shall be packed, prepared for shipment/delivery unless it has been approved and written instruction have been received by the Purchaser.

The bidder has to mention the place of Technical Orientation and Quality Test Witness in the following table: -

Sl. No.	Item	Period of Technical Orientation and Quality Test Witness	Place & Country of Technical Orientation and Quality Test Witness

7.8.8.2 Post Landing Inspection:

Post landing inspection shall be done immediately after arrival of the goods/materials at the designated store of WZPDCL/project office/ site; the quality witness team along with the Engineer shall conduct Post Landing Inspection in presence of the representative of Supplier.

The inspection team shall conduct the following test: -

ii) Design and visual (physical) inspection and quantity checks

The program of such inspection shall be intimated to the representative of Supplier by WZPDCL upon

arrival of the materials at WZPDCL store/project office of the Inspector(s) to be selected for test witnessing. Any defect or damage have been found at post-delivery inspection, the defective or damaged panels/ materials/ goods to be repaired/ replaced by the Bidder/ supplier at his own cost. The goods/materials shall be under the custody of the contractor for installation. The contractor shall be responsible for all types of security and safety of the inspected materials.

7.8.9 INSPECTION AND TESTING OF TESTING TOOLS, EQUIPMENT AND ACCESSORIES

7.8.9.1 Post Landing Inspection of Testing Tools, Equipment and accessories.

Post landing inspection shall be done immediately after arrival of the testing tools and equipment's at the designated store of WZPDCL/project office/ site; the quality witness team (pre-delivery inspection team) along with the engineer shall conduct Post Landing Inspection in presence of the representative of Supplier.

The inspection team shall conduct the following test

i) Design and visual (physical) inspection and quantity checks

The purchaser has right to inspect, test and where necessary, reject the Goods arrival in purchaser's store shall in no way be limited or waived by reason of the goods having previously been tested and passed by the manufacturer/ supplier/contractor.

The program of such inspection shall be intimated to the representative of Supplier by WZPDCL upon arrival of the materials at WZPDCL store/project office of the Inspector(s) to be selected for test witnessing. Any defect or damage have been found at post-delivery inspection, the defective or damaged panels/ materials/ goods to be repaired/ replaced by the Bidder/ supplier at his own cost. The goods/materials shall be under the custody of the contractor for installation. The contractor shall be responsible for all types of safety and security of the inspected materials.

Nothing in this clause shall in any way release the supplier/contractor from any warranty or other obligation under the provisions of the contract/ purchase order.

SECTION 7.9
PRE-COMMISSIONING TEST OF SUBSTATION

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SECTION 7.9: PRE-COMMISSIONING TEST OF SUBSTATION

(Test reports and documents required for substation commissioning)

7.9.1 Circuit Breaker (33 kV):

1) Name plate data
2) Insulation Test (Insulation resistance & DAR across open contact, Phase to Ground, Phase to Phase etc. with minimum 5 kV test voltage / Power frequency withstand test (Hi-pot)/ Leakage current test etc.)
3) Closing/Opening operation check from Remote & Local, Closing Interlock check, Anti-pumping operation check
4) Closing/Opening timing check
5) Contact resistance check
6) Spring charge operation check, heating and illumination circuit functionality check

7.9.2 CT/PT (33 kV & 11 kV):

1) Name plate data
2) Insulation Test (Insulation resistance & DAR across Primary to Ground, Secondary to Ground, Primary to Secondary, Secondary 1 to Secondary 2, Phase to Phase etc. with minimum 5 kV test voltage for primary and 500 V test voltage for secondary / Power frequency withstand test (Hi-pot)/ Leakage current test/ tanδ test etc.)
3) Polarity & Ratio test
4) CT magnetization curve test
5) CT secondary winding resistance check

7.9.3 Control & Relay Protection Panel (33 kV):

1) Name Plate Data
2) Complete Relay test (Over current & Earth fault relay, Directional Over current & Earth fault relay (if applicable), Differential relay etc.
3) Primary injection test (Tripping & indication test of Over current & Earth fault relay, CT core allocation check, Single point earthing check)
4) Differential relay & Restricted Earth Fault relay tripping, indication and stability test
5) Master Trip relay, Trip circuit supervision relay, DC/AC fail relay and all other auxiliary relay functionality check
6) Closing/Opening operation check from CP & SCADA, Closing Interlock check, Anti-pumping operation check
7) Trip logic test
8) Alarm and indication circuit functionality check, Indicative meter and Energy meter check
9) Heating and illumination circuit functionality check
10) Wiring/ Ferrule Number/ Color Coding check as per drawing

7.9.4 Switchgear Panel (33 & 11 kV):

1) Name Plate Data
2) Insulation Test of Circuit breaker (Insulation resistance & DAR across open contact, Phase to Ground, Phase to Phase etc. with minimum 5 kV test voltage / Power frequency withstand test (Hi-pot)/ Leakage current test etc.)
3) Insulation Test of Busbar (Insulation resistance & DAR across Phase to Ground, Phase to Phase etc. with minimum 5 kV test voltage / Power frequency withstand test (Hi-pot)/ Leakage current test etc.)
4) Complete Relay test (Over current & Earth fault relay, Directional Over current & Earth fault relay (if applicable) etc.)
5) Primary injection test (Tripping & indication test of O/C & E/F relay, CT core allocation check, Single point earthing check)
6) Master Trip relay, Trip circuit supervision relay, DC/AC fail relay and all other auxiliary relay functionality check
7) Closing/Opening operation check from CP & SCADA, Closing Interlock check, Mechanical Interlock check, Anti-pumping operation check

8) Alarm and indication circuit functionality check, Indicative meter and Energy meter check
9) Closing/Opening timing check
10) Contact resistance check
11) Spring charge operation check, heating and illumination circuit functionality check
12) Wiring/ Ferrule Number/ Color Coding check as per drawing

7.9.5 Power Transformer:

1) Name plate data
2) Insulation Test (Insulation resistance, DAR & PI across HV to LV, HV to Ground, LV to Ground etc. with minimum 5 kV test voltage / Power frequency withstand test (Hi-pot)/ Leakage current test/ tanδ test etc.)
3) Winding Resistance check
4) OLTC functionality check
5) Voltage Ratio check (At all tap changer positions)
6) Open circuit test (magnetizing current and no-load loss measurement)
7) Short circuit test (At all tap changer positions)
8) Magnetic balance test
9) Vector group check
10) Bushing CT polarity & ratio test, magnetization curve test, secondary winding resistance check
11) Functionality check of cooling fan (Manual operation by WTI, OTI)
12) Functionality check and trip test of WTI, OTI, PRD, Buchholz relay (MT and OLTC) etc.
13) AVR functionality check (if provided)
14) Oil Test Report (Main Tank (Top & Bottom) & OLTC)
15) Heating circuit functionality check.

7.9.6 Disconnecting Switch/Isolator/Earthing Switch (33 kV & 11 kV):

1) Name plate data
2) Insulation Test (Insulation resistance & DAR across open contact, Phase to Ground, Phase to Phase etc. with minimum 5 kV test voltage / Power frequency withstand test (Hi-pot)/ Leakage current test etc.)
3) Contact resistance check
4) Closing/Opening operation check, Mechanical Interlock check

7.9.7 Busbar (33 kV):

1) Busbar details (Size, Type and Capacity etc.)
2) Insulation Test (Insulation resistance & DAR across Phase to Ground, Phase to Phase etc. with minimum 5 kV test voltage / Power frequency withstand test (Hi-pot)/ Leakage current test etc.)

7.9.8 Underground Cable & Line Conductor (33 kV & 11 kV):

1) Underground Cable & Line Conductor details (Size, Type and Capacity etc.)
2) Insulation Test (Insulation resistance, DAR & PI across Phase to Ground, Phase to Phase etc. with minimum 5 kV test voltage / Power frequency withstand test (Hi-pot)/ Leakage current test/ tan S test (for cable only) etc.)
3) Phase Sequence Check

7.9.9 Earthing Resistance Measurement (Desired value < 0.25 ohm):

1) Substation mesh earthing
2) CRP panel & Switchgear panel earthing
3) 33 kV CB/CT/PT/LA/Isolator etc. earthing
4) Power Transformer body & neutral earthing

7.9.10 DC System:

7.9.10.1 Charger:

1) Nameplate data

2) Functionality check (Boost charge, Float charge, Trickle charge etc.)
3) Protection check (Over voltage, Over load, Short circuit, Earth fault, Reverse polarity etc.)
4) Alarm & Indication check

7.9.10.2 Battery:

1) Nameplate data
2) Capacity test (Battery bank shall be discharged at rated current by applying load bank under charger switched off condition and voltage of each cell shall be measured at 30 minutes interval with a duration up to Cell EODV)

7.9.11 Attachments:

1) Approved Equipment Layout Drawing (33 kV Switchyard, Control Room, 11 kV Switchgear).
2) Approved Single Line Diagram along with relay model, CT ratio and load.
3) Approved Schematic diagram of CRP panel and Switchgear panel.
4) Approved General Arrangement (GA) drawing of Front View, Rear View, LHS view, RHS view of the panel.
5) Fault level calculation, CT sizing calculation.
6) Trip Matrix along with detail relay settings and related calculation for Line Feeder, Transformer feeder, Incomer Feeder and Outgoing Feeder.

NB:

1) The above-mentioned information and reports must be submitted to the office of the Project Director, EAUPDSP, WZPDCL, Khulna and P&D, WZPDCL, Khulna at least 15 days before the expected date of commissioning. Softcopy of the requested information and documents may be emailed to eaupdsp@gmail.com & wzpdcl.planning@gmail.com
2) The pre-commissioning test must be witnessed by WZPDCL engineers and must be signed by the testing team members and witnesses.
3) Description of the test equipment for each test shall be mentioned.
4) The relay settings have to be finalized as per WZPDCL's recommendation.

SECTION 8: GUARANTEED TECHNICAL PARTICULARS

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8.1 GUARANTEED TECHNICAL PARTICULARS OF 33 KV INDOOR TYPE GAS INSULATED SWITCHGEAR (GIS) WITH PROTECTION, CONTROL AND METERING EQUIPMENT

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, otherwise bid shall be rejected)

Sl. No.	DESCRIPTION	UNIT	WZPDCL'S REQUIREMENT	BIDDER'S GUARANTEED VALUES
	Incoming Feeder/Outgoing Feeder, Transformer Feeder & Bus coupler (With Riser) Switchgear:			
1.	Manufacturer's Name & Address		Shall be mentioned	
2.	Model		Shall be mentioned	
3.	Manufacturer & country of origin		USA/UK/EU/Japan/ South Korea/Malaysia	
4.	Applied Standard		Latest version of IEC 62271 fully complied	
5.	Rated nominal Voltage	kV	33	
6.	Rated Voltage	kV	36	
7.	Rated Frequency	Hz	50	
8.	Material of Bus-Bar		HDHC Copper	
9	Busbar Scheme		Single Bus with Bus Sectionalized	
10	Installation		Free Standing	
11.	Rated Current for Main Bus	Amp	1250	
12.	Cross Section of bus bar at least	Sq. mm	1250	
13.	Rated short time current	KA	25	
14.	Short time current rated duration	Sec.	3	
15.	Pressure relief device is integrated with each gas chamber and pressure relief ducts to the outside the room		Yes	
16.	Mimic diagram is depicted in front of switchgear panel		Yes	
17.	Electrical and Mechanical interlock between Circuit breaker, isolator and earth switch		Yes	
18	Capacitive Voltage Indicator with interlock contact for ES operation		Yes	
19.	**Circuit Breaker:**			
	Type of interrupter		VCB	
	Class of Circuit Breaker ((through necessary Type Test report))		E2M2 or better	
	Internal Arc Classification (as per IEC)		25 KA, 3s	
	Insulation media		SF6	
	Interrupting media		Vacuum	
	Manufacturer's name and country of origin of vacuum interrupter (Shall be same as mentioned in Type Test		To be mentioned	

Sl. No.	DESCRIPTION	UNIT	WZPDCL'S REQUIREMENT	BIDDER'S GUARANTEED VALUES
	report)			
	Manufacturer's model no. of vacuum interrupter		To be mentioned	
	Guaranteed Nos. of operation for Vacuum Interrupter:			
	a) at rated Current switching	Nos.	Min. 10000	
	b) at Short circuit current switching	Nos.	≥ 50	
	Rated Voltage	KV	36	
	Rated Current (for incoming/ outgoing feeder)	A	1250	
	Rated Current (for Transformer)	A	1250	
	Rated Current (for Bus coupler)	A	1250	
	Rated Short Ckt. Breaking Current	KA	25	
	Rated duration of short circuit current	sec	3	
	Rated Short CKt. Making Current	KA	63	
	Rated Breaking time	Cycle	< 3	
	Opening time	Sec.	< 0.05	
	Closing time	Sec.	< 0.08	
	Rated operating Sequence		O-0.3 sec-CO-3 min-CO	
	Control Voltage	V	DC 110	
	Motor Voltage for spring charge	V	AC 230	
	Power Consumption of Charging motor	W	Max 260	
	Power consumption of opening/trip coil	W	Max 300	
	Nos. of Trip coils	Nos	2	
	Main Contact: a) Type of contact b) Material of contract surfaces c) Contract resistance	 - - μΩ	 To be mentioned To be mentioned Less than 40	
20	**Three position disconnector Switch (Motorized)**			
	Type		Shall be mentioned	
	Rated Voltage	KV	36	
	Rated Current (for incoming/ outgoing feeder)	A	1250	
	Rated Current (Transformer)	A	1250	
	Rated Current (for Bus-coupler)	A	1250	
	Rated short time current	KA	25	
	Short time current rated duration	S	3	
	Switch Position		close, open, earth	
	Electrical and Mechanical interlock		As per IEC 62271-200	
21.	**Current Transformer:**			

Sl. No.	DESCRIPTION	UNIT	WZPDCL'S REQUIREMENT	BIDDER'S GUARANTEED VALUES
	Type		Ring core / block type with sensor	
	Rated Voltage	KV	36	
	Accuracy Class, Metering		0.2S	
	Accuracy Class, Protection		5P20	
	Rated Current Ratio (for incoming, outgoing)	A	400-800/5-5-5A	
	Rated Current Ratio (for Bus-coupler)		400-800/5-5-5A	
	Rated Current Ratio (for transformer panel)	A	300-600/5-5-5A	
	Burden for metering	VA	30 (at max CT ratio)	
	Burden for protection	VA	30 (at max CT ratio)	
	Extended Current Rating for metering	A	120 % of rated Current	
	Instrument Security factor (metering)		< 5	
	Rated frequency	Hz	50	
22	**33 kV Cable Compartment: (For Incoming & Transformer Feeder)**			
	Material		Highly Conductive Copper	
	Bus bar type		Single	
	Cross Section	mm^2	1250	
	Nominal Current (for incoming, outgoing)	A	1250	
	Nominal Current (for Transformer)	A	1250	
	Cable connection		1 nos./ph x 500 sq. mm Cu lug type with provision for 2 nos./ph	
23.	**Voltage Transformer:**			
	Number of Phase		Single Phase	
	Rated Primary Voltage	kV	$33/\sqrt{3}$	
	Rated Secondary Voltage	V	$110/\sqrt{3}$	
	Rated Tertiary Voltage	V	$110/\sqrt{3}$	
	Rated burden, Secondary	VA	50	
	Rated burden, Tertiary	VA	50	
	Accuracy class of secondary core		0.2	
	Accuracy class of tertiary core		3P	
	LV Compartment		IP40	
24.	**Line Voltage Transformer**			
	Number of Phase		Single Phase	
	Rated Primary Voltage	kV	$33/\sqrt{3}$	
	Rated Secondary Voltage	V	$110/\sqrt{3}$	

Sl. No.	DESCRIPTION	UNIT	WZPDCL'S REQUIREMENT	BIDDER'S GUARANTEED VALUES
	Rated Burden	VA	50	
	Accuracy class of secondary core		0.2	
	Accuracy class of tertiary core		3P	
25.	**SF6 Safety and life**			
	SF6 Pressure	KPa	Shall be mentioned	
	Rated pressure at 20 degree C	KPa	Shall be mentioned	
	Bursting Pressure	KPa	Shall be mentioned	
	Gas leakage rate/year	KPa	≤0.1%	
	Safety indication		To be incorporated	
	Capacitive voltage indicator		In the front of the panel	
	Gas pressure Manometer		As per IEC 62271-1	
	Bus Bar Gas Pressure Manometer		As per IEC 62271-1	
	Life/ Endurance of switchgear switches			
	a) Circuit Breakers		As per IEC 62271-100	
	b) Disconnectors & Earthing switches		As per IEC 62271-102	
	Alarm level for insulation	Kpa	140	
	Rated filling level for insulation	Kpa	150	
26	**Dimension and Weight**			
	Height	mm	Shall be mentioned	
	Width	mm	Shall be mentioned	
	Depth	mm	Shall be mentioned	
	Weight including Circuit Breaker	kg	Shall be mentioned	
27	**Construction:**			
	a) Stainless steel tank		Shall be mentioned	
	b) Equipped with disconnector and earthing switch. The earthing switch shall have full fault-making capacity.		Shall be mentioned	
	c) Each gas filled compartment shall be equipped with density sensors giving alarm by low gas density.		Shall be mentioned	
	Applied Standard		Shall be mentioned	
28	**Degree of Protection**			
	Enclosure	IP3X		
	HV Compartment	IP65		
	LV Compartment	IP40		
29.	**Insulation level:**			
	AC withstand voltage 1min. dry	kV	70	
	Impulse Withstand, full wave	kV	170	

Sl. No.	DESCRIPTION	UNIT	WZPDCL'S REQUIREMENT	BIDDER'S GUARANTEED VALUES
30.	**Type Test Report (as per IEC 62271-200)**			
	Lightning Impulse Voltage Withstand tests		Shall be submitted	
	Power frequency withstand tests		Shall be submitted	
	Temperature/Gas pressure Rise Tests.		Shall be submitted	
	Measurement of resistance of the main circuit.		Shall be submitted	
	Short circuit performance tests		Shall be submitted	
	Mechanical operation tests.		Shall be submitted	
	Arc fault test		Shall be submitted	
	Gas Leakage Test		Shall be submitted	
	PROTECTION CONTROL & METERING (PCM)			
31	**Differential Relay with inbuilt REF features (only for transformer feeder panel)**			
	Manufacturer's Name & country **(To be mentioned only one within scope)**		ABB- (Sweden/Finland) /Siemens – Germany (except 7SR series)/ Schneider- (France, UK, Finland)/ GE (UK/France/Canada)	
	Manufacture's Model no.		Shall be mentioned	
	Type of Relay		Numerical programmable	
	Maximum through fault at which the protective equipment is stable with recommend settings:			
	a) Earth faults	Rating % of CT rating	Shall be mentioned	
	b) Phase faults		Shall be mentioned	
	Maximum time delay between initiation of fault and energize of breaker trip circuit.	ms	Shall be mentioned	
	Communication Facilities		SCADA Supported	
	Communication Standard		IEC-61850 with FO-LC Port	
	Features: 07 BI (mini.), 07 BO (mini.), Mimic Display, Low impedance REF, and others features as per section-7 of technical specification.		Yes	
32.	**IDMT OVER CURRENT & EARTH FAULT RELAY**			
	Manufacturer's Name & country **(To be mentioned only one within scope)**		ABB- (Sweden/Finland) /Siemens – Germany (except 7SR series)/ Schneider- (France, UK, Finland)/ GE (UK/France/Canada)	

Sl. No.	DESCRIPTION	UNIT	WZPDCL'S REQUIREMENT	BIDDER'S GUARANTEED VALUES
	Manufacture's Model no.		Shall be mentioned	
	Type of relay		Numerical programmable Multifunction	
	Range of current setting:			
	a) Phase element	% of CT rating	Shall be mentioned	
	b) Each fault element		Shall be mentioned	
	Range of timing settings at 10-time CT rating	Sec	Shall be mentioned	
	Burden of relay at 10-time CT rating	VA	Shall be mentioned	
	Communication Facilities		SCADA Supported	
	Communication Standard		IEC-61850 with FO-LC Port	
	Features: 16 BI (mini.), 11 BO (mini.), Mimic Display, and others features as per section-7 of technical specification.		Yes	
33.	**Trip Circuit Supervision (TCS) Relay (Separate Relay for each trip coil)**			
	Manufacture's Name		Shall be mentioned	
	Country of Origin		Shall be mentioned	
	Manufacture's Model no.		Shall be mentioned	
	Type of Relay		Shall be mentioned	
34.	**Trip Relay (Separate Relay)**			
	Manufacture's Name		Shall be mentioned	
	Country of Origin		Shall be mentioned	
	Manufacture's Model no.		Shall be mentioned	
	Type of Relay		Shall be mentioned	
	Operating Time		< 10 ms	
	Operating Coil Voltage- 110V DC		Yes	
	Hand & Electrical reset type for O/C, E/F protection Hand & Electrical reset type for Differential, REF and Transformer Self-protection		Yes	
35.	**Separate Auxiliary Flag Relays for Transformer self-protection (OTA, OTT, WTA, WTT, BA, BT, OLTC Surge, PRD for main tank.**			
	Manufacture's Name		Shall be mentioned	
	Country of Origin		Shall be mentioned	
	Manufacture's Model no.		Shall be mentioned	
	Type of Relay		Shall be mentioned	
36.	**Annunciator**			

Sl. No.	DESCRIPTION	UNIT	WZPDCL'S REQUIREMENT	BIDDER'S GUARANTEED VALUES
	Manufacture's Name		Shall be mentioned	
	Country of Origin		Shall be mentioned	
	Manufacture's Model no.		Shall be mentioned	
	Windows		24 nos	
	Built in buzzer and buttons for accept, mute, test, reset, etc.		Yes	
37.	**Control Switch**			
	Manufacture's Name		Shall be mentioned	
	Country of Origin		Shall be mentioned	
	Manufacture's Model no.		Shall be mentioned	
	Separate TNC/Discrepancy switch and Local Remote (L/R) selector switch		Yes	
38.	**AVR Relay:** Transformer incomer PCM panel shall be equipped with AVR relay and control switch for RTCC operation along with necessary indication system (Tap position, oil temperature, winding temperature etc.).		Yes	
	PROTECTION CONTROL & METERING (Line Feeder & Bus Coupler)			
39.	**IDMT OVER CURRENT & EARTH FAULT RELAY**			
	Manufacturer's Name & country **(To be mentioned only one within scope)**		ABB- (Sweden/Finland) /Siemens – Germany (except 7SR series)/ Schneider- (France, UK, Finland)/ GE (UK/France/Canada)	
	Manufacture's Model no.		Shall be mentioned	
	Type of relay		Numerical programmable Multifunction	
	Range of current setting:			
	a) Phase element	% of CT rating	Shall be mentioned	
	b) Each fault element		Shall be mentioned	
	Range of timing settings at 10-time CT rating	Sec	Shall be mentioned	
	Burden of relay at 10-time CT rating	VA	Shall be mentioned	
	Communication Facilities		SCADA Supported	
	Communication Standard		IEC-61850 with FO-LC Port	
	Features: 23 BI (mini.), 16 BO (mini.), Mimic Display, and others features as per section-7 of technical specification.		Yes	
40.	**Trip Circuit Supervision (TCS) Relay (Separate Relay for each trip coil)**			
	Manufacture's Name		Shall be mentioned	

Sl. No.	DESCRIPTION	UNIT	WZPDCL'S REQUIREMENT	BIDDER'S GUARANTEED VALUES
	Country of Origin		Shall be mentioned	
	Manufacture's Model no.		Shall be mentioned	
	Type of Relay		Shall be mentioned	
41.	**Trip Relay (Separate Relay)**			
	Manufacture's Name		Shall be mentioned	
	Country of Origin		Shall be mentioned	
	Manufacture's Model no.		Shall be mentioned	
	Type of Relay		Shall be mentioned	
	Operating Time		< 10 ms	
	Hand & Electrical reset type for O/C, E/F protection		Yes	
42.	**Annunciator**			
	Manufacture's Name		Shall be mentioned	
	Country of Origin		Shall be mentioned	
	Manufacture's Model no.		Shall be mentioned	
	Windows		16 nos	
	Built in buzzer and buttons for accept, mute, test, reset, etc.		Yes	
43.	**Control Switch**			
	Manufacture's Name		Shall be mentioned	
	Country of Origin		Shall be mentioned	
	Manufacture's Model no.		Shall be mentioned	
	Separate TNC/Discrepancy switch and Local Remote (L/R) selector switch		Yes	
44.	**METERING AND INSTRUMENTATION (for incoming/outgoing/transformer feeder)**			
	a) kWh & kVARh Meter			
	Manufacture's Name & Country		AEG(Germany) / ABB(Switzerland)/ Areva(UK)/ Schlumberger(USA)/ Elster (USA/Romania), Lyndis Gyr+ (Switzerland)/ Honeywell (USA)/ Toshiba (Japan)/ CEWE, UK	
	Manufacture's Model no.		Shall be mentioned	
	Type of Meter		Numerical programmable Multifunction	
	Class of Accuracy		0.2S	
	b) **VOLT METERS with Selector Switch**			
	Manufacturer's Name and Country		Shall be mentioned	
	Manufacture's Model no.		Shall be mentioned	

Sl. No.	DESCRIPTION	UNIT	WZPDCL'S REQUIREMENT	BIDDER'S GUARANTEED VALUES
	Type of Meter		Analogue, 90-degree scale range	
	Class of Accuracy		1.0	
	c) **AMPERE METERS**			
	Manufacturer's Name and Country		Shall be mentioned	
	Manufacture's Model no.		Shall be mentioned	
	Type of Meter		Analogue, 240-degree scale range	
	Class of Accuracy		1.0	
	Separate A-meter for each phase		Yes	
	d) Multifunctional meter			
	Manufacturer's Name and Country			
	Manufacture's Model no.			
	Type of Meter		Digital, Import/Export	
	Parameters: capable of measuring and displaying MW, MVAR, PF, V, I, f, Φ etc.		Yes	
	Class of Accuracy		1.0	
STATION AUXILIARY TRANSFORMER SWITCHGEAR UNIT				
45.	Manufacturer's Name & Address		To be mentioned	
46.	Manufacturer country of origin		USA/UK/EU/Japan/ South Korea/ Malaysia	
47.	Type		Shall be mentioned	
48.	Rated nominal Voltage	kV	33	
49.	Rated Voltage	kV	36	
50.	Material of Bus-Bar		HDHC Copper	
51.	Rated Current for main bus	A	1250	
52.	Cross Section of busbar	mm^2	1250	
53.	Rated short time current	KA	25	
54.	Short time current rated duration	Sec.	3	
55.	**Load Break Switch:**			
	Operating Mechanism		Lever or Spring	
	Insulation media		Air	
	Interrupting media		Air or Vacuum	
	Manufacturer's model no. of vacuum contactor (if applicable)	-	Shall be mentioned	
	Guaranteed Nos. of operation at rated Current switching	Nos.	Shall be mentioned	
56.	**Circuit Breaker:**			
	Manufacturer's model no. of vacuum interrupter		Shall be mentioned	

Sl. No.	DESCRIPTION	UNIT	WZPDCL'S REQUIREMENT	BIDDER'S GUARANTEED VALUES
	Rated Voltage	KV	36	
	Rated Current	A	Shall be mentioned	
	Rated Short Ckt. Breaking Current	KA	25	
	Rated duration of short circuit current	sec	3	
	Rated Short CKt. Making Current	KA	63	
	Rated Breaking time	Cycle	< 3	
57.	**DS**			
	Operating Mechanism		Shall be mentioned	
	Insulating media		SF6	
	Interrupting media		SF6	
58.	**Insulation level:**			
	AC withstand voltage 1min. dry	kV	70	
	Impulse Withstand, full wave	kV	170	
59.	**Degree of Protection**			
	Enclosure		IP3X	
	HV Compartment		IP65	
	LV Compartment		IP40	
60.	**Dimension and Weight**			
	Height	mm	Shall be mentioned	
	Weight	mm	Shall be mentioned	
	Depth	mm	Shall be mentioned	
61.	**Type Test Report (as per IEC 62271-200)**			
	Lightning Impulse Voltage Withstand tests		Shall be submitted	
	Power frequency withstand tests		Shall be submitted	
	Temperature/Gas pressure Rise Tests.		Shall be submitted	
	Measurement of resistance of the main circuit.		Shall be submitted	
	Short circuit performance tests		Shall be submitted	
	Mechanical operation tests.		Shall be submitted	
	Arc fault test		Shall be submitted	
	PROTECTION CONTROL & METERING (PCM) for station transformer (if CB is offered)			
62	**IDMT OVER CURRENT RELAY**			
	Manufacturer's Name & country **(To be mentioned only one within scope)**		ABB- (Sweden/Finland) /Siemens – Germany (except 7SR series)/ Schneider- (France, UK, Finland)/ GE (UK/France/Canada)	
	Manufacture's Model no.		Shall be mentioned	
	Type of relay		Numerical programmable	

Sl. No.	DESCRIPTION	UNIT	WZPDCL'S REQUIREMENT	BIDDER'S GUARANTEED VALUES
			Multifunction	
	Communication Facilities		SCADA Supported	
	Communication Standard		IEC-61850 with FO-LC Port	
	Features: BI, BO, Mimic Display, and others features as per section-7 of technical specification.		Yes	
63.	**Trip Circuit Supervision (TCS) Relay (Separate Relay)**			
	Manufacture's Name		Shall be mentioned	
	Country of Origin		Shall be mentioned	
	Manufacture's Model no.		Shall be mentioned	
	Type of Relay		Shall be mentioned	
64.	**Trip Relay (Separate Relay)**			
	Manufacture's Name		Shall be mentioned	
	Country of Origin		Shall be mentioned	
	Manufacture's Model no.		Shall be mentioned	
	Type of Relay		Shall be mentioned	
65.	**Annunciator**			
	Manufacture's Name		Shall be mentioned	
	Country of Origin		Shall be mentioned	
	Manufacture's Model no.		Shall be mentioned	
66	**METERING**			
	a) KWH & kVAR Meter			
	Manufacture's Name & Country		Shall be mentioned	
	Manufacture's Model no.		Shall be mentioned	
	Type of Meter		Numerical	
	Class of Accuracy		1.0	
	b) VOLT METERS			
	Manufacturer's Name and Country		Shall be mentioned	
	Manufacture's Model no.		Shall be mentioned	
	Type of Meter		Analogue, 90-degree scale range	
	Class of Accuracy		1.0	
	c) AMPERE METERS			

Sl. No.	DESCRIPTION	UNIT	WZPDCL'S REQUIREMENT	BIDDER'S GUARANTEED VALUES
	Manufacturer's Name and Country		Shall be mentioned	
	Manufacture's Model no.		Shall be mentioned	
	Type of Meter		Analogue, 240-degree scale range	
	Class of Accuracy		1.0	
	Separate A-meter for each phase		Yes	
	d) Wattmeter			
	Manufacturer's Name and Country		Shall be mentioned	
	Manufacture's Model no.		Shall be mentioned	
	Type of Meter		Analogue, Import/Export	
	Class of Accuracy		1.0	
6.	The PCM Panel for all feeders shall be complied all the technical specification mentioned in Section-7		Yes	

Seal & Signature of the Manufacturer	Seal & Signature of the Tenderer

8.2 GUARANTEED TECHNICAL PARTICULARS OF 11KV GAS INSULATED SWITCHGEAR WITH PROTECTION AND CONTROL EQUIPMENT

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, otherwise bid shall be rejected)

Sl. No.	DESCRIPTION	UNIT	WZPDCL'S REQUIREMENT	BIDDER'S GUARANTEED VALUES
	TRANSFORMER INCOMING SWITCHGEAR UNITS:			
1.	Manufacturer's Name & Address		Shall be mentioned	
	Manufacturer country of origin		Europe/USA/Japan/ South Korea/ Malaysia	
2	Type		Shall be mentioned	
4.	Applied Standard		IEC 62271 fully complied	
5.	Rated nominal Voltage	kV	11	
6.	Rated maximum Voltage	kV	12	
7.	Rated Frequency	Hz	50	
8.	Rated Current for main bus	A	2000	
9.	Cross section of Busbar at least	mm^2	2000	
10.	Material of Bus-Bar		HDHC Copper	
11.	Rated short time current	KA	25	
12	Short time current rated duration	Sec.	3	
13.	Rated normal current: Incoming feeder from 20/26 MVA Transformer	A	2000	
	a) Pressure relief device is integrated with each gas chamber and pressure relief duct up to outside the room		Yes	
	b) Percentage of Gas leakage per year of each gas filled compartment (same as mentioned in Type Test)		< 0.1 %	
14	Mimic diagram is depicted in front of switchgear panel		Yes	
15	Electrical and Mechanical interlock between Circuit breaker, isolator and earth switch		Yes	
16	Capacitive Voltage Indicator		Yes	
17.	**Circuit Breaker:**			
	Type		VCB	
	Class of Circuit Breaker (through necessary Type test)		E2M2 or better	
	Insulation media		SF_6	
	Interrupting media		Vacuum	
	Rated Voltage	kV	12	
	Rated Current	A	2000	
	Rated Short Ckt. Breaking Current	KA	25 for 3s	

Sl. No.	DESCRIPTION	UNIT	WZPDCL'S REQUIREMENT	BIDDER'S GUARANTEED VALUES
	Rated Short Ckt. Making Current	KA	63	
	Rated Breaking time	Cycle	< 3	
	Opening time	Sec.	< 0.05	
	Closing time	Sec.	< 0.08	
	Rated operating Sequence		0-0.3 sec-CO-3 min-CO	
	Nos. of Trip coils	-	2	
	Main Contact: a) Type of contact b) Material of contract surfaces c) Contract resistance	 - - $\mu\Omega$	 To be mentioned To be mentioned Less than 40	
	Manufacturer's name and country of origin of Vacuum interrupter (Shall be same as mentioned in Type Test Report)		Shall be mentioned	
	Manufacturer's model no. of vacuum interrupter	-	Shall be mentioned	
	Guaranteed no. of operation for Vacuum interrupter			
	a) Vacuum interrupter normal condition at rated current switching	nos.	Min. 10000	
	b) Vacuum interrupter in short circuit condition i.e. at the short circuit current switching	nos.	≥ 50	
	Control Voltage	V	DC 110	
	Motor Voltage for spring charge	V	AC 240	
	Power Consumption of Charging motor	W	max 240	
	Power consumption of closing coil	W	Shall be mentioned	
	Power consumption of opening coil	W	Shall be mentioned	
18	**Three position disconnector Switch (Motorized)**			
	Type		Shall be mentioned	
	Rated Voltage	KV	12	
	Rated Current	A	2000	
	Rated short time current	KA	25	
	Short time current rated duration	S	3	
	Switch Position		close, open, earth	
	Electrical and Mechanical interlock		As per IEC 62271-200	
19.	**Current Transformer:**			
	Rated Voltage	KV	12	
	Accuracy Class, Metering		0.2S & F.S. < 5	

Sl. No.	DESCRIPTION	UNIT	WZPDCL'S REQUIREMENT	BIDDER'S GUARANTEED VALUES
	Accuracy Class, Protection		5P20	
	Rated Current ratio: - Transformer Incoming Feeder	A	900-1800/5-5A	
	Burden for metering	VA	30 (at max CT ratio)	
	Burden for protection	VA	30 (at max CT ratio)	
	Extended Current Rating for metering	A	120% of rated Current	
20.	**Voltage Transformer:**			
	Number of Phase		Single Phase	
	Rated primary Voltage	kV	11/√3	
	Rated secondary Voltage	V	110/√3	
	Rated tertiary Voltage	V	110/√3	
	Rated burden, Secondary / Tertiary	VA	50 / 50	
	Accuracy class of Secondary/ Tertiary core		0.2/ 3P	
	Type		Resin cast	
	Mounting on Incoming panel at bus		Yes	
21	**PROTECTION IDMT OVER CURRENT & EARTH FAULT**			
	Manufacturer's Name & country **(To be mentioned only one within scope)**		ABB- (Sweden/Finland) /Siemens – Germany (except 7SR series)/ Schneider- (France, UK, Finland)/ GE (UK/France/Canada)	
	Manufacture's model no.	-		
	Type of relay	-	Numerical programmable	
	Directional Feature can be activated/de-activated		Yes	
	Range of current setting: ➢ Phase element ➢ Each fault element	rating		
	Range of timing settings at 10-time CT rating			
	Burden of relay at 10-time CT rating	VA	Shall be mentioned	
	Percentage of current setting at which relay will reset			
	Reset time after removal of 10-time CT rated current for:			
	a) Phase element (100%)			
	b) E/F element (40%)	Sec		
	Communication Facilities		SCADA Supported	

Sl. No.	DESCRIPTION	UNIT	WZPDCL'S REQUIREMENT	BIDDER'S GUARANTEED VALUES
	Communication Standard		IEC-61850 with FO-LC Port	
	Features: 16 BI (mini.), 11 BO (mini.), Mimic Display, and others as per section-7 of technical specification.		Yes	
22	**Trip Circuit Supervision (TCS) Relay (Separate Relay for each trip coil)**			
	Manufacture's Name		Shall be mentioned	
	Country of Origin		Shall be mentioned	
	Manufacture's Model no./ Type No		Shall be mentioned	
23	**Trip Relay (Separate Relay)**			
	Manufacture's Name		Shall be mentioned	
	Country of Origin		Shall be mentioned	
	Manufacture's Model no. / Type No		Shall be mentioned	
	Operating Time		< 10 ms	
	All O/C, E/F protection Hand & Electrical reset type.		Yes	
24.	**METERING KWh Meter**			
	Manufacture's Name & Country	-	Shall be mentioned	
	Manufacture's Model no.	-	Shall be mentioned	
	Type of meter	-	Numerical programmable	
	Class of accuracy	-	0.2	
25.0	**INDICATION VOLT & AMPERE METERS**			
	Manufacturer's Name and Country	-		
	Manufacture's Model no.	-		
	Type of meter	-	Analogue	
	Class of Accuracy	-		
	Separate A-meter for each phase	-	Yes	
26.	**Multifunctional meter**			
	Manufacturer's Name and Country	-		
	Manufacture's Model no.	-		
	Type of Meter	-	Digital, Import/Export	
	Parameters: capable of measuring and displaying MW, MVAR, PF, V, I, f, Φ etc.		Yes	
	Class of Accuracy		1.0	
27	**Control Switch**			
	Manufacture's Name		Shall be mentioned	
	Country of Origin		Shall be mentioned	
	Manufacture's Model no.		Shall be mentioned	
	Separate TNC/Discrepancy switch and Local Remote (L/R) selector		Yes	

Sl. No.	DESCRIPTION	UNIT	WZPDCL'S REQUIREMENT	BIDDER'S GUARANTEED VALUES
	switch			
28	**Annunciator (16 windows)**			
	Manufacture's Name		Shall be mentioned	
	Country of Origin		Europe/USA/Japan/ South Korea/Malaysia	
	Manufacture's Model no.		Shall be mentioned	
	Windows		16 nos	
	Built in buzzer and buttons for accept, mute, test, reset, etc.		Yes	
29	**Cable Compartment:**			
	Rated Current	A	2000	
	Cable connection		2 nos/ph x 1C x 500 mm^2 Cu Cable	
	Capacitive Voltage Indicator		Shall be incorporated in the front side of the panel	
30.	**Insulation level:**			
	AC withstand voltage 1 min. dry	KV	28	
	Impulse Withstand, full wave	KV	75	
31.	**Degree of Protection**			
	Enclosure		IP3X	
	HV Compartment		IP65	
	LV Compartment		IP40	
	Cable Compartment		IP40	
32.	**Earthing Switch:**			
	Type		Shall be mentioned	
	Short Time Current, 3 secs	KA	Shall be mentioned	
33.	**Dimension and Weight**			
	Height	mm	2200	
	Width	mm	shall be mentioned	
	Depth	mm	shall be mentioned	
	[redacted]	Kg.	shall be mentioned	
BUS COUPLER (WITH RISER) SWITCHGEAR UNIT:				
34	a) Manufacturer's Name & Address		To be mentioned	
	b) Manufacturer country of origin		Europe/USA/Japan/ South Korea/Malaysia	
35	Type		shall be mentioned	
36.	Applied Standard		Shall be mentioned	
37	Rated nominal Voltage	kV	11	
38.	Rated Maximum Voltage	kV	12	
39.	a) Rated Current for main bus	A	2000	
	b) Cross section of Busbar at least	mm^2	2000	

Sl. No.	DESCRIPTION	UNIT	WZPDCL'S REQUIREMENT	BIDDER'S GUARANTEED VALUES
40.	Material of Bus-Bar		HDHC Copper	
41.	Rated short time current	KA	25	
42.	Short time current rated duration	Sec.	3	
43	a) Pressure relief device is integrated with each gas chamber and pressure relief duct up to outside the room		Yes	
	b) Percentage of Gas leakage per year of each gas filled compartment (same as mentioned in Type Test)		< 0.1 %	
44	Mimic diagram is depicted in front of switchgear panel		Yes	
45	Electrical and Mechanical interlock between Circuit breaker, isolator and earth switch		Yes	
46.	**Circuit Breaker:**			
	Type		VCB	
	Insulation media		SF_6	
	Interrupting media		Vacuum	
	Class of Circuit Breaker (through necessary Type test)		E2M2 or better	
	Rated Voltage	KV	12	
	Rated Current	A	2000	
	Rated Short Ckt. Breaking Current	KA	25 for 3 sec	
	Rated Short Ckt. making Current	KA	63	
	Rated Breaking time	Cycle	< 3	
	Opening time	Sec.	< 0.05	
	Closing time	Sec.	< 0.08	
	Control Voltage	V	DC 110	
	Motor Voltage for spring charge	V	AC 240	
	Nos. of Trip coils	-	2	
	Manufacturer's name and country of origin of Vacuum interrupter (Shall be same as mentioned in Type Test Report)		Shall be mentioned	
	Manufacturer's model no. of vacuum interrupter		Shall be mentioned	
	Guaranteed no. of operation for Vacuum interrupter:			
	a) Vacuum interrupter normal condition at rated current switching	nos.	Min. 10000	
	b) Vacuum interrupter in short circuit condition i.e. at the short	nos.	≥ 50	

Sl. No.	DESCRIPTION	UNIT	WZPDCL'S REQUIREMENT	BIDDER'S GUARANTEED VALUES
	circuit current switching			
47.	**Three position disconnector Switch (Motorized)**			
	Type		Shall be mentioned	
	Rated Voltage	KV	12	
	Rated Current	A	2000	
	Rated short time current	KA	25	
	Short time current rated duration	S	3	
	Switch Position		close, open, earth	
	Electrical and Mechanical interlock		As per IEC 62271-200	
48.	**Current Transformer:**			
	Rated Voltage	kV	12	
	Accuracy Class, Metering		0.2 & F.S. < 5	
	Accuracy Class, Protection		5P20	
	Rated Current ratio	A	900-1800/5-5	
	Burden	VA	15+15	
	Rated frequency	Hz	50	
49.	**Insulation level:**			
	AC withstand voltage 1 min. dry	kV	28	
	Impulse Withstand, full wave	kV	75	
50.	**Degree of Protection**			
	Enclosure		IP3X	
	HV Compartment		IP65	
	LV Compartment		IP40	
	Cable Compartment		IP40	
51.	**Earthing Switch:**			
	Type		Shall be mentioned	
	Short Time Current, 3 secs	KA	Shall be mentioned	
52.	**Dimension and Weight**			
	Height	mm	2200	
	Width	mm	shall be mentioned	
	Depth	mm	shall be mentioned	
	[redacted]	Kg.	shall be mentioned	
53	**PROTECTION IDMT OVER CURRENT & EARTH FAULT**			
	Manufacture's Name & Country of Origin **(To be mentioned only one within scope)**		ABB- (Sweden/ Finland) /Siemens – Germany (except 7SR series)/ Schneider (France, UK, Finland)/ GE (UK/ France/ Canada)	
	Manufacture's model no.	-	[redacted]	

Sl. No.	DESCRIPTION	UNIT	WZPDCL'S REQUIREMENT	BIDDER'S GUARANTEED VALUES
	Type of relay	-	Numerical programmable	
	Directional Feature can be activated/de-activated		Yes	
	Range of current setting: - Phase element - Each fault element	rating		
	Range of timing settings at 10-time CT rating			
	Burden of relay at 10-time CT rating			
	Percentage of current setting at which relay will reset			
	Reset time after removal of 10-time CT rated current for:			
	a) Phase element (100%)			
	b) E/F element (40%)	Sec		
	Communication Facilities		SCADA Supported	
	Communication Standard		IEC-61850 with FO-LC Port	
	Features: 16 BI (mini.), 11 BO (mini), Mimic Display, and others as per section-7 of technical specification.		Yes	
54.	**Trip Circuit Supervision (TCS) Relay (Separate Relay for each trip coil)**			
	Manufacture's Name		Shall be mentioned	
	Country of Origin		Shall be mentioned	
	Manufacture's Model no./ Type No		Shall be mentioned	
55.	**Trip Relay (Separate Relay)**			
	Manufacture's Name		Shall be mentioned	
	Country of Origin		Shall be mentioned	
	Manufacture's Model no. / Type No		Shall be mentioned	
	Operating Time		< 10 ms	
	All O/C, E/F protection Hand & Electrical reset type.		Yes	
56.	**INDICATION AMPERE METERS**			
	Manufacturer's Name and Country	-		
	Manufacture's Model no.	-		
	Type of meter	-	Analogue	
	Class of Accuracy	-		
	Separate A-meter for each phase	-	Yes	
57.	**Control Switch**			
	Manufacture's Name		Shall be mentioned	
	Country of Origin		Shall be mentioned	

Sl. No.	DESCRIPTION	UNIT	WZPDCL'S REQUIREMENT	BIDDER'S GUARANTEED VALUES
	Manufacture's Model no.		Shall be mentioned	
	Separate TNC/Discrepancy switch and Local Remote (L/R) selector switch		Yes	
58.	**Annunciator**			
	Manufacture's Name		Shall be mentioned	
	Country of Origin		Europe/USA/Japan/ South Korea/Malaysia	
	Manufacture's Model no.		Shall be mentioned	
	Windows		16 nos	
	Built in buzzer and buttons for accept, mute, test, reset, etc.		Yes	
11 kV OUTGOING FEEDER SWITCHGEAR UNITS:				
59.	a) Manufacturer's Name & Address		Shall be mentioned	
	b) Manufacturer country of origin			
60.	Type		Shall be mentioned	
61.	Applied Standard		Shall be mentioned	
62.	Rated nominal Voltage	kV	11	
63.	Rated maximum Voltage	kV	12	
64.	Material of Bus-Bar		HDHC Copper	
65.	a) Rated Current for main bus	A	2000	
	b) Cross section of Busbar at least	mm^2	2000	
66.	Rated short time current	KA	25	
67.	Short time current rated duration	Sec.	3	
68.	**Circuit Breaker:**			
	Type		VCB	
	Insulation media		SF_6	
	Interrupting media		Vacuum	
	Rated Voltage	KV	12	
	Rated Current	A	630	
	Rated Short Ckt. Breaking Current	KA	25	
	Rated Short CKt. making Current	KA	63	
	Rated Breaking time	Cycle	< 3	
	Opening time	Sec.	< 0.05	
	Closing time	Sec.	< 0.08	
	Rated operating Sequence		0-0.3 sec-CO-3 min-CO	
	Control Voltage	V	DC 110	
	Motor Voltage for spring charge	V	AC 240	
	Manufacturer's name and country of origin of Vacuum interrupter (Shall be same as mentioned in Type Test Report)		Shall be mentioned	

Sl. No.	DESCRIPTION	UNIT	WZPDCL'S REQUIREMENT	BIDDER'S GUARANTEED VALUES
	Manufacturer's model no. of vacuum interrupter		Shall be mentioned	
	Guaranteed no. of operation for Vacuum interrupter:			
	a) Vacuum interrupter normal condition at rated current switching	nos.	Min. 10000	
	b) Vacuum interrupter in short circuit condition i.e. at the short circuit current switching	nos.	≥ 50	
69.	**Three position disconnector Switch (Motorized)**			
	Type		Shall be mentioned	
	Rated Voltage	KV	12	
	Rated Current	A	2000	
	Rated short time current	KA	25	
	Short time current rated duration	S	3	
	Switch Position		close, open, earth	
	Electrical and Mechanical interlock		As per IEC 62271-200	
70.	**Current Transformer:**			
	Rated Voltage	KV	12	
	Accuracy Class, Metering		0.2 & F.S. < 5	
	Accuracy Class, Protection		5 P20	
	Rated Current ratio	A	200-400/5/5A	
	Burden	VA	15+15	
	Rated frequency	Hz	50	
	PROTECTION IDMT OVER CURRENT & EARTH FAULT			
	Manufacture's Name & Country of Origin **(To be mentioned only one within scope)**		ABB- (Sweden/ Finland) /Siemens – Germany (except 7SR series)/ Schneider (France, UK, Finland)/ GE (UK/ France/ Canada)	
	Manufacture's model no.	-		
	Type of relay	-	Numerical programmable	
	Directional Feature can be activated/de-activated		Yes	
	Range of current setting: a) Phase element b) Each fault element	rating		
	Range of timing settings at 10-time CT rating			

Sl. No.	DESCRIPTION	UNIT	WZPDCL'S REQUIREMENT	BIDDER'S GUARANTEED VALUES
	Burden of relay at 10-time CT rating			
	Percentage of current setting at which relay will reset			
	Reset time after removal of 10-time CT rated current for:			
	a) Phase element (100%)			
	b) E/F element (40%)	Sec		
	Communication Facilities		SCADA Supported	
	Communication Standard		IEC-61850 with FO-LC Port	
	Features: 16 BI (mini.), 11 BO (mini.), Mimic Display, and others as per section-7 of technical specification.		Yes	
72.	**Trip Circuit Supervision (TCS) Relay (Separate Relay for each trip coil)**			
	Manufacture's Name		Shall be mentioned	
	Country of Origin		Shall be mentioned	
	Manufacture's Model no./ Type No		Shall be mentioned	
73.	**Trip Relay (Separate Relay)**			
	Manufacture's Name		Shall be mentioned	
	Country of Origin		Shall be mentioned	
	Manufacture's Model no. / Type No		Shall be mentioned	
	Operating Time		< 10 ms	
	All O/C, E/F protection Hand & Electrical reset type.		Yes	
74.	**METERING: KWh Meter**			
	Manufacture's Name & Country	-	AEG(Germany) / ABB(Switzerland)/ Areva(UK)/ Schlumberger(USA)/ Elster (USA/Romania), Lyndis Gyr+ (Switzerland)/ Honeywell (USA)/ Toshiba (Japan)/ CEWE, UK	
	Manufacture's Model no.	-	Shall be mentioned	
	Type of meter	-	Numerical programmable Multifunction	
	Class of accuracy	-	0.2S	

Sl. No.	DESCRIPTION	UNIT	WZPDCL'S REQUIREMENT	BIDDER'S GUARANTEED VALUES
75.	**INDICATION AMPERE METERS**			
	Manufacturer's Name and Country	-		
	Manufacture's Model no.	-		
	Type of meter	-	Analogue/ digital	
	Class of Accuracy	-		
	Separate A-meter for each phase	-	Yes	
	Multifunctional meter			
	Manufacturer's Name and Country	-		
	Manufacture's Model no.	-		
	Type of Meter	-	Digital, Import/Export	
	Parameters: capable of measuring and displaying MW, MVAR, PF, V, I, f, Φ etc.		Yes	
	Class of Accuracy		1.0	
76.	**Control Switch**			
	Manufacture's Name		Shall be mentioned	
	Country of Origin		Shall be mentioned	
	Manufacture's Model no.		Shall be mentioned	
	Separate TNC/Discrepancy switch and Local Remote (L/R) selector switch		Yes	
77.	**Annunciator**			
	Manufacture's Name		Shall be mentioned	
	Country of Origin		Europe/USA/Japan/ South Korea/Malaysia	
	Manufacture's Model no.		Shall be mentioned	
	Windows		12 nos	
	Built in buzzer and buttons for accept, mute, test, reset, etc.		Yes	
78.	**Cable Compartment:**			
	Rated Current	A	2000	

Sl. No.	DESCRIPTION	UNIT	WZPDCL'S REQUIREMENT	BIDDER'S GUARANTEED VALUES
	Cable connection		2 nos./ph x 1C x 500 mm^2 Cu Cable	
	Capacitive Voltage Indicator		Shall be incorporated in the front side of the panel	
79.	**Insulation level:**			
	AC withstand voltage I min. dry	KV	28	
	Impulse Withstand, full wave	KV	75	
80.	**Degree of Protection and safety indicator**			
	Enclosure		IP3X	
	HV Compartment		IP65	
	LV Compartment		IP40	
	Cable Compartment		IP40	
81.	**Earthing Switch:**			
	Type		Shall be mentioned	
	Short Time Current, 3 sec.	KA	Shall be mentioned	
82.	**Bus bar:**			
	Material		Copper	
	Cross Section	mm^2	2000	
83.	**Dimension and Weight**			
	Height	mm	2200	
	Width	mm	Shall be mentioned	
	Depth	mm	Shall be mentioned	
	[redacted]	Kg.	Shall be mentioned	

Seal & Signature of the Manufacturer **Seal & Signature of the Bidder**

8.3 GUARANTEED TECHNICAL PARTICULARS OF 33/11KV, 10/13.33 MVA POWER TRANSFORMER

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, otherwise the bid shall be rejected.)

Sl. No.	Description	Unit	WZPDCL's Requirement	Manufacturer 's Guaranteed Particulars
1.	RATING AND PERFORMANCE			
1.1	Manufacturer's name & country	-	To be mentioned	
1.2	Manufacturer's Model no.	-	To be mentioned	
1.3	Continuous maximum rating (ONAN / ONAF)	MVA	10/13.33	
1.4	No. of phases	Nos.	3	
1.5	Rated frequency	Hz	50	
1.6	Normal transformation ratio at No-load	kV	33/11	
1.7	Rated HT voltage (phase to phase)	kV	33	
1.8	Maximum HT voltage (phase to phase)	kV	36	
1.9	Rated LT voltage (phase to phase)	kV	11	
1.10	Maximum LT voltage (phase to phase)	kV	12	
1.11	Installation	-	Outdoor	
1.12	Type of Transformer	-	Core, Conservator, Oil immersed	
1.13	Direction of normal power flow	-	HT-LT	
1.14	No of windings	Nos.	2	
1.15	Bushing materials	-	Porcelain	
1.16	Type of cooling	-	ONAN/ONAF	
1.17	Coolant	-	Mineral Oil free from PCB as per IEC-60296	
1.18	Type of earthing	-	Effectively earth	
1.20	Type of base	-	On wheels with adequate size and 10M length of rails and fixing arrangement	
1.21	Phase connection: 33 KV winding with bushing CT 11KV winding with bushing CT	 - -	 Delta Star	
1.22	Vector group	-	Dyn11	
1.23	Neutral to be brought out: HT LT	 - -	 Nil Yes	
1.24	Basic Insulation Level (BIL): High voltage winding Low voltage winding	 KV KV	 170 75	
1.25	Max. Temp. Rise over 40^0C of ambient (at CMR & normal tap change position) supported by Design Calculation sheet (to be enclosed) on the basis of Design Data: -			
	a) Winding Temp. Rise	^{0}C	65	
	b) Top Oil Temp. Rise	^{0}C	60	

Sl. No.	Description	Unit	WZPDCL's Requirement	Manufacturer 's Guaranteed Particulars
TEST VOLTAGE:				
1.26	Impulse front wave test voltage (1.2/50 micro sec. wave shape): High voltage side low voltage side	 kV kV	 170 75	
1.27	Power Frequency withstand test voltage for 1 (one) minute: High voltage side Low voltage side	 kV kV	 70 28	
1.28	Short circuit MVA available: at 33 KV at 11KV	 MVA MVA	 1500 500	
1.29	Impedance voltage at 75 ^{0}C and at normal ratio and rated frequency and at ONAN condition.	%	8.5%	
2.	**VOLTAGE CONTROL (OLTC)**			
2.1	Type of Tap Changer control	-	On load auto regulation and remote & manual control	
2.2	OLTC, MDU & AVR Manufacturer's name & country	-	MR, Germany/ABB, Sweden	
2.3	Model Number		Shall be mentioned	
2.4	Nos. of tapping	-	17	
2.5	Tapping steps	-	±10% in steps of 1.25% 17 tapping (i.e., 33 ± 8x1.25%)	
2.6	HV or LV winding	-	HV winding	
2.7	Power Frequency withstand test voltage between first and last contracts of the selector switch between diverter and switch contract.	kV	75	
2.8	Rated Voltage for control circuit		Shall be mentioned	
2.9	Power Supply for control motor		Shall be mentioned	
2.10	AVR Manufacturer Name & Country		MR, Germany/ABB, Sweden	
2.11	Model No with ordering code		Shall be mentioned	
2.12	Features: 12 BI, 08 BO, RTD and mA input with IEC 61850 FO-LC Communication Port		Yes.	
3.	GENERAL			
3.1	Manufacturer's Name & Address		To be mentioned	
3.2	Material of core & grading		CRGO/ Amorphous	
3.3	Core Loss/ Kg, supported by Characteristic Curve (to be submitted)		To be mentioned	
3.4	Thickness of core, mm		To be mentioned	
3.5	Core Dia, mm		To be mentioned	
3.6	Total weight of core, Kg		To be mentioned	

Sl. No.	Description	Unit	WZPDCL's Requirement	Manufacturer 's Guaranteed Particulars
3.7	Maximum flux density in iron at normal voltage and frequency and at normal ratio (ONAF condition) Cores Yokes	 Tesla Tesla	 < 1.7 To be mentioned	
3.8	Over Flux Withstand Capability	Tesla	140% for 5sec	
3.9	Magnetizing current (approx.)	%	To be mentioned	
3.10	a) No load losses at rated voltage, ratio and frequency.	KW	**7-12**	
	b) Full Load losses at rated voltage, normal ratio & frequency in ONAN condition at 75^0C	KW	To be mentioned	
	c) Full Load losses at rated voltage, normal ratio & frequency in ONAF condition at 75^0C.	KW	**50-70**	
	d) Auxiliary Losses	KW	To be mentioned	
	e) Total Loss (a+c+d)	KW	To be mentioned	
3.11	Maximum current density in core at CMR	A/mm^2	To be mentioned	
4.	DETAILS OF CONSTRUCTION			
4.1	Types of winding: HV LV	-	To be mentioned	
4.2	Copper Conductor's Manufacturer Name & Address		To be mentioned	
4.3	Material of windings	-	copper	
4.4	Winding resistance of:			
	a) H.T. winding,	Ohm.	To be mentioned	
	b) L.T. winding,	Ohm.	To be mentioned	
4.5	Current density of:			
	a) H.T. winding, Amps/sq. mm	A/mm^2	To be mentioned	
	b) L.T. winding, Amps/sq. mm	A/mm^2	To be mentioned	
4.6	Outer, Inner & Mean dia of copper winding:			
	a) H.T. winding,	mm	To be mentioned	
	b) L.T. winding,	mm	To be mentioned	
4.7	Size of Copper conductor/bar:			
	a) H.T. winding SWG, dia. in mm/area in mm^2		To be mentioned	
	b) L.T. winding SWG, area in mm^2		To be mentioned	
4.8	Number of Turns:			
	a) HT winding.	nos.	To be mentioned	
	b) LT winding	nos.	To be mentioned	
4.9	Copper weight of windings:			
	a) HT winding	Kg	To be mentioned	
	b) LT winding	Kg	To be mentioned	
4.10	Total weight of copper windings	Kg	To be mentioned	

Sl. No.	Description	Unit	WZPDCL's Requirement	Manufacturer 's Guaranteed Particulars
4.11	Type of insulation of: Tapping Tapping connections Core bolts Core bolt washers Side plates Core laminations	-	To be mentioned	
4.12	Type of winding connections (crimped or brazed)	-	To be mentioned	
4.13	Thickness of transformer tank: Top Sides Bottom	 mm mm mm	 To be mentioned To be mentioned To be mentioned	
4.15	Vacuum withstand capability of the tank			
	Main tank	Kpa	To be mentioned	
	Conservator	Kpa	To be mentioned	
	Radiators	Kpa	To be mentioned	
4.16	Provision of tank earthing	Nos		
4.17	Material used for gaskets for oil tight joints	mm	To be mentioned	
5.	RADIATORS			
5.1	Thickness of radiator plates/ cooling tubes	mm	To be mentioned	
5.2	Equipment for ON cooling state radiators on main tank separate cooler banks	 - -	 To be mentioned To be mentioned	
5.3	Number of coolers/ radiators or cooler banks per transformer	Nos.	To be mentioned	
5.4	Rating of each cooler /radiator bank	KW	To be mentioned	
6.	Oil Volume and Weight			
6.1	Type of oil		Class-1 grade, insulating mineral oil, free from PCB (polychlorinated biphenyl)	
6.2	Manufacturer Name of oil		Shall be mentioned	
6.3	Breakdown Voltage at 2.5 mm gap between electrodes		>50 kV	
6.4	Appearance		Liquid and free from suspended matter or sediment	
6.5	Density at 20^0 C		0.895 g/cm^3 (maximum)	
6.7	Flash point (Closed cup)		140^0 C (minimum)	
6.8	Kinematics Viscosity at -15^0 C		800 cSt. (Maximum)	
6.9	Kinematics Viscosity at 20^0 C		40 cSt. (Maximum)	
6.10	Pour point		-30^0 C (maximum)	
6.11	Neutralization value		0.03 mg KOH/g (maximum)	
6.12	Neutralization value after oxidation		0.40 mg KOH/g (maximum)	

Sl. No.	Description	Unit	WZPDCL's Requirement	Manufacturer 's Guaranteed Particulars
6.13	Total sludge after oxidation		0.10% weight (maximum)	
6.14	PCB Content		Free from PCB	
6.15	Water content		25ppm (maximum)	
6.16	Total oil required including cooler system	Litres	To be mentioned	
6.17	Volume of oil above of the top yoke	Litres	To be mentioned	
6.18	Total volume of conservator	Litres	To be mentioned	
6.19	Weight of core and winding assembly	Tones	To be mentioned	
6.20	Weight of each oil cooler bank complete with oil if mounted separately from transformer	Tones	To be mentioned	
6.21	Total weights of complete transformer, including attached coolers, voltage regulating equipment, all fittings and oil	Tones	To be mentioned	
6.22	Weight of transformer arranged for transport	Tones	To be mentioned	
6.23	Brief description of transformer or parts thereof subjected to short-circuit test or for which short-circuit calculations are available	-	To be mentioned	
7.	TRANSFORMER BUSHING INSULATORS			
7.1	Manufacture's name & country	-	To be mentioned	
7.2	Insulator material	-	Porcelain	
7.3	Bushing housing		Porcelain	
7.4	Bushing Current Rating at 75˚C	A	To be mentioned	
7.5	Insulator type and rated voltage	-	To be mentioned	
7.6	Pitch circle diameter and drilling of flange	mm approx.	To be mentioned	
7.7	Length of Insulator (overall)	mm	To be mentioned	
7.8	Weight of Insulator	kg	To be mentioned	
7.9	One minute 50 Hz dry withstand routine test voltage	KV	To be mentioned	
7.10	Lightning Impulse flashover voltage (1.2/50 wave)	KV	To be mentioned	
7.11	Full wave Lightning Impulse Voltage withstand	KV	To be mentioned	
7.12	50 Hz wet withstand voltage across arcing horns	KV	To be mentioned	
7.13	Under oil flashover voltage type test	KV	To be mentioned	
7.14	Total creepage distance of shedding	mm	Min. 25mm per KV	
7.15	Protected creepage distance of shedding	mm	To be mentioned	
7.16	Rated Short circuit Current withstand capability		25KA, 3sec	
8.	BUSHING CTS 33 KV FOR DIFFERENTIAL PROTECTION			
8.1	Manufacturer's name & country	-	To be mentioned	
8.2	Rated Voltage		33KV	
8.3	Rated maximum Voltage		36KV	
8.4	Ratio	A	300/1/ 1	
8.5	Rated output	VA	30 VA	

Sl. No.	Description	Unit	WZPDCL's Requirement	Manufacturer 's Guaranteed Particulars
8.6	Accuracy class	-	PS, knee point > 500V	
8.7	Electrical Clearance from phase to phase	mm	To be mentioned	
8.9	Electrical Clearance phase to earth	mm	To be mentioned	
9.	BUSHING CTS 11 KV FOR DIFFERENTIAL PROTECTION			
9.1	Manufacturer's name & country	-	To be mentioned	
9.2	Rated voltage	KV	11	
9.3	Rated maximum voltage	KV	12	
9.4	Ratio	A	900/1/ 1	
9.5	Rated output	VA	30 VA	
9.6	Accuracy class	-	PS, knee point > 500V	
10.	NEUTRAL BUSHING CTS 11 KV FOR SEF & REF PROTECTION			
10.1	Manufacturer's name & country	-	To be mentioned	
	Rated voltage	KV	11	
	Rated maximum voltage	KV	12	
10.2	Ratio	A	900/1/1 A	
10.3	Rated output	VA	30 VA	
10.4	Accuracy class	-	PS, knee point > 500V	
11.0	Oil Temperature Indicator			
	Manufacturer Name		To be mentioned	
	Alarm contact		01No	
	Trip Contact		01No	
	Alarm & Trip Range			
12.0	Winding Temperature Indicator (HV & LV)			
	Manufacturer Name & Country of origin		To be mentioned	
	Alarm contact		01No	
	Trip Contact		01No	
	Alarm & Trip Range			
13.0	Dial Thermometer			
	Alarm Contact		01No	
	Trip Contact		01No	
14.0	Buchholz relay		Yes/No	
	Manufacturer Name		To be mentioned	
	Make/Model Number		To be mentioned	
	Alarm contact		01No	
	Trip Contact		01No	
15.0	PRD		Yes/No	
	Manufacturer Name		To be mentioned	
	Make/Model Number		To be mentioned	
	Alarm contact		01No	
	Trip Contact		01No	
16.0	Is terminal permanent terminal marking provided?		Yes/No	
17.0	Parallel operation of identical transformer		Required	
18.0	Marshalling Box		Shall be provided	

Sl. No.	Description	Unit	WZPDCL's Requirement	Manufacturer 's Guaranteed Particulars
19.0	Maintenance free Silica Gel Breather		Shall be provided	
20.0	Guaranteed Noise level as per IEC 551	db		
21.0	Harmonics			
	R.M.S. value of the fundamental current	Amp.	To be mentioned	
	R.M.S. value of 3rd harmonics current	Amp	To be mentioned	
	R.M.S. value of 5th harmonics current	Amp	To be mentioned	
22.0	Type of paint applied internally		To be mentioned	
23.0	Type of paint applied externally		To be mentioned	
24.0	Type of weatherproof anti rust material primer		To be mentioned	
25.0	Dimension of the transformer			
	Length	mm	To be mentioned	
	Width	mm	To be mentioned	
	Height	mm	To be mentioned	
26.0	Standard		Design, Manufacture, Testing, Installation and performance shall be in accordance to the latest edition of the IEC 60076	

Seal & Signature of the Manufacturer **Seal & Signature of the Tenderer**

8.4 GUARANTEED TECHNICAL PARTICULARS OF 200 KVA, 33/0.415 KV, 3-PHASE STATION TRANSFORMER

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, otherwise the bid shall be rejected.)

Sl. No.	Description	WZPDCL'S Requirement	Manufacturer's Guaranteed Data
1	Manufacturer's Name & Address	To be mentioned	
2	Manufacturer's Type & Model No.	To be mentioned	
3	KVA Rating	200	
4	Number of Phases	3	
5	Rated frequency, Hz	50	
6	Rated primary voltage, KV	33	
7	Rated no load sec. voltage, V	415	
8	Vector group	Dyn11	
9	Highest system voltage of :		
	a) Primary winding, KV	36	
	b) Secondary winding, V	457	
10	Basic insulation level, KV	170	
11	Power frequency withstand voltage, KV		
	a) HT Side	70	
	b) LT Side	2.5	
12	Type of cooling	ONAN	
13	Max. Temp. Rise over 40^0C of ambient supported by Calculation (to be submitted) of Load Loss, Temperature Rise and Heat Dissipation by Radiator on the basis of Design Data:		
	a) Windings deg. C	65	
	b) Top oil deg. C	60	
14	Type of primary tapping off load, %	+1x2.5%, 0,-3x 2.5%	
15	Percentage Impedance at 75^o C, %	5%	
16	No-load loss, Watts	650	
17	Load losses at rated full load at 75^0C, Watts	2910	
18	Magnetising current at normal voltage, Amps	To be mentioned	
19	Efficiency at 75^0C and 100% load:		
	a) at 1.0 power factor, %	To be mentioned	
	b) at 0.8 power factor, %	To be mentioned	
20	Efficiency at 75^0C and 75% load:		
	a) at 1.0 power factor, %	To be mentioned	
	b) at 0.8 power factor, %	To be mentioned	
21	Efficiency at 75^0C and 50% load:		
	a) at 1.0 power factor, %	To be mentioned	
	b) at 0.8 power factor, %	To be mentioned	
22	Efficiency at 75^0C and 25% load:		
	a) at 1.0 power factor, %	To be mentioned	
	b) at 0.8 power factor, %	To be mentioned	
23	Regulation at full load:		
	a) at 1.0 power factor, %	To be mentioned	
	b) at 0.8 power factor, %	To be mentioned	
	Transformer Oil:		
24	a) Type of oil	Mineral Insulating Oil	
	b) Manufacturer's Name & Address	To be mentioned	
25	Total weight of oil, Kg	To be mentioned	
26	Breakdown Voltage at 2.5mm gap between	> 50 kV	

Sl. No.	Description	WZPDCL'S Requirement	Manufacturer's Guaranteed Data
	electrodes		
	Transformer Core:		
27	Manufacturer's Name & Address	To be mentioned	
28	Total weight of core, Kg	To be mentioned	
29	Material of core & grading	To be mentioned	
30	Core Loss/ Kg, supported by Characteristic Curve & Core Manufacturer's Brochure	To be mentioned	
31	Thickness of core, mm	To be mentioned	
32	Core Dia, mm	To be mentioned	
33	Max. magnetic flux density, Tesla	< 1.7	
	Transformer Windings:		
34	Copper Conductor's Manufacturer Name & Address	To be mentioned	
35	Material of windings	copper	
36	Winding resistance of:		
	a) H.T. winding, Ohm. (per phase at 75^{o} C)	To be mentioned	
	b) L.T. winding, milli-Ohm. (per phase at 75^{o} C)	To be mentioned	
37	Current density of:		
	a) H.T. winding, Amps/sq. mm	To be mentioned	
	b) L.T. winding, Amps/sq. mm	To be mentioned	
38	Outer, Inner & Mean dia of copper winding:		
	a) H.T. winding, mm	To be mentioned	
	b) L.T. winding, mm	To be mentioned	
39	Size of Copper Conductor:		
	a) H.T. winding SWG, dia. in mm & area in mm^2	To be mentioned	
	b) L.T. winding SWG, area in mm^2	To be mentioned	
40	Number of Turns:		
	a) HT winding, nos.	To be mentioned	
	b) LT winding, nos.	To be mentioned	
41	Copper weight of windings:		
	a) HT winding, Kg	To be mentioned	
	b) LT winding, Kg	To be mentioned	
42	Total weight of copper windings, Kg	To be mentioned	
43	Dimension of Transformer:		
	a) Width, mm	To be mentioned	
	b) Length, mm	To be mentioned	
	c) Height, mm	To be mentioned	
	d) Tank Sheet thickness of top, bottom & side, mm	To be mentioned	
	e) Total weight of transformer tank, Kg	To be mentioned	
44	a) Total weight of active part (core, coil and other accessories), Kg	To be mentioned	
	b) Total weight of complete Transformer including fittings & oil, Kg	To be mentioned	
45	Type of breathings	To be mentioned	
46	Name of relevant IEC or other Equivalent Standards for Design, manufacture, testing and performance.	To be mentioned	
47	Drawing:		

Sl. No.	Description		WZPDCL'S Requirement	Manufacturer's Guaranteed Data
	a)	General Arrangement & Outline Dimensions	To be submitted	
	b)	Internal Construction Details/ Sectional drawing of active parts including Insulation arrangement	To be submitted	
	c)	HT & LT Bushings with dimension & current ratings	To be submitted	
	d)	Cross-section & Dimensional drawing of Core & Windings	To be submitted	
	e)	Radiator with detail dimensional drawing	To be submitted	
	f)	Tap changer with dimension & current ratings.	To be submitted	
48	Routine Test Report:			
	a)	Measurement of turn ratio test.	To be submitted	
	b)	Vector group test.	To be submitted	
	c)	Measurement of winding resistance.	To be submitted	
	d)	Measurement of insulation resistance.	To be submitted	
	e)	Measurement of no-load loss & no-load current.	To be submitted	
	f)	Measurement of impedance voltage & load loss.	To be submitted	
	g)	Dielectric withstands Tests.	To be submitted	
	h)	Transformer oil test (including Tan delta).	To be submitted	
49	Type Tests report along with details test result and drawings for 33/0.415KV, 200KVA, 3-Phase, Dyn11 Distribution Transformer from an independent testing Laboratory/ Institute as per IEC 60076/ BS 171 Standards:			
	a)	Impulse Voltage Withstands test.	To be submitted	
	b)	Temperature Rise test.	To be submitted	
50	Short-circuit Tests Report for the offered 33/0.415KV, 200KVA, 3-Phase, Dyn11 Distribution Transformer as per relevant IEC with detail test results & drawings from reputed independent testing Laboratory/ Institution or detail calculation on the basis of design data by the manufacturer.		To be submitted	

Manufacturer's Seal & Signature

Tenderer seal & signature

8.5 GUARANTEED TECHNICAL PARTICULARS OF 33KV SINGLE PHASE LIGHTNING ARRESTER

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, **otherwise the bid shall be rejected)**

Sl. No.	Description	Unit	WZPDCL's Requirement	Manufacturer's Guaranteed Particulars
01	Manufacturer's Name and Country	-	To be mentioned	
02	Manufacturer's model No.	-	To be mentioned	
03	Type of the Arrester	-	Metal Oxide (ZnO), Gapless	
04	Rated Arrester Voltage	kV	36	
05	Max. System Voltage (P-P)	KV	42	
06	Continuous Operating Voltage	kV	30	
07	Nominal Discharge Current (8/20micro sec)	KA	10	
08	Power Frequency withstand voltage of the Arrester Housing, Dry & Wet	kV rms	70 (Dry) & 70 (Wet)	
09	Impulse withstand Voltage of the Arrester Housing.	kV (peak)	170	
10	Lightning Impulse Residual Voltage (8/20 micro-second wave)	kV (peak)	170	
11	Maxm. Steep Current Impulse Residual Voltage at 10 KA of 1 micro second front time.	kV (peak)	130	
12	High Current Impulse Withstand Value (4/10 micro second)	KA	Min 100KA	
13	Temporary Over voltage capability:			
	a) 0.1 Second	kV (peak)	To be mentioned	
	b) 1.0 Second	kV (peak)	To be mentioned	
	c) 10 Second	kV (peak)	To be mentioned	
	d) 100 Second	kV (peak)	To be mentioned	
14	Leakage Current at rated voltage	mA	< 1 mA	
15	Total Creepage distance (minimum)	mm/ kV	25	
16	Overall dimension:			
	a) Height	mm	To be mentioned	
	b) Diameter	mm	To be mentioned	
17	Total weight of Arrester	Kg.	To be mentioned	
18	Line discharge class	-	Shall be mentioned	
19	Short Circuit Current Withstand duration	Sec	25 KA, 3 sec	
20	Minimum Energy Discharge capability (KJ/KV) at rated voltage	-	5	
21	Min. Bending load (kgm)		500	
22	Surge Counter /Monitor		Shall be provided	
23	Cable for Connecting Surge Counter		Shall be provided	
24	Standard	-	IEC-60099-4	

Seal & Signature of the Manufacturer **Seal & Signature of the Tenderer**

8.6 GUARANTEED TECHNICAL PARTICULARS OF 33 KV OFF-LOAD ISOLATOR WITHOUT EARTH BLADE

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, otherwise the bid shall be rejected.)

Sl. No.	Description	Unit	WZPDCL's Requirement	Manufacturer's guaranteed Particulars
	General Description of Disconnecting Switch			
1.	Manufacturer's Name and country	-	To be mentioned	
2.	Manufacturer's Model no.	-	To be mentioned	
3.	Frequency	Hz	50	
4.	System Nominal Voltage	KV	33	
5.	System Maximum Voltage	KV	36	
6.	Basic Insulation Level	KV	170	
7.	Rated Normal Current	A	1250	
8	Power Frequency Withstand Voltage (for 1 min)	KV	70	
9.	Rated short time withstand current (for 3sec.)	KA	25	
10.	Installation	-	Outdoor	
11.	Type	-	Single Vertical Break	
12.	Construction	-	Open	
13.	Mounting Position	-	Vertical	
14.	Number of Pole	nos.	3 (Three)	
15.	No. of break per pole	nos.	one	
16	Air gap between pole of phase	mm	1000	
17	Insulator Material		Porcelain	
18	Creepage distance of Insulator	mm/KV	25	
	Contract			
19	Materials of the current carrying path		Copper with Nickel Plating	
20.	Contract Resistance	μΩ	Less than 50	
21	**Contact Area:**			
	Moving Blade	Sq. mm	6x50 mm copper flat bar, length 750±20 mm -02 Nos per phase	
	Terminal Pad	Sq. mm	10x60 mm Copper flat bar 02 Nos per phase	
22	Contact type		Spring loaded contact	
23	Operation	-	Gang	
24	Type of main DS operating mechanism	-	Manual & Motor	
25	Number of main DS operating mechanism per set	Nos	1	
26.	Nos. of Auxiliary Contracts (NO/NC) For Isolator	-	Isolator- 4NO-4NC	
27	Locking facility in the operating box in both and open position		Yes	
28	**Operating GI Pipe Dimensions:**			
	For main DS		OD- 42 mm, ID –36 mm, Length – 6 meters	
29	**MS Solid Square Shaft Dimensions**			

Sl. No.	Description	Unit	WZPDCL's Requirement	Manufacturer's guaranteed Particulars
	for gang operation (Hot Dip Galvanized):			
	For main DS		32x32x3600 mm	
30	Total weight of Isolator	Kg	To be mentioned	
31.	Total weight of Unit	Kg	To be mentioned	
32.	Outline Dimensional & Cross-section Drawings of Offered type 33KV Isolator & Mounting Structure Arrangement	-	To be mentioned	
33.	Manufacturer's Printed Catalogue describing Specification & Technical Data of Offered type Equipment.	-	To be mentioned	
34.	Standard	-	IEC-62271-102	

Note: All exposed MS parts should be Hot Dip Galvanized

Seal & Signature of the Manufacturer **Seal & Signature of the Tenderer**

8.7 GUARANTEED TECHNICAL PARTICULARS OF 33 KV OFF-LOAD ISOLATOR WITH EARTH BLADE

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, **otherwise the bid shall be rejected.)**

Sl. No.	Description	Unit	WZPDCL's Requirement	Manufacturer's guaranteed Particulars
	General Description of Disconnecting Switch			
1.	Manufacturer's Name and country	-	To be mentioned	
2.	Manufacturer's Model no.	-	To be mentioned	
3.	Frequency	Hz	50	
4.	System Nominal Voltage	KV	33	
5.	System Maximum Voltage	KV	36	
6.	Basic Insulation Level	KV	170	
7.	Rated Normal Current	A	1250	
8	Power Frequency Withstand Voltage (for 1 min)	KV	70	
9.	Rated short time withstand current (for 3sec.)	KA	25	
10.	Installation	-	Outdoor	
11.	Type	-	Single Vertical Break	
12.	Construction	-	Open	
13.	Mounting Position	-	Vertical	
14.	Number of Pole	nos.	3 (Three)	
15.	No. of break per pole	nos.	one	
16	Air gap between pole of phase	mm	1000	
17	Insulator Material		Porcelain	
18	Creepage distance of Insulator	mm/KV	25	
	Contract			
19	Materials of the current carrying path		Copper with Nickel Plating	
20.	Contract Resistance DS and ES	μΩ	Less than 50	
21	**Contact Area:**			
	Moving Blade DS	Sq. mm	6x50 mm copper flat bar, length 750±20 mm -02 Nos per phase	
	Moving Blade ES	Sq. mm	6x50 mm copper flat bar, length 500±15 mm -02 Nos per phase	
	Terminal Pad	Sq. mm	10x60 mm Copper flat bar 02 Nos per phase	
22	Contact type		Spring loaded contact	
23	Operation	-	Gang	
24	Type of main DS operating mechanism	-	Manual & Motor	
25	Number of main DS operating mechanism per set	Nos	1	
26	Type of Earth Switch operating mechanism		Manual	
27	Number of Earth Switch operating mechanism per set	Nos	1	
28.	Nos. of Auxiliary Contracts (NO/NC) For Isolator& Earth Switch -Isolator	-	Isolator- 4NO-4NC & Earth switch – 4NO-	

Sl. No.	Description	Unit	WZPDCL's Requirement	Manufacturer's guaranteed Particulars
			4NC	
29	Locking facility in the operating box in both and open position		Yes	
30	Mechanical Interlocking facility between main DS and ES		Yes	
31	**Operating GI Pipe Dimensions:**			
	For main DS		OD- 42 mm, ID –36 mm, Length – 6 meters	
	For Earth Switch		OD- 42 mm, ID –36 mm, Length – 6 meters	
32	**MS Solid Square Shaft Dimensions for gang operation (Hot Dip Galvanized):**			
	For main DS		32x32x3600 mm	
	For Earth Switch		25x25x3600mm	
33	Total weight of Isolator	Kg	To be mentioned	
34	Total weight of earth switch	Kg	To be mentioned	
35.	Total weight of Unit	Kg	To be mentioned	
36.	Outline Dimensional & Cross-section Drawings of Offered type 33KV Isolator & Mounting Structure Arrangement	-	To be mentioned	
37.	Manufacturer's Printed Catalogue describing Specification & Technical Data of Offered type Equipment.	-	To be mentioned	
38.	Standard	-	IEC-62271-102	

Note: All exposed MS parts should be Hot Dip Galvanized

Seal & Signature of the Manufacturer **Seal & Signature of the Tenderer**

8.8 GUARANTEED TECHNICAL PARTICULARS OF 33 KV OFF-LOAD FUSED ISOLATOR WITHOUT EARTH BLADE FOR BUS PT AND AUXILIARY TRANSFORMER

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, **otherwise the bid shall be rejected.)**

Sl. No.	Description	Unit	WZPDCL's Requirement	Manufacturer's guaranteed Particulars
	General Description of Disconnecting Switch			
1.	Manufacturer's Name and country	-	To be mentioned	
2.	Manufacturer's Model no.	-	To be mentioned	
3.	Application of the Disconnecting Switch		33kV Bus PT & Auxiliary Transformer	
4.	Frequency	Hz	50	
5.	System Nominal Voltage	KV	33	
6.	System Maximum Voltage	KV	36	
7.	Basic Insulation Level	KV	170	
8	Rated Normal Current	A	400	
9.	Power Frequency Withstand Voltage (for 1 min)	KV	70	
10.	Rated short time withstand current (for 3sec.)	KA	25	
11.	Installation	-	Outdoor	
12.	Type	-	Single Vertical Break Fuse Isolator	
13.	Construction	-	Open	
14.	Mounting Position	-	Vertical	
15.	Number of Pole	nos.	3 (Three)	
16	No. of break per pole	nos.	one	
17	Air gap between pole of phase	mm	1000	
18	Insulator Material		Porcelain	
19	Creepage distance of Insulator	mm/KV	25	
	Contract			
20.	Materials of the current carrying path		Copper with Nickel Plating	
21	Contract Resistance	μΩ	Less than 50	
22	**Contact Area:**			
	Moving Blade	Sq. mm	6x50 mm copper flat bar, length 810±20 mm -02 Nos per phase	
	Terminal Pad	Sq. mm	10x60 mm Copper flat bar 02 Nos per phase	
23	Contact type		Spring loaded contact	
24	Operation	-	Gang	
25	Type of main DS operating mechanism	-	Manual	
26.	Number of main DS operating mechanism per set	Nos	1	
27	Nos. of Auxiliary Contracts (NO/NC) For Isolator	-	Isolator- 4NO-4NC	
28	Locking facility in the operating box in both and open position		Yes	
29	**Operating GI Pipe Dimensions:**			
	For main DS		OD- 42 mm, ID –36 mm, Length – 6 meters	

Sl. No.	Description	Unit	WZPDCL's Requirement	Manufacturer's guaranteed Particulars
30	**MS Solid Square Shaft Dimensions for gang operation (Hot Dip Galvanized):**			
	For main DS		32x32x3600 mm	
31	Total weight of Unit	Kg	To be mentioned	
	Fuse Description			
32	Rated Fuse Voltage	KV	33	
33	Fuse type		DIN Fuse	
34	Rated fuse link normal current	A	6.3	
35	Rated fuse link interrupting current	KA	25 kA, RMS Symmetrical	
36	Fuse link type		Two element, slow/ fast unit	
37	Fuse end cap type		Heavy duty, sealed cap with eye at both ends of fuse holder	
38	Fuse link co-ordination		Shall co-ordinate with existing system protective equipment	
39.	Outline Dimensional & Cross-section Drawings of Offered type 33KV Isolator & Mounting Structure Arrangement	-	To be mentioned	
40.	Manufacturer's Printed Catalogue describing Specification & Technical Data of Offered type Equipment.	-	To be mentioned	
41.	Standard	-	IEC-62271-102	

Note: All exposed MS parts should be Hot Dip Galvanized

Seal & Signature of the Manufacturer **Seal & Signature of the Tenderer**

8.9 GUARANTEED TECHNICAL PARTICULARS OF 33 KV OUTDOOR TYPE VACUUM CIRCUIT BREAKER

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, **otherwise the bid shall be rejected.)**

Sl. No.	Description	Unit	WZPDCL's Requirement	Manufacturer's Guaranteed Particulars
1	Manufacturer's Name & Country	-	To be mentioned	
2	Manufacturer's model no.	-	To be mentioned	
3	Maximum Rated Voltage	KV	36	
4	Frequency	Hz	50	
5	Rated Normal current	A	1250A	
6	No. of phase	-	3	
7	No. of break per phrase	-	To be mentioned	
8	Interrupting medium	-	Vacuum	
9	Manufacturer's name and country of vacuum interrupter	-	To be mentioned	
10	Manufacturer's model no. of vacuum interrupter	-	To be mentioned	
11	Impulse withstands on 1.2/50 μs wave	KV	170	
12	Power Frequency Test Voltage (Dry), at 50Hz, 1 min.	KV	70	
13	Short time withstand current, 3 second, rms	KA	25	
14	Breaking capacity: a) Symmetrical, rms b) Asymmetrical, rms	 KA KA	 25 As per IEC	
15	Short circuit making current, peak	KA	78.75	
16	First phase to clear factor	-	To be mentioned	
17	Rated transient recovery voltage at 100% rated short circuit breaking current	KVp	To be mentioned	
18	Rated line charging breaking current	A	To be mentioned	
19	Rated cable charging breaking current	A	To be mentioned	
20	Rated out of phase breaking current	A	To be mentioned	
21	Is circuit breaking restrike free?	Yes/ No	Yes	
22	Trip coil current	A	To be mentioned	
23	Trip coil voltage	V, DC	110	
24	Is the circuit breaker trip free?	Yes/ No	Yes	
25	Type of arc contacts or arc control Device	-	To be mentioned	
26	Main Contact: a) Type of contact b) Material of contract surfaces c) Contract resistance	 - - μΩ	 To be mentioned To be mentioned Less than 40	
27	Does magnetic effect of load Currents increase contact pressure?	Yes/ No	To be mentioned	
28	Length of each break/ phase	mm	To be mentioned	
29	Length of stroke	mm	To be mentioned	
30	Weight of circuit breaker unit complete, without operating mechanism and structure	Kg	To be mentioned	
31	Weight of circuit breaker complete with all fittings as in service.	Kg	To be mentioned	
32	Maximum shock load imposed on floor or foundation when opening under fault	N	To be mentioned	

Sl. No.	Description	Unit	WZPDCL's Requirement	Manufacturer's Guaranteed Particulars
	conditions (state compression or tension)			
33	Maximum pressure rises in circuit Breaker due to making or breaking of Rated current in outer chamber	KN/ m^2	To be mentioned	
34	Routine pressure test on circuit Breaker tanks or chamber	KN/ m^2	To be mentioned	
35	Design pressure type test on circuit Breaker tanks or chamber	KN/ m^2	To be mentioned	
	Operating Particulars:			
36	a) Opening time: without current at 100% of rated breaking current b) Breaking time c) Closing time	sec. Cycle ms	0.05 (maximum) 2 or 3 cycles To be mentioned	
37	Maximum arc duration of any duty Cycle of IEC 56-2	ms At…%	To be mentioned	
38	Current at which maximum arc duration occurs (critical current)	A	To be mentioned	
39	Make time	ms	To be mentioned	
40	Minimum time for arc extinction to Contract remark when adapted for auto re-closing	ms	To be mentioned	
41	Time from closing of control switch to completion of closing stroke during fault making	ms	To be mentioned	
Constructional Features:				
42	Is an external series break Incorporated in the breaker?	Yes/ No	To be mentioned	
43	Is any device used to limit transient Recovery voltage?	Yes/ No	To be mentioned	
44	Method of closing	-	To be mentioned	
45	Method of tripping	-	To be mentioned	
46	Number of close/ trip operation possible on one spring charge	Nos.	To be mentioned	
47	Rated voltage of spring winding motor for closing	V.AC	230	
48	Spring winding motor current	A	To be mentioned	
49	Closing release coil current	A	To be mentioned	
50	Closing release coil voltage	V.DC	110	
51	Minimum clearance in air:			
	a) Between phrase	mm	370	
	b) Phrase to earth	mm	325	
	c) Across circuit breaker poles	mm	To be mentioned	
	d) Live conductor to ground level	mm	To be mentioned	
	e) Live insulator to ground level	mm	To be mentioned	
52	Material of tank or chamber	-	To be mentioned	
53	Material of moving contract tension rod	-	To be mentioned	
54	Period of time equipment has been in commercial operation	Year	To be mentioned	
55	No. of tripping coil	Nos.	2	
56	Circuit breaking terminal connector	-	Copper	
57	Creepage distance (min)	KV/mm	25	

Sl. No.	Description	Unit	WZPDCL's Requirement	Manufacturer's Guaranteed Particulars
58	Method of indicating VCB ON/ OFF	Mech. & Elect.	To be mentioned	
59	Life of interrupter	Years	To be mentioned	
60	Pressure in vacuum tube for VCB	Bar	To be mentioned	
61	Guaranteed nos. of operation for vacuum Interrupter:			
	a) at rated Current switching	Nos.	To be mentioned	
	b) at Short circuit current switching	Nos.	≥ 50	
62	Circuit Breaker Class shall be (through necessary type test Report)	-	E2, M2 Class	
63	Rated operating sequence	-	O-0.3sec-CO-3m-CO	
64	All current carrying parts of VCB Shall be made of	-	Copper	
65	Standard	-	IEC 62271-100	

Manufacturer's Seal & Signature **Tenderer Seal & Signature**

8.10 GUARANTEED TECHNICAL PARTICULARS OF 33KV OUTDOOR TYPE SINGLE PHASE CURRENT TRANSFORMER

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, otherwise the bid shall be rejected.)

Sl. No.	Description	Unit	WZPDCL's Requirement	Manufacturer's Guaranteed Particulars
1	Manufacturer's Name & Country	-	To be mentioned	
2	Manufacturer's Model No.	-	To be mentioned	
3	Application	-	Metering and Protection	
4	Type	-	Induction	
5	Installation	-	Outdoor	
6	Construction	-	Sealed Tank	
7	Insulation	-	Oil	
8	Number of Phase	-	Single	
9	Rated Frequency	Hz	50	
10	Mounting	-	On Supporting Structure	
11	Primary rated voltage (Phase to Phase)	kV	33	
12	Maximum System Voltage (Phase to Phase)	kV	36	
13	System Earthing	-	Effectively Earthed	
14	Basic Insulation Level (1.2/50 Micro-Sec.)	kV	170	
15	Power frequency withstand voltage (1 Min. 50 Hz.)	kV	70	
16	**Ratio for 33KV Line feeder:**			
	10/13 MVA Power Transformer		400-800/5-5-5A	
	20/26MVA Power Transformer		400-800/5-5-5A	
	Ratio for 33KV Transformer feeder:			
	10/13 MVA Power Transformer		300-600/5-5-5A	
	20/26MVA Power Transformer		300-600/5-5-5A	
17	Type of Winding:			
	a) Primary	-	Single Winding	
	b) Secondary	-	Three winding (one for protection & two for measuring)	
18	Accuracy Class:			
	a) for measurement	-	0.2S	
	b) for Protection	-	5P20	
19	Burden:			
	a) for measurement	VA	30	
	b) for Protection	VA	30	
20	Short Time Current Rating for 3 Sec.	kA	25	
21	Extended Current Rating (% of rated current)	%	120	
22	Over Current Rating	A	<10	
23	Creepage Distance	mm/ kV(Min.)	25	
24	Rated accuracy limit factor	-	To be mentioned	
25	Knee point voltage	V	To be mentioned	
26	Bushing	-	Porcelain outdoor type	
27	Standard	-	IEC 61869-2	

Seal & Signature of the Manufacturer **Seal & Signature of the Tenderer**

8.11 GUARANTEED TECHNICAL PARTICULARS OF 33 KV OUTDOOR TYPE SINGLE PHASE POTENTIAL TRANSFORMER

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, otherwise the bid shall be rejected.)

Sl. No.	Description	Unit	WZPDCL's Requirement	Manufacturer's Guaranteed Particulars
1	Manufacturer's Name & Country or origin	-	To be mentioned	
2	Manufacturer's Model No.	-	To be mentioned	
3	Type	-	Induction Type	
4	Ratio	V	$33000/\sqrt{3}:110/\sqrt{3}:110/\sqrt{3}$	
5	No. of phase	Nos.	Single Phase	
6	Total capacitance at 100 Hz	PF	To be mentioned	
7	50 Hz 1 (One) minute withstand voltage wet	KV	To be mentioned	
8	Impulse withstands (1.2/50 micro sec. wave)	KV	170	
9	Rated burden per phase	VA	50VA	
10	Class of accuracy	-	0.2+3P	
11	Temperature co-efficient of ratio per ^{0}C	-	To be mentioned	
12	System earthing	-	Effectively Earthed	
13	Creepage Distance	mm/kV	25 (min)	
14	Maximum errors with 5% primary voltage:			
	a) Ratio	%	To be mentioned	
	b) Phase angle	minutes	To be mentioned	
15	Total weight complete	Kg	To be mentioned	
16	Standard	-	As per relevant IEC 61869-3	

Seal & Signature of the Manufacturer **Seal & Signature of the Tenderer**

8.12 GUARANTEED TECHNICAL PARTICULARS OF 33 KV BUS BAR INSULATOR STRING

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, otherwise the bid shall be rejected.)

Sl. No.	Description	Unit	WZPDCL's Requirement	Manufacturer's guaranteed Particulars
1	Manufacturer's Name & Country	-	To be mentioned	
2	Manufacturer's model no.	-	To be mentioned	
3	Insulator material	-	Porcelain	
4	Number of units per string	Nos.	3	
5	Insulator Voltage Class	KV	12	
6	Insulator Materials		Porcelain	
7	Type of Insulator	-	Ball and socket type disc, security clip made of rod brass alloy.	
8	Creepage/ leakage distance (min.)	mm	298	
9	Total creepage distance of string	mm	850	
10	Unit Spacing	mm	146	
11	Dry Arcing distance (minimum)	mm	1968	
12	Diameter of Insulator	mm	256	
13	Withstand Voltage, Minimum:			
	a) Power Frequency; dry (one min.)	KV	70	
	b) Power Frequency; wet (one min.)	KV	40	
	c) Impulse 1.2/50 μ sec	KV	110	
14	Flashover Voltage, Minimum:			
	a) Power Frequency, dry	KV	80	
	b) Power Frequency, wet	KV	50	
	c) 50% Impulse 1.2/50 μ sec wave, positive or impulse 1.2/50 μsec wave positive.	KV	125	
	d) 50% Impulse 1.2/50 μ sec wave Negative	KV	130	
15	Power Frequency Puncture Voltage, minimum	KV	110	
16	Radio Influence Voltage Data, minimum			
	a) Power frequency test voltage RMS to Ground	KV	10	
	b) Maximum RIV at 1,000 Kc	μV	50	
17	Minimum Mechanical Strength for Suspension:			
	a) Electro-mechanical Breaking Load	Kg	7260	
	b) Mechanical Breaking load	Kg	6800	
	c) Tension Proof Test Load	Kg	3400	
	d) Time Load Test Value	Kg	4536	
	e) Mechanical Impact Strength	mm Kg	630	
18	Minimum Mechanical Strength for Strain Stringing:			
	a) Electro-mechanical Breaking Load	Kg	11340	

Sl. No.	Description	Unit	WZPDCL's Requirement	Manufacturer's guaranteed Particulars
	b) Mechanical Breaking load	Kg	11340	
	c) Tension Proof Test Load	Kg	3400	
	d) Time Load Test Value	Kg	4536	
	e) Mechanical Impact Strength	mm Kg	530	
19	Insulator Hardware		Insulator hardware for insulator strings or bus-support such shall have UTS-120 KN and galvanized as per BS-729 OR ASTM A-153.	
20	Standard		AS per latest editions of IEC-383.	

Seal & Signature of the Manufacturer **Seal & Signature of the Tenderer**

8.13 GUARANTEED TECHNICAL PARTICULARS OF 10/13.33 MVA, 33/11KV POWER TRANSFORMER PROTECTION, CONTROL & METERING (PCM) PANELS

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, otherwise the bid shall be rejected.)

No	Description	Unit	EMPLOYER'S Requirement	Manufacturer's Guaranteed Particulars
1.	Manufacturer's Name and address		Shall be mentioned	
2.	Country of Origin of Panel		Shall be mentioned	
3	System nominal voltage	KV	33	
4	Maximum System Voltage	KV	36	
5	Rated Frequency	Hz	50	
6	**PROTECTION Differential Relay with inbuilt REF features**			
	Manufacturer's Name **(To be mentioned only one within scope)**		ABB- (Sweden/ Finland) /Siemens – Germany (except 7SR series) / Schneider- (France/ UK / Finland)/ GE (UK/France /Canada)	
	Country of Origin			
	Manufacture's Model no.		To be mentioned	
	Type of Relay			
	Maximum through fault at which the protective equipment is stable with recommend settings:			
	a) Earth faults		Shall be mentioned	
	b) Phase faults		Shall be mentioned	
	Maximum time delay between initiation of fault and energize of breaker trip circuit.	ms	Shall be mentioned	
	Communication Facilities		SCADA Supported	
	Communication Standard		IEC-61850 with FO-LC Port	
	Features: 07 BI (mini.), 07 BO (mini.), Mimic Display, Low impedance REF, and others as per section-7 of technical specification.		Yes	
7	**IDMT OVER CURRENT & EARTH FAULT RELAY**			
	Manufacturer's Name **(To be mentioned only one within scope)**		ABB- (Sweden/ Finland) /Siemens – Germany (except 7SR series) / Schneider- (France/ UK / Finland)/ GE (UK/France /Canada)	
	Manufacture's Model no.			
	Type of relay		Numerical programmable Multifunction (IED)	
	Range of current setting:			

No	Description	Unit	EMPLOYER'S Requirement	Manufacturer's Guaranteed Particulars
	a) Phase element	rating	Shall be mentioned	
	b) Each fault element		Shall be mentioned	
	Range of timing settings at 10-time CT rating		Shall be mentioned	
	Burden of relay at 10-time CT rating		Shall be mentioned	
	Percentage of current setting at which relay will reset.		Shall be mentioned	
	Reset time after removal of 10-time CT rated current for:		Shall be mentioned	
	a) Phase element (100%)		Shall be mentioned	
	b) E/F element (40%)	Sec	Shall be mentioned	
	Communication Facilities		SCADA Supported	
	Communication Standard		IEC-61850 FO-LC Port	
	Features: 16 BI, 11 BO, Mimic Display, and others features as per section-7 of technical specification.		Yes	
8	**Separate Auxiliary Flag Relays for Transformer self-protection (OTA, OTT, WTA, WTT, BA, BT, OLTC Surge, PRD for main tank).**			
	Manufacture's Name		Shall be mentioned	
	Country of Origin		Shall be mentioned	
	Manufacture's Model no		Shall be mentioned	
	Type of Relays		Shall be mentioned	
9	**Trip Circuit Supervision (TCS) Relay (Separate Relay for each trip coil)**			
	Manufacture's Name		Shall be mentioned	
	Country of Origin		Shall be mentioned	
	Manufacture's Model no.		Shall be mentioned	
	Type of Relay		Shall be mentioned	
10	**Trip Relay (Separate Relay)**			
	Manufacture's Name		Shall be mentioned	
	Country of Origin		Shall be mentioned	
	Manufacture's Model no.		Shall be mentioned	
	Type of Relay		Shall be mentioned	
	Operating Time		< 10 ms	
	Operating Coil Voltage- 110V DC		Yes	
	All O/C, E/F protection Hand & Electrical reset type for Differential, REF and Transformer Self-protection		Yes	
11	**Annunciator**			
	Manufacture's Name		Shall be mentioned	
	Country of Origin		Shall be mentioned	
	Manufacture's Model no.		Shall be mentioned	
	Windows		24 nos	
	Built in buzzer and buttons for accept, mute, test, reset, etc.		Yes	
12	**Control Switch**			

No	Description	Unit	EMPLOYER'S Requirement	Manufacturer's Guaranteed Particulars
	Manufacture's Name		Shall be mentioned	
	Country of Origin		Shall be mentioned	
	Manufacture's Model no.		Shall be mentioned	
	Separate TNC/Discrepancy switch and Local Remote (L/R) selector switch		Yes	
13	**AVR Relay:** Transformer incomer PCM panel shall be equipped with AVR relay and control switch for RTCC operation along with necessary indication system (Tap position, oil temperature, winding temperature etc.).		Yes	
14	**METERING AND INSTRUMENTATION**			
	a) KWH & kVARH Meter			
	Manufacture's Name & Country		Siemens (Germany/ Switzerland)/ AEG (Germany) / ABB (Switzerland)/ Toshiba (JAPAN) /Elster (USA /Romania), Landis+ Gyr (Switzer land/ Greece)/ Honeywell/ Itron (USA)/ CEWE, UK	
	Manufacture's Model no.		Shall be mentioned	
	Type of Meter		Numerical programmable Multifunction (IED)	
	Class of Accuracy			
	b) VOLT METERS with Selector Switch			
	Manufacturer's Name and Country		Shall be mentioned	
	Manufacture's Model no.		Shall be mentioned	
	Type of Meter		Analogue/ Digital, 90-degree scale range	
	Class of Accuracy		1	
	c) AMPERE METERS			
	Manufacturer's Name and Country		Shall be mentioned	
	Manufacture's Model no.		Shall be mentioned	
	Type of Meter		Analogue/ Digital, 240-degree scale range	
	Class of Accuracy		1	
	Separate A-meter for each phase		Yes	
	d) Multifunctional Meter			
	Manufacturer's Name and Country		Shall be mentioned	
	Manufacture's Model no.		Shall be mentioned	
	Type of Meter		Digital, Import/Export	
	Parameters: capable of measuring and displaying MW,		Yes	

No	Description	Unit	EMPLOYER'S Requirement	Manufacturer's Guaranteed Particulars
	MVAR, PF, V, I, f, Φ etc.			
	Class of Accuracy		1	
15.	**Overall dimensions of each Panel unit:**			
	a) - Height - Width - Depth	mm mm mm	2200 To be mentioned To be mentioned	

Seal & Signature of the manufacturer: **Seal & Signature of the Tenderer**

8.14 GUARANTEED TECHNICAL PARTICULARS OF 33KV FEEDER PCM PANEL (INCOMING/OUTGOING)

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, otherwise the bid shall be rejected.)

Sl. No	Description	Unit	EMPLOYER'S Requirement	Guaranteed Particulars Manufacturer's
1	Manufacturer's Name		Shall be mentioned	
2	Country of Panel			
3	System nominal voltage	KV	33	
4	Maximum System Voltage	KV	36	
5	Rated Frequency	Hz	50	
	PROTECTION IDMT OVER CURRENT & EARTH FAULT WITH DIRECTIONAL FEATURE RELAY			
	Manufacture's Name & Country of Origin **(To be mentioned only one within scope)**		ABB- (Sweden/ Finland) /Siemens – Germany (except 7SR series)/ Schneider (France, UK, Finland)/ GE (UK/ France/ Canada)	
	Country of Origin			
	Manufacture's model no.	-		
	Type of relay	-		
	Directional Feature			
	Maximum through fault at which the protective equipment is stable with recommend settings:			
	a) Earth faults		To be mentioned	
	b) Phase faults		To be mentioned	
	Maximum time delay between initiation of fault and energization of breaker trip circuit.	ms	Shall be mentioned	
	Range of timing settings at 10-time CT rating		Shall be mentioned	
	Burden of relay at 10-time CT rating		Shall be mentioned	
	Percentage of current setting at which relay will reset		Shall be mentioned	
	Reset time after removal of 10			
	time CT rated current for:			
	a) Phase element (100%)		Shall be mentioned	
	b) E/F element (40%)		Shall be mentioned	
	Communication Facilities		SCADA Supported	
	Communication Standard		IEC-61850 FO-LC Port	
	Features: 23 BI (min.), 16 BO (mini.), Mimic Display, and others as per section-7 of technical specification.		Yes	
7	**Trip Circuit Supervision (TCS) Relay (Separate Relay for each trip coil)**			
	Manufacture's Name		Shall be mentioned	
	Country of Origin		Shall be mentioned	
	Manufacture's Model no.		Shall be mentioned	

Sl. No	Description	Unit	EMPLOYER'S Requirement	Guaranteed Particulars Manufacturer's
	Type of Relay		Shall be mentioned	
8	**Trip Relay (Separate Relay)**			
	Manufacture's Name		Shall be mentioned	
	Country of Origin		Shall be mentioned	
	Manufacture's Model no.		Shall be mentioned	
	Type of Relay		Shall be mentioned	
	Operating Time		< 10 ms	
	Operating Coil Voltage- 110V DC		Yes	
	Hand & Electrical reset type for all O/C, E/F protection		Yes	
9	**Annunciator**			
	Manufacture's Name		Shall be mentioned	
	Country of Origin		Shall be mentioned	
	Manufacture's Model no.		Shall be mentioned	
	Windows		16 nos	
	Built in buzzer and buttons for accept, mute, test, reset, etc.		Yes	
10	**Control Switch**			
	Manufacture's Name		Shall be mentioned	
	Country of Origin		Shall be mentioned	
	Manufacture's Model no.		Shall be mentioned	
	Separate TNC/Discrepancy switch and Local Remote (L/R) selector switch		Yes	
11	**METERING & INDICATION KWh Meter**			
	Manufacture's Name & Country	-	Siemens (Germany/ Switzerland)/AEG (Germany)/ ABB (Switzerland/Finland)/ Alstom (UK)/ Itron (USA)/ Elster (USA/Romania)/ Landis+ Gyr (Switzerland)/ Honey well / Itron (USA)/ Toshiba (Japan)/ CEWE, UK	
	Manufacture's Model no.	-	To be mentioned	
	Type of Meter	-		
	Class of Accuracy	-		
	INDICATION VOLT & AMPERE METERS			
	Manufacturer's Name and Country	-		
	Manufacture's Model no.	-	Shall be mentioned	
	Type of Meter	-		
	Class of Accuracy		0.5	
	Separate A-meter for each phase		Yes	
	a) Multifunctional meter			
	Manufacturer's Name and	-		

Sl. No	Description	Unit	EMPLOYER'S Requirement	Guaranteed Particulars Manufacturer's
	Country			
	Manufacture's Model no.	-		
	Type of Meter	-	Digital, Import/Export	
	Parameters: capable of measuring and displaying MW, MVAR, PF, V, I, f, Φ etc.		Yes	
	Class of Accuracy		1	
12	**Overall dimensions of each Panel unit:**			
	a) - Height - Width - Depth	mm mm mm	2200 To be mentioned To be mentioned	

Seal & Signature of the manufacturer **Seal & Signature of the Tenderer**

8.15 GUARANTEED TECHNICAL PARTICULARS OF 11KV INDOOR AIR INSULATED SWITCHGEAR CUBICLES WITH BREAKER, PROTECTION, CONTROL & METERING CUBICLES.

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, otherwise the bid shall be rejected)

Sl. No.	Description	Unit	WZPDCL's Requirement	Manufacturer's Guaranteed Particulars
1.	Manufacturer's Name & Country of origin	-	To be mentioned	
2.	Manufacturer's Model no.	-	To be mentioned	
3.	System nominal voltage	kV	11	
4.	Maximum System Voltage	kV	12	
5.	Rated Frequency	Hz	50	
6	**Circuit Breaker**			
	Rated normal current:			
	a) Incoming for 10/13.33 MVA Transformer		1600	
	b) bus Coupler	A	1600	
	c) Outgoing Feeder	A	630	
7.	No. of phase	nos.	3	
8.	No. of breaks per phase	nos.	To be mentioned	
9.	Interrupting medium	-	Vacuum	
10.	Manufacturer's name and country of origin of Vacuum Interrupter	-	To be mentioned	
11.	Manufacturer's model no. of vacuum interrupter	-	To be mentioned	
12.	Power Frequency withstand voltage	kV	28	
13.	Lightning Impulse withstand voltage on 1.2/50 μs wave	kV	75	
14.	Emergency overload rating of normal at 20^0C ambient	-	To be mentioned	
15.	Duration in any 24 hrs. period	-	To be mentioned	
16	**Current Transformer:**			
	Accuracy Class, Metering		0.2S	
	Accuracy Class, Protection		5P20	
	Rated Current Ratio (for Transformer incoming)	A	800-1600/5-5A	
	Rated Current Ratio (for Bus coupler)	A	800-1600/5-5A	
	Rated Current Ratio (for Outgoing feeder)	A	200-400/5-5A	
	Burden for metering	VA	30	
	Burden for protection	VA	30	
17.	Busbar Scheme	no.	Single	
18.	Number of Busbar	nos.	3	
19.	Temperature Rise of Busbar at rated current	^{0}C	To be mentioned	
20.	Material of Busbar	-	Copper	
21.	Cross-section of Busbar	mm^2	To be mentioned	

Sl. No.	Description	Unit	WZPDCL's Requirement	Manufacturer's Guaranteed Particulars
22.	Rated normal current of bus bar for 10/13.33 MVA S/S	A	1600	
23.	Bus bar insulation material	-	To be mentioned	
24.	Are floor plates or rails included?	-	To be mentioned	
25.	**Overall dimensions of each circuit breaker unit:**			
	a) Incomer: - - Height - Width - Depth	 mm mm mm	 To be mentioned To be mentioned To be mentioned	
	b) Feeder: - - Height - Width - Depth	 mm mm mm	 To be mentioned To be mentioned To be mentioned	
	c) Bus coupler: - - Height - Width - Depth	 mm mm mm	 To be mentioned To be mentioned To be mentioned	
26.	Width necessary for breaker withdrawal	mm	To be mentioned	
27.	Rated Short-time withstand Current (Rated short circuit breaking current) for 3 sec.	KA	min 25	
28.	Rated Peak withstand Current (Rated short circuit making current)	KA	min 62.5	
29.	Breaking capacity: a) Symmetrical rms b) Asymmetrical rms	 KA KA	 25 As per IEC	
30.	Rated duration of short circuit	Sec.	3sec	
31.	Degrees of protection by enclosures	IP	IP4X	
32.	First pole to clear factor	-	To be mentioned	
33.	Rate transient recovery voltage at 100% rated short circuit breaking current	KVp	To be mentioned	
34.	Rated line charging breaking current	A	To be mentioned	
35.	Rated cable charging breaking current	A	To be mentioned	
36.	Rated out of phase breaking current	A	To be mentioned	
37.	Is circuit breaker re-strike free?	-	Yes	
38.	No. of tripping coil	nos.	2	
39.	Trip coil current	A	To be mentioned	
40.	Trip coil voltage	VDC	110	
41.	Is circuit breaker trip free?	-	Yes	
42.	Type of main contact	-	To be mentioned	
43.	Material of contact surface	-	To be mentioned	
44.	Contact resistance	$\mu\Omega$	< 40	

Sl. No.	Description	Unit	WZPDCL's Requirement	Manufacturer's Guaranteed Particulars
45.	Does magnetic effect of load current increase contact?	-	To be mentioned	
46.	Length of each break/ phase	mm	To be mentioned	
47.	Length of stroke	mm	To be mentioned	
48.	Weight of circuit breaker complete, without operating mechanism and cubicles	Kg	To be mentioned	
49.	Weight of circuit breaker complete with PCM cubicles as in service	Kg	To be mentioned	
50.	Maximum shock load imposed on floor or foundation when opening under fault condition (state compression or tensions)	N	To be mentioned	
	OPERATING:			
51.	Operating Sequence	-	To be mentioned	
52.	a) Opening time without current at 100% of rated breaking current b) Braking time c) Closing time	ms cycle ms	0.05 (maximum) 2 or 3 cycles To be mentioned	
53.	Maximum arc duration of any duty cycle as per latest revision of relevant IEC.	ms at....%	To be mentioned	
54.	Current at which maximum arc duration occurs (critical current)	A	To be mentioned	
55.	Make time	ms	To be mentioned	
56.	Minimum time for arc extinction to contact remake when adapted for auto re-closing	ms	To be mentioned	
57.	Time from closing of control of switch to completion of closing stroke during fault making.	ms	To be mentioned	
58.	Is there anti-pumping facility?	-	Yes	
59.	Is there electrical and mechanical interlocking?	-	Yes	
60.	Pressure in vacuum tube	bar	To be mentioned	
61.	Guaranteed no. of operation for vacuum interrupter	nos.	To be mentioned	
62.	In normal condition at rated current switching	nos.	To be mentioned	
63.	In short circuit condition i.e. at the short circuit current switching	nos.	≥ 50	
64	Circuit Breaker Class shall be (through necessary type test Report)	-	E2, M2 Class	
	CONSTRUCTION FEATURE:			
65.	Is an external series break incorporated in the breaker?	-	To be mentioned	
66.	Is any device used to limit transient recovery voltage?	-	To be mentioned	

Sl. No.	Description	Unit	WZPDCL's Requirement	Manufacturer's Guaranteed Particulars
67.	Method of closing	-	To be mentioned	
68.	Method of tripping	-	To be mentioned	
69.	Minimum clearance in air: a) between phases b) phase to earth	 mm mm	 To be mentioned To be mentioned	
70.	Material of tank or chamber	-	To be mentioned	
71.	Material of moving contact tension rod	-	To be mentioned	
72.	Period of time equipment has been in commercial operation	Years	To be mentioned	
73.	Is removable draw-out type VCB mounted on the lower part of the panel i.e. on floor/ medium part of the panel ie trolley type?	-	To be mentioned	
74.	All meters, protective relays, signaling etc. mounted on the upper part of the panel.	-	To be mentioned	
75.	Rates voltage of spring winding motor for closing.	Vac	240	
76.	Materials of all current carrying parts of VCB.	-	Copper	
77.	Name of relevant IEC Standards to be followed fin Design, Manufacture, Testing and Performance.	-	To be mentioned	
78	For 11 KV outgoing feeders having gang operated earth switch		Yes	
	PROTECTION			
A.	**33/11KV, 10/ 13.33 MVA, 11KV TRANSFORMER INCOMING CUBICLES**			
79.0	**Over Current and Earth Fault protection with IDMT & Instantaneous features**			
	Manufacturer's Name **(To be mentioned only one within scope)**		ABB- (Sweden/ Finland) /Siemens – Germany (except 7SR series) / Schneider- (France/ UK / Finland)/ GE (UK/France /Canada)	
	Manufacture's model no.	-	To be mentioned	
	Type of relay	-	Numerical programmable with directional, arc fault and all necessary features (IED)	
	Range of timing settings at 10-time CT rating	Sec	To be mentioned	
	Burden of relay at 10-time CT rating	VA	To be mentioned	
	Percentage of current setting at which relay will reset	%	To be mentioned	

Sl. No.	Description	Unit	WZPDCL's Requirement	Manufacturer's Guaranteed Particulars
	Reset time after removal of 10-time CT rated current for: a) Phase element (100%) b) E/F element (40%)	 Sec Sec	 To be mentioned To be mentioned	
	Communication Facilities		SCADA Supported	
	Communication Standard		IEC-61850 with FO-LC Port	
	Features: 16 BI, 11 BO, Mimic Display, and others as per section-7 of technical specification.		Yes	
80	**Trip Circuit Supervision (TCS) Relay (Separate Relay for each trip coil)**			
	Manufacture's Name		Shall be mentioned	
	Country of Origin		Shall be mentioned	
	Manufacture's Model no.		Shall be mentioned	
	Type of Relay		Shall be mentioned	
81	**Trip Relay (Separate Relay)**			
	Manufacture's Name		Shall be mentioned	
	Country of Origin		Shall be mentioned	
	Manufacture's Model no.		Shall be mentioned	
	Type of Relay		Shall be mentioned	
	Operating Time		< 10 ms	
	Operating Coil Voltage- 110V DC		Yes	
	All O/C, E/F protection Hand & Electrical reset type.		Yes	
82	**Control Switch**			
	Manufacture's Name		Shall be mentioned	
	Country of Origin		Shall be mentioned	
	Manufacture's Model no.		Shall be mentioned	
	Separate TNC/Discrepancy switch and Local Remote (L/R) selector switch		Yes	
83	**Annunciator (16 Windows)**			
	Manufacture's Name		Shall be mentioned	
	Country of Origin		Shall be mentioned	
	Manufacture's Model no.		Shall be mentioned	
	Windows		16 nos	
	Built in buzzer and buttons for accept, mute, test, reset, etc.		Yes	
B	**11KV Bus Cubicles**			
84.0	**Over Current and Earth Fault protection with IDMT & Instantaneous features**			
	Manufacturer's Name **(To be mentioned only one within scope)**		ABB- (Sweden/ Finland) /Siemens – Germany (except 7SR series) / Schneider- (France/ UK / Finland)/ GE (UK/France /Canada)	
	Manufacture's model no.	-	To be mentioned	

Sl. No.	Description	Unit	WZPDCL's Requirement	Manufacturer's Guaranteed Particulars
	Type of relay	-	Numerical programmable (IED)	
	Range of current setting: a) Phase element b) Earth fault element	% of CT rating	 To be mentioned To be mentioned	
	Range of timing settings at 10-time CT rating	Sec	To be mentioned	
	Burden of relay at 10-time CT rating	VA	To be mentioned	
	Percentage of current setting at which relay will reset	%	To be mentioned	
	Reset time after removal of 10-time CT rated current for: a) Phase element (100%) b) E/F element (40%)	 Sec Sec	 To be mentioned To be mentioned	
	Communication Facilities		SCADA Supported	
	Communication Standard		IEC-61850 with FO-LC Port	
	Features: 16 BI, 11 BO, Mimic Display, and others as per section-7 of technical specification.		Yes	
85	**Trip Circuit Supervision (TCS) Relay (Separate Relay for each trip coil)**			
	Manufacture's Name		Shall be mentioned	
	Country of Origin		Shall be mentioned	
	Manufacture's Model no.		Shall be mentioned	
	Type of Relay		Shall be mentioned	
86	**Trip Relay (Separate Relay)**			
	Manufacture's Name		Shall be mentioned	
	Country of Origin		Shall be mentioned	
	Manufacture's Model no.		Shall be mentioned	
	Type of Relay		Shall be mentioned	
	Operating Time		< 10 ms	
	Operating Coil Voltage- 110V DC		Yes	
	All O/C, E/F protection Hand & Electrical reset type.		Yes	
87	**Control Switch**			
	Manufacture's Name		Shall be mentioned	
	Country of Origin		Shall be mentioned	
	Manufacture's Model no.		Shall be mentioned	
	Separate TNC/Discrepancy switch and Local Remote (L/R) selector switch		Yes	
88	**Annunciator**			
	Manufacture's Name		Shall be mentioned	
	Country of Origin		Shall be mentioned	
	Manufacture's Model no.		Shall be mentioned	
	Windows		12 nos	
	Built in buzzer and buttons for accept, mute, test, reset, etc.		Yes	
C	**11KV Outgoing Feeder Cubicles**			
89	**Over Current and Earth Fault protection with IDMT & Instantaneous features**			

Sl. No.	Description	Unit	WZPDCL's Requirement	Manufacturer's Guaranteed Particulars
	Manufacture's name & country of relay	-	Siemens (Germany) / ABB (Switzerland/ Sweden/Finland)/ Schneider Electric (Uk/ France)/ GE (UK/France/ Canada)/ Alstom (Uk/ France)	
	Manufacture's model no.	-	To be mentioned	
	Type of relay	-	Numerical programmable (IED)	
	Range of current setting: a) Phase element b) Earth fault element	% of CT rating	 To be mentioned To be mentioned	
	Range of timing settings at 10-time CT rating	Sec	To be mentioned	
	Burden of relay at 10-time CT rating	VA	To be mentioned	
	Percentage of current setting at which relay will reset	%	To be mentioned	
	Reset time after removal of 10-time CT rated current for: a) Phase element (100%) b) E/F element (40%)	 Sec Sec	 To be mentioned To be mentioned	
	Communication Facilities		SCADA Supported	
	Communication Standard		IEC-61850 with FO-LC Port	
	Features: 16 BI, 11 BO, Mimic Display, and others as per section-7 of technical specification.		Yes	
90	**Trip Circuit Supervision (TCS) Relay (Separate Relay for each trip coil)**			
	Manufacture's Name		Shall be mentioned	
	Country of Origin		Shall be mentioned	
	Manufacture's Model no.		Shall be mentioned	
	Type of Relay		Shall be mentioned	
91	**Trip Relay (Separate Relay)**			
	Manufacture's Name		Shall be mentioned	
	Country of Origin		Shall be mentioned	
	Manufacture's Model no.		Shall be mentioned	
	Type of Relay		Shall be mentioned	
	Operating Time		< 10 ms	
	Operating Coil Voltage- 110V DC		Yes	
	All O/C, E/F protection Hand & Electrical reset type.		Yes	
92	**Control Switch**			
	Manufacture's Name		Shall be mentioned	
	Country of Origin		Shall be mentioned	
	Manufacture's Model no.		Shall be mentioned	
	Separate TNC/Discrepancy switch and Local Remote (L/R) selector switch		Yes	
93	**Annunciator**			

Sl. No.	Description	Unit	WZPDCL's Requirement	Manufacturer's Guaranteed Particulars
	Manufacture's Name		Shall be mentioned	
	Country of Origin		Shall be mentioned	
	Manufacture's Model no.		Shall be mentioned	
	Windows		12 nos	
	Built in buzzer and buttons for accept, mute, test, reset, etc.		Yes	
D	**METERING AND INDICATION FOR 33/11KV, 10/13.33 MVA TRANSFORMER 11KV INCOMING AND 11KV OUTGOING FEEDER**			
94	KWh Meter			
	Manufacture's Name & Country	-	Siemens (Germany)/ ABB (Switzerland /Finland) AEG(Germany)/ Itron(USA) /Elster(USA/ Romania) /Landis+gyr, (Switzerland)/ Toshiba (Japan)/ Honeywell (USA)/ CEWE, UK	
	Manufacture's Model no.	-	To be mentioned	
	Type of meter	-	Numerical Programmable Multifunction	
	Class of accuracy	-	0.2S	
95	**INDICATION AMMETERS**			
	Manufacturer's Name and Country	-	To be mentioned	
	Manufacture's Model no.	-	To be mentioned	
	Type of meter	-	Analogue/ Digital	
	Class of Accuracy	-	1	
96	**VOLTMETER WITH SELECTOR SWITCH**			
	Manufacturer's Name and Country		To be mentioned	
	Manufacture's Model no.		To be mentioned	
	Type of meter		Analogue / Digital	
	Class of Accuracy		1.0	
	Only for 11 KV incomer PCM Panels.		Yes	
97	**Multifunctional meter**			
	Manufacturer's Name and Country	-		
	Manufacture's Model no.	-		
	Type of Meter	-	Digital, Import/Export	
	Parameters: capable of measuring and displaying MW, MVAR, PF, V, I, f, Φ etc.		Yes	
	Class of Accuracy		1.0	
98	**Capacitive Voltage Divider (CVD) based Live Line Indicator (LLI) for each panel**		Yes	

Sl. No.	Description	Unit	WZPDCL's Requirement	Manufacturer's Guaranteed Particulars
99	The Switchgear and PCM Panel Shall be complied all the technical specification mentioned in Section-7		Yes	

Manufacturer Seal and signature **Tenderers Seal and signature**

8.16 GUARANTEED TECHNICAL PARTICULARS OF 110V 3 X 5(6) A, 3-PHASE 4-WIRE, 3-ELEMENT, SOLID STATE INDOOR TYPE MULTI TARIFF PROGRAMMABLE METER

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, otherwise the bid shall be rejected.)

Sl No	Description	Unit	EMPLOYER'S Requirement	Manufacturer's Guaranteed Particulars
01	Reference standard		Relevant ANSI /IEC standard	
02	Manufacturer's name & address		Siemens (Germany/ Switzerland)/ ABB (Switzerland) /Finland AEG (Germany)/ Itron(USA) /Elster (USA/Romania) /Landis +gyr, (Switzerland/Greece)/ Toshiba (Japan)/ Honeywell (USA)/ CEWE, UK	
03	Manufacturer's type & model		To be mentioned	
04	Construction / Connection		3-phase, 4-wire solidly grounded neutral	
05	Installation		Indoor Installation in A socket [for socket type]	
06	Number of elements		3	
07	Rated voltage	Volt	110	
08	Minimum Biasing Voltage	Volt	40	
09	Variation of frequency	%	±2	
10	Variation of voltage	%	+10, -20	
11	Accuracy class		0.2S (point two)	
12	Rated current I) Basic current II) Maximum current	 A A	 5A 6A	
13	Register type		LCD Display	
14	Number of digit (integer)	Nos.	7 with 1 (Programmable)	
15	Starting current	mA	0.1% of Nominal Current	
16	Losses at nominal load	Watt & VA	To be mentioned	
17	Meter constant	Imp. / KWh.	To be mentioned	
18	Integration period Resetting period Cumulative MD transfer cycle timing device		30 (thirty) minutes 1 (one) month Built-in Built-in	
19	Size of the digit of display	W x H in mm	4 X 8	
20	No. of terminal	Nos.	10 (Minimum)	

Sl No	Description	Unit	EMPLOYER'S Requirement	Manufacturer's Guaranteed Particulars
21	Type of Socket/enclosure and Country of origin		To be mentioned	
22	Battery service life and Shelf life	Year	10(Ten) & 15 (fifteen)	
23	Year of manufacture		To be mentioned	
24	List of recommended spare parts (If any)		To be mentioned	
25	Warranty	Year	3 (Three)	
26	Meter Service life (minimum)	Year	15 (fifteen)	
27	Weight of meter	Kg	To be mentioned	
28	Dimensions	mm x mm x mm	To be mentioned	
29	Outlines, drawings & leaflets		To be mentioned	
30	Performance curve for balanced & unbalanced load		To be mentioned	
31	Meter sealing condition		Hermetically or Ultrasonic welded	
32	a) Country of origin b) Place of manufacture c) Place of testing		To be mentioned	
33	Memory storage		Shall To be mentioned by putting Yes / No	
	i) Equipment identification code.			
	ii) Security code			
	iii) Access code			
	iv) Number of power interruption with date & time			
	v) Latest power failure time & date			
	vi) Event log.			
	vii) Cumulative KWh, KVarh (Q_1+Q_4) reading			
	viii) Load Profile with 30 min interval at least 90 days for:			
	KWh, kVarh (Q_1+Q_4)			
	Phase voltage or Vh			
	Phase amps or Ah			
34	Communication Facilities		RE, RS 232, RS 485, RJ45, DLMS/ COSEM, GSM-GPRS and Modbus or IEC 61850.	
35	GSM-GPRS Modem		Yes	

Seal & Signature of the manufacturer: **Seal & Signature of the Tenderer:**

8.17 MANUFACTURER'S GUARANTEED TECHNICAL DATA SCHEDULE FOR 11KV INDOOR TYPE SINGLE PHASE CURRENT TRANSFORMER

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, **otherwise the bid shall be rejected.)**

Sl. No.	Description	Unit	WZPDCL's Requirement	Manufacturer's guaranteed Particulars
	FOR PROTECTION & METERING:			
1	Manufacturer's name & country	-	To be mentioned	
2	Manufacturer's model no.	-	To be mentioned	
	Application	-	Metering & Protection	
3	Installation	-	Indoor	
4	Mounting	-	On transformer incoming pane / separate PT panel	
5	Primary Rated Voltage (Phase to Phase)	kV	11	
6	Maximum System Voltage (Phase to Phase)	kV	12	
7	Basic Insulation Level (1.2/50 Micro-sec.)	kV	75	
8	Power Frequency Withstand Voltage (1 Min. 50 Hz).	kV	28	
	Ratio:			
	Ratio for Outgoing feeder:		200-400/5-5A	
	Ratio for Power Transformer incomer & Bus Coupler:		900-1800/5-5A	
10	Type of Winding:			
	a) Primary	-	Single Winding	
	b) Secondary	-	Double (1 protection & 1 measuring)	
11	Rated output for Incoming panel			
	a) for measurement	VA	30	
	b) for Protection	VA	30	
12	Rated output for outgoing panel			
	a) for measurement	VA	30	
	b) for Protection	VA	30	
13	Accuracy class			
	a) for measurement	-	0.2S	
	b) for Protection - 11kV Transformer Incomer - 11kV Outgoing/ transformer feeder	 - -	 5P20 5P20	
14	Rated short time thermal current, for 3 sec.	KA	25	
15	Rate accuracy limit factor	-	To be mentioned	
16	RCT at 75° C For Measuring Core For Protection Core	 mΩ mΩ	 To be mentioned To be mentioned	
17	Knee point voltage For Measuring Core For Protection Core	 V V	 To be mentioned To be mentioned	
18	Extended Current Rating (% of rated current)	%	120	
19.	Major insulation	-	Epoxy resin	

20	Name of relevant IEC Standards to be followed for Design, Manufacture, Testing and Performance.	-	To be mentioned	
21	Creepage Distance		Shall be mentioned	

Seal & Signature of the Manufacturer **Seal & Signature of the Tenderer**

8.18 MANUFACTURER'S GUARANTEED TECHNICAL DATA SCHEDULE FOR 11KV INDOOR TYPE SINGLE PHASE POTENTIAL TRANSFORMER

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, otherwise the bid shall be rejected.)

Sl. No.	Description	Unit	WZPDCL's Requirement	Manufacturer's Guaranteed Particulars
1.	Manufacturer's Name and country	-	To be mentioned	
2.	Manufacturer's Model no.	-	To be mentioned	
3.	Type	-	Induction type	
4.	Ratio	V	11000/√3:110/√3: 110/√3	
5.	Rated Burden:			
	a) for measurement	VA	30	
	b) for Protection	VA	30	
6.	Class of accuracy:			
	a) for measurement	VA	0.2	
	b) for Protection	VA	3P	
7.	No. of phase	no.	Single phase	
8.	No. of secondary winding	nos.	To be mentioned	
9.	Creepage distance (min)	mm/KV	25	
10.	Total weight	Kg	To be mentioned	
11.	Insulation	-	Epoxy resin	
12.	Name of relevant IEC Standards to be followed for Design, Manufacture, Testing and Performance.	-	To be mentioned	

Seal & Signature of the Manufacturer

8.19 GUARANTEED TECHNICAL PARTICULARS OF 33KV, 1-CORE, 500 mm^2 UNDERGROUND XLPE COPPER CABLE

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, **otherwise the bid shall be rejected.)**

Sl. No	DESCRIPTION	UNIT	WZPDCL REQUIREMENT	TENDERER'S GUARANTEED VALUES
1	Name & address of the Manufacturer		To be mentioned	
2	Type/Model of the offered Cable		To be mentioned	
3	Standards		Performance, Design and testing shall be in accordance to the IEC, BS, BDS or equivalent international standards	
4	Nominal System Voltage	KV	33	
5	Rated voltage of Cable	KV	18/30 (36)	
6	Process of manufacturing		VCV/CCV	
7	Number of core and Cross-Sectional area of conductor cores	Sq.mm	1C x 500	
8	Conductor materials		Copper	
9	Number of strands	Nos	To be mentioned	
11	Diameter of each strand	mm	To be mentioned	
12	Shape of conductor		Compacted Circular	
13	Type of non-metallic conductor screen		Semi-conducting	
14	Thickness of semi-conducting conductor screen	mm	≤ 0.7	
15	Nominal diameter of Al wire Armour	mm	≥ 2.5	
16	Average thickness of insulation	mm	≥ 8.00	
17	Process of curing		Dry process	
18	Material of Insulation		Cross-Linked Poly-ethylene (XLPE)	
19	Type of non-metallic insulating screen		Semi-conducting	
20	Thickness of semi-conducting Insulation screen	mm	≥ 0.7	
21	Number and diameter of copper Screen strands	No/ mm	To be mentioned (Based on design calculation)	
22	Composition of filler		PVC	
23	Composition of bedding		Extruded PVC	
24	Thickness of bedding	mm	To be mentioned (Based on design calculation)	
25	Number & diameter of amour wire or Thickness of corrugated aluminum sheath	No./ mm Or mm	To be mentioned (Based on design calculation)	
26	Average thickness of MDPE over sheath	mm	To be mentioned (Based on design calculation)	
27	Nominal diameter of complete cable	mm	To be mentioned (Based on design calculation)	

28	Nominal weight per meter of Complete cable	Kg/m	To be mentioned (Based on design calculation)	
29	Minimum radius of bend round which cable can be laid	mm	To be mentioned (Based on design calculation)	
30	Maximum D.C. resistance of Conductor per kilometer at 20° C	Ohm/km	0.0366	
31	Maximum A.C. resistance of Conductor per meter at a maximum conductor temperature of 90° C	Ohm/m	To be mentioned (Based on design calculation)	
32	Reactance per kilometer of cable at 50 Hz	ohm/Km	0.102	
33	Maximum Star capacitance per kilometer of cable at 50 Hz	µF/Km	0.628	
34	Charging current per conductor per meter at 18000/30000 Volts, 50 Hz	mA	To be mentioned (Based on design calculation)	
35	Maximum current carrying capacity of conductor in ground	A	To be mentioned (Based on design calculation)	
36	Maximum conductor temperature under continuous loading	°C	To be mentioned (Based on design calculation)	
37	Short- circuit withstand capacity of the cable for 1 sec. duration	kA	71.54	
38	Conductor temperature at the end of short circuit.	° C	250	
39	Metallic Screen short circuit withstand capacity for 1 second	kA	25 (with detail calculation)	
40	Cable resistance & reactance:			
	a) For positive sequence	Ohm/km	To be mentioned (Based on design calculation)	
	b) Negative sequence	Ohm/km	To be mentioned (Based on design calculation)	
	c) Zero sequence	Ohm/km	To be mentioned (Based on design calculation)	

Seal & Signature of the Manufacturer **Seal & Signature of the Tenderer**

8.19.1 GUARANTEED TECHNICAL PARTICULARS OF 33KV XLPE, 1-CORE, 500 mm^2 COPPER CABLE ACCESSORIES

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, **otherwise the bid shall be rejected.)**

S No.	Description of Items	EMPLOYER'S Requirement	Manufacturers Particulars
1	**Indoor Termination Kits for 33 KV XLPE, 1-Core, 500 $mm^{2\ Copper}$ cable**		
	Name & address of	Shall be	
	Type/model of the	Shall be	
		For 33 KV, 1-core, XLPE 500 ^{2} Copper Conductors	
		For Indoor installation in	
		33 KV, effectively earthed	
	Cable	500 mm^2 1- core Copper Conductors	
	Kit	- Heat shrinkable high voltage - Heat shrinkable stress control - Stress relieving mastic - Truck resistant sealant - Cable preparation - Solderless earth connection - Compression lugs for 500 mm^2 - Installation	
2	**Outdoor Termination Kits for 33 KV XLPE, 1-Core, 500mm^2 Copper Cable**		
	Name and address of	Shall be	
	Type/model of the	Shall be	
		For 33KV, 1-Core, XLPE 500 ^{2} Copper Conductors	
		For Outdoor installation	
		33 KV, effectively earthed	
	Cable	500 mm^2 1-core Copper	
	Kit	- Heat shrinkable high voltage and - Heat shrinkable stress control - Stress relieving mastic - Truck resistant sealant - Heat shrinkable truck resistant rain - Support insulator - Cable preparation - Solder less earth connection - Compression lugs for 500 - Support insulators Tee	
3	**Straight-through joint box for 33 KV XLPE, 1-Core, 500mm^2 Copper cable**		
	Name & address of	Shall be	
	Type/model of the	Shall be	

S No.	Description of Items	EMPLOYER'S Requirement	Manufacturers Particulars
		For 33 KV, 1-core, XLPE 500 ^{2} Copper Conductors	
		For underground	
		33 KV, effectively earthed	
	Cable	500 mm^2 1-core	
		The joint shall be proof Ingress of moisture and	
	Kit	- Compression - Valid filling - Heat shrinkable stress - Truck resistant sealant - Heat shrinkable insulating - Heat shrinkable black/red dual - Roll - Heat shrinkable outer jacket - Cable preparation - Solderless earth connection - Misc. other - Installation	

Seal & Signature of the Manufacturer **Seal & Signature of the Tenderer**

8.20 GUARANTEED TECHNICAL PARTICULARS OF 11KV, 1-CORE, 300 mm² UNDERGROUND XLPE COPPER CABLE

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, **otherwise the bid shall be rejected.)**

Sl. No	DESCRIPTION	UNIT	WZPDCL REQUIREMENT	TENDERER'S GUARANTEED VALUES
1	Name & address of the Manufacturer		To be mentioned	
2	Type/Model of the offered Cable		To be mentioned	
3	Standards		Performance, Design and testing shall be in accordance to the IEC, BS, BDS or equivalent international standards	
4	Nominal System Voltage	KV	11	
5	Rated voltage of Cable	KV	6/10 (12)	
6	Process of manufacturing		VCV/CCV	
7	Number of core and Cross-Sectional area of conductor cores	Sq.mm	1C x 300	
8	Conductor materials		Copper	
9	Number of strands	Nos	To be mentioned	
11	Diameter of each strand	mm	To be mentioned	
12	Shape of conductor		Compacted Circular	
13	Type of non-metallic conductor screen		Semi-conducting	
14	Thickness of semi-conducting conductor screen	mm	≥ 0.7	
15	Nominal diameter of Al wire Armour	mm	≥ 2.0	
16	Average thickness of insulation	mm	≥ 3.4	
17	Process of curing		Dry process	
18	Material of Insulation		Cross-Linked Poly-ethylene (XLPE)	
19	Type of non-metallic insulating screen		Semi-conducting	
20	Thickness of semi-conducting Insulation screen	mm	≥ 0.7	
21	Number and diameter of copper Screen strands	No/ mm	To be mentioned (Based on design calculation)	
22	Composition of filler		PVC	
23	Composition of bedding		Extruded PVC	
24	Thickness of bedding	mm	To be mentioned (Based on design calculation)	
25	Number & diameter of amour wire or Thickness of corrugated aluminum sheath	No./ mm Or mm	To be mentioned (Based on design calculation)	
26	Average thickness of MDPE over sheath	mm	To be mentioned (Based on design calculation)	
27	Nominal diameter of complete cable	mm	To be mentioned (Based on design calculation)	
28	Nominal weight per meter of Complete cable	Kg/m	To be mentioned (Based on design calculation)	

29	Minimum radius of bend round which cable can be laid	mm	To be mentioned (Based on design calculation)	
30	Maximum D.C. resistance of Conductor per kilometer at 20° C	Ohm/km	<.0601	
31	Maximum A.C. resistance of Conductor per meter at a maximum conductor temperature of 90° C	Ohm/m	To be mentioned (Based on design calculation)	
32	Inductance per kilometer of cable at 50 Hz	mH/Km	0.336	
33	Star capacitance per meter of cable at 50 Hz	mF/km	Approximate 0.50	
34	Charging current per conductor per meter at 18000/30000 Volts, 50 Hz	mA	To be mentioned (Based on design calculation)	
35	Maximum current carrying capacity of conductor in ground	A	To be mentioned (Based on design calculation)	
36	Maximum conductor temperature under continuous loading	°C	To be mentioned (Based on design calculation)	
37	Short- circuit withstand capacity of the cable for 1 sec. duration	kA	42.92	
38	Conductor temperature at the end of short circuit.	° C	250	
39	Metallic Screen short circuit withstand capacity for 1 second	kA	25 (with detail calculation)	
40	Cable resistance & reactance:			
	a) For positive sequence	Ohm/km	To be mentioned (Based on design calculation)	
	b) Negative sequence	Ohm/km	To be mentioned (Based on design calculation)	
	c) Zero sequence	Ohm/km	To be mentioned (Based on design calculation)	

Seal & Signature of the Manufacturer **Seal & Signature of the Tenderer**

8.20.1 GUARANTEED TECHNICAL PARTICULARS OF 11KV XLPE, 1-CORE, 300 mm^2 COPPER CABLE ACCESSORIES

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, **otherwise the bid shall be rejected.)**

S No.	Description of Items	EMPLOYER'S Requirement	Manufacturers Particulars
1	**Indoor Termination Kits for 11 KV XLPE, 1-Core, 300 sq. mm Copper cable**		
	Name & address of	Shall be	
	Type/model of the	Shall be	
		For 11 KV, 1-core, XLPE 300 mm^2 Copper Conductors	
		For Indoor installation in	
		11 KV, effectively earthed	
	Cable	300 mm^2 1- core Copper Conductors	
	Kit	- Heat shrinkable high voltage - Heat shrinkable stress control - Stress relieving mastic - Truck resistant sealant - Cable preparation - Solderless earth connection - Compression lugs for 300 mm^2 - Installation	
2	**Outdoor Termination Kits for 11KV XLPE, 1-Core, 300mm^2 Copper Cable**		
	Name and address of	Shall be	
	Type/model of the	Shall be	
		For 11KV, 1-Core, XLPE 300 mm^2 Copper Conductors	
		For Outdoor installation	
		11KV, effectively earthed	
	Cable	300 mm^2 1-core Copper	
	Kit	- Heat shrinkable high voltage and - Heat shrinkable stress control - Stress relieving mastic - Truck resistant sealant - Heat shrinkable truck resistant rain - Support insulator - Cable preparation - Solder less earth connection - Compression lugs for 300 - Support insulators Tee	
3	**Straight-through joint box for 11KV XLPE, 1-Core, 300mm^2 Copper cable**		
	Name & address of	Shall be	
	Type/model of the	Shall be	

S No.	Description of Items	EMPLOYER'S Requirement	Manufacturers Particulars
		For 11KV, 1-core, XLPE 300 mm^2 Copper Conductors	
		For underground	
		11KV, effectively earthed	
	Cable	300 mm^2 1-core	
		The joint shall be proof Ingress of moisture and	
	Kit	- Compression - Valid filling - Heat shrinkable stress - Truck resistant sealant - Heat shrinkable insulating - Heat shrinkable black/red dual - Estomeric - Roll - Heat shrinkable outer jacket - Cable preparation - Solderless earth connection - Misc. other - Installation	

Seal & Signature of the Manufacturer **Seal & Signature of the Tende**

8.21 GUARANTEED TECHNICAL PARTICULARS OF 11KV, XLPE, 3CX 185MM^2 COPPER CABLE

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, **otherwise the bid shall be rejected.)**

Sl No	DESCRIPTION	UNIT	EMPLOYER'S REQUIREMENT	TENDERER'S GUARANTEED VALUES
	Name & address of		To be	
	Type/Model of the offered		To be	
	System			
	Rated Voltage of		6/10	
	Process of			
	Number of core and area of conductor		3C x 185	
	Conductor			
	Shape of			
	Type of conductor			
	Thickness of semi			
	Average thickness of insulation			
	Process of		Dry	
	Material of		Cross Poly ethylene	
	Type of non-metallic			
	Thickness of Insulation		0.7	
	Number & diameter of Screen		To be mentioned (Based on design calculation)	
	Composition of			
	Composition of		Extruded	
	Thickness of		To be mentioned (Based on design calculation)	
	Number & diameter of armour		To be	
	Average thickness of PV C		To be mentioned (Based on design calculation)	
	Nominal diameter of		To be mentioned (Based on design calculation)	
	Nominal weight per meter complete		To be mentioned (Based on design calculation)	
	Minimum radius of bend which cable can be		To be mentioned (Based on design calculation)	
	Maximum D.C. resistance Conductor per meter at		To be mentioned (Based on design calculation)	
	Maximum A.C. resistance Conductor per meter at a maximum conductor		To be mentioned (Based on design calculation)	
	Star reactance per meter of at		To be mentioned (Based on design calculation)	
	Star capacitance per meter cable at		To be mentioned (Based on design calculation)	

Sl No	DESCRIPTION	UNIT	EMPLOYER'S REQUIREMENT	TENDERER'S GUARANTEED VALUES
	Charging current per per meter at		To be mentioned (Based on design calculation)	
	Maximum current capacity of conductor in		To be mentioned (Based on design calculation)	
	Maximum conductor under continuous		To be mentioned (Based on design calculation)	
	Short-circuit capacity of the for 1 sec.		26.50	
	Conductor temperature at the of short			
	Metallic Screen short-circuit		25 (with detail calculation)	
	Cable resistance &			
	a) positive		To be mentioned (Based on design calculation)	
	b) negative		To be mentioned (Based on design calculation)	
	c) zero		To be mentioned (Based on design calculation)	

Seal & Signature of the Manufacturer **Seal & Signature of the Tenderer**

8.21.1 GUARANTEED TECHNICAL PARTICULARS OF 11 KV XLPE, 3-CORE, 185 MM^2 COPPER CABLE ACCESSORIES

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, **otherwise the bid shall be rejected.)**

Sl No	DESCRIPTION	EMPLOYER'S REQUIREMENT	TENDERER'S GUARANTEED VALUES
1	**Indoor Termination Kits for 11 KVXLPE, 3-Core, 185mm^2 Copper Cable**		
	Name and address of	Shall be	
	Type/model of the	Shall be	
		For 11KV, 3-core, XLPE mm^2 Copper Conductors	
		For Indoor installation switchgear	
		11KV, effectively	
	Cable	185 mm^2 Copper	
	Kit	- Heat shrinkable high Insulating and - Heat shrinkable tubing - Stress relieving mastic - Truck resistant sealant - Cable preparation - Solderless earth connection - Compression lugs for mm^2 Copper - Installation	
2	**OutdoorTerminationKitsfor11KVXLPE,3-Core,185mm^2 Copper Cable**		
	Name and address of	Shall be	
	Type/model of the	Shall be	
		For 11KV, 3-core, XLPE mm^2 Copper	
		For outdoor installation	
		11KV, effectively	
	Cable	185 mm^2 Copper	
	Kit	- Heat shrinkable high Insulating and - Heat shrinkable tubing - Stress relieving mastic - Truck resistant sealant - Heat shrinkable truck rain skirt - Support - Cable preparation - Solderless earth connection - Compression lugs for mm^2 Copper - Support insulators Tee - Installation	
3	**Straight-through joint box for 11 KV XLPE, 3-Core, 185 mm^2 Copper cable**		
	Name and address of	Shall be	

Sl No	DESCRIPTION	EMPLOYER'S REQUIREMENT	TENDERER'S GUARANTEED VALUES
	Type/model of the	Shall be	
		For 11KV, 3-core, XLPE Copper	
		For underground	
		11 KV, effectively	
	Cable	185 mm^2 Copper	
		The joint shall be proof ingress of moisture and	
	Kit	- Compression - Valid filling - Heat shrinkable tubing - Truck resistant sealant - Heat shrinkable high insulating - Heat shrinkable black/red - Estomeric - Roll - Heat shrinkable outer jacket - Cable preparation - Solder less earth connection - Misc. other - Installation	

Seal and Signature of the manufacturer: **Seal and Signature of the Tenderer:**

8.22 Guaranteed Technical Particulars for Single-Core, 120 mm² PVC Insulated and PVC Sheathed Copper Cable for grounding system

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, **otherwise the bid shall be rejected.)**

Sl. No.	Description	Unit	Purchaser's Requirement	Manufacturer's Particulars
1	Name of the Item		sq. PVC [redacted] PVC [redacted] Sheathed Cables	
2	Name of the Manufacturer		Shall be mentioned	
3	Address of the Manufacturer		Shall be mentioned	
4	Standard		Performance Design and Testing shall be in accordance to the BS, IEC, BDS or equivalent International standards.	
5	Cable Size	mm^2	1CX120	
6	Material		PVC Insulated and PVC Sheathed plain annealed copper.	
7	Numbers & Diameter of wires	Mm	37/2.033	
8	Maximum resistance at 30 deg. C	ohm/KM	0.153	
9	Nominal thickness of insulation	Mm	1.6	
10	Nominal thickness of sheath	Mm	1.8	
11	Color of sheath		Black	
12	Approximate outer diameter	Mm	21.6	
13	Approximate weight	Kg/KM	1340	
14	Continuous permissible service voltage	V	600/1000	
15	Current rating at 30 deg. C ambient temperature U/G	Amps	310	
16	Current rating at 35 deg. C ambient in air	Amps	350	
17	Drum wound length	M	500	
18	Net Weight	Kg	Shall be mentioned	
19	Gross weight	Kg	Shall be mentioned	
20	Treated Wooden Drum Standard		AWPA C_1 – 82, C_2 –83, C_{16} –82, P_5 –83.	

Seal & Signature of the Manufacturer **Seal & Signature of the Tenderer**

8.23 GUARANTEED TECHNICAL PARTICULARS OF SINGLE-CORE, 1Cx95 mm² PVC INSULATED AND PVC SHEATHED COPPER CABLE

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, **otherwise the bid shall be rejected.)**

Sl. No.	Description	Unit	Purchaser's Requirement	Manufacturer's Particulars
1	Name of the Item		3C x 95 sq. mm PVC Insulated and PVC Sheathed Cables	
2	Name of the Manufacturer		Shall be mentioned	
3	Address of the Manufacturer		Shall be mentioned	
4	Standard		Performance Design and Testing shall be in accordance to the BS, IEC, BDS or equivalent International standards.	
5	Cable Size	mm^2	3C x 95	
6	Material		PVC Insulated and PVC Sheathed plain annealed copper.	
7	Numbers & Diameter of wires	mm	19/ 2.524	
8	Maximum resistance at 30° C	Ω/KM	0.1964	
9	Nominal thickness of insulation	mm	1.6	
10	Nominal thickness of sheath	mm	1.8	
11	Colour of sheath		Black	
12	Approximate outer diameter	mm	19.4	
13	Approximate weight	Kg/KM	1129	
14	Continuous permissible service voltage	V	600/1000	
15	Current rating at 30° C ambient temperature U/G	Amps	270	
16	Current rating at 35° C ambient in air	Amps	300	
17	Drum wound length	M	500	
18	Net Weight	Kg	Shall be mentioned	
19	Gross weight	Kg	Shall be mentioned	
20	Treated Wooden Drum Standard		AWPA C_1 – 82, C_2 –83, C_{16} –82, P_5 –83.	

Seal and Signature of the manufacturer: **Seal and Signature of the Tenderer:**

8.24 GUARANTEED TECHNICAL PARTICULARS OF LV Power CABLES (UNARMOURED)

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, **otherwise the bid shall be rejected.)**

To be filled in separately for each size of the unarmoured copper power cable

Sl. No	Description	Unit	EMPLOYER's Requirement	Manufacturer's guaranteed Particulars
1	Name of Manufacturer		To be mentioned	
2	Year of Manufacture		To be mentioned	
3	No of cores		To be mentioned	
4	Cross-section of cores		To be mentioned	
5	No. and diameter of wires		To be mentioned	
6	Shape of conductor		To be mentioned	
7	Material of conductor		To be mentioned	
8	Current carrying capacity		To be mentioned	
9	Insulation thickness and material		To be mentioned	
10	Insulation resistance		To be mentioned	
11	Thickness & material of inner sheath		To be mentioned	
12	Nominal dia over inner sheath		To be mentioned	
13	Conductor resistance		To be mentioned	
14	Colour scheme of cores		To be mentioned	
15	Thickness and material of outer sheath		To be mentioned	
16	Test voltages both A.C. and D.C		To be mentioned	
17	Length of cable per drum length		To be mentioned	
18	Net weight per drum length		To be mentioned	
19	Gross weight per drum		To be mentioned	
20	Current rating factors based on :-		To be mentioned	
	a) Variation in ground temperature		To be mentioned	
	b) Variation in ambient air temperature		To be mentioned	
	c) Groups laid direct in ground in horizontal formation		To be mentioned	
	d) Groups laid direct in ground in tier formation		To be mentioned	
	e) Depth of laying in ground		To be mentioned	
	f) Group laid in covered trenches in horizontal formation		To be mentioned	
21	Standard		To be mentioned	

Seal & Signature of the Manufacturer **Seal & Signature of the Tenderer**

8.25 Guaranteed Technical Particulars for 4CX2.5 sq. mm PVC Insulated and PVC Sheathed Copper Cable

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, **otherwise the bid shall be rejected.)**

Sl. No.	Description	Unit	Purchaser's Requirement	Manufacturer's Particulars
1	Name of the Item		4CX2.5 mm^2 PVC Insulated and PVC Sheathed Copper Cable with Armouring	
2	Name of the Manufacturer		Shall be mentioned	
3	Address of the Manufacturer		Shall be mentioned	
4	Standard		Performance Design and Testing shall be in accordance to the BS, IEC, BDS or equivalent International standards.	
5	Cable Size	mm^2	4CX2.5 mm^2	
6	Material		Plain annealed Copper Cable	
7	Numbers & Diameter of Copper wires	mm	7/0.67	
8	Diameter of Steel wires	mm	1.4	
9	Thickness of Steel Tape	mm	To be mentioned	
10	Maximum resistance at 30 deg.	ohm/KM	7.28	
11	Nominal thickness of insulation	mm	0.8 (min.)	
12	Nominal thickness of sheath	mm	1.8 (min)	
13	Colour of sheath		Black	
14	Colour of Core		Red, Yellow, Blue, Black	
15	Approximate outer diameter	mm	17	
16	Approximate weight	Kg/KM	670	
17	Drum wound length	M	1000	
18	Net Weight	Kg	Shall be mentioned	
19	Gross weight	Kg	Shall be mentioned	
20	Treated Wooden Drum Standard		AWPA C_1 - 82, C_2 -83, C_{16} - 82, P_5 -83.	

Seal & Signature of the Manufacturer **Seal & Signature of the Tenderer**

8.26 Guaranteed Technical Particulars for 4CX6 sq. mm PVC Insulated and PVC Sheathed Copper Cable

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, **otherwise the bid shall be rejected.)**

Sl. No.	Description	Unit	Purchaser's Requirement	Manufacturer's Particulars
1	Name of the Item		4CX6 mm^2 PVC Insulated and PVC Sheathed Copper Cable with Armouring	
2	Name of the Manufacturer		Shall be mentioned	
3	Address of the Manufacturer		Shall be mentioned	
4	Standard		Performance Design and Testing shall be in accordance to the BS, IEC, BDS or equivalent International standards.	
5	Cable Size	mm^2	4CX6 mm^2	
6	Material		Plain annealed Copper Cable	
7	Numbers & Diameter of Copper wires	mm	7/1.04	
8	Numbers & Diameter of Steel	mm	4x0.8	
9	Nominal size of Steel Tape	mm	0.25	
10	Maximum resistance at 30 deg.	ohm/KM	3.20	
11	Nominal thickness of insulation	mm	1.0 (min.)	
12	Nominal thickness of sheath	mm	1.8 (min)	
13	Colour of sheath		Black	
14	Colour of Core		Red, Yellow, Blue, Black	
15	Approximate outer diameter	mm	21	
16	Approximate weight	Kg/KM	920	
17	Drum wound length	M	1000	
18	Net Weight	Kg	Shall be mentioned	
19	Gross weight	Kg	Shall be mentioned	
20	Treated Wooden Drum Standard		AWPA C_1 - 82, C_2 -83, C_{16} - 82, P_5 -83.	

Seal & Signature of the Manufacturer **Seal & Signature of the Tenderer**

8.27 Guaranteed Technical Particulars for 4CX4 sq. mm PVC Insulated and PVC Sheathed Copper Cable

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, **otherwise the bid shall be rejected.)**

Sl. No.	Description	Unit	Purchaser's Requirement	Manufacturer's Particulars
1	Name of the Item		4CX4 mm^2 PVC Insulated and PVC Sheathed Copper Cable with Armouring	
2	Name of the Manufacturer		Shall be mentioned	
3	Address of the Manufacturer		Shall be mentioned	
4	Standard		Performance Design and Testing shall be in accordance to the BS, IEC, BDS or equivalent International standards.	
5	Cable Size	mm^2	4CX4 mm^2	
6	Material		Plain annealed Copper Cable	
7	Numbers & Diameter of Copper wires	mm	7/0.85	
8	Numbers & Diameter of Steel	mm	4x0.8	
9	Nominal size of Steel Tape	mm	0.25	
10	Maximum resistance at 30 deg.	ohm/KM	1.90	
11	Nominal thickness of insulation	mm	1.0 (min.)	
12	Nominal thickness of sheath	mm	1.8 (min)	
13	Colour of sheath		Black	
14	Colour of Core		Red, Yellow, Blue, Black	
15	Approximate outer diameter	mm	20	
16	Approximate weight	Kg/KM	810	
17	Drum wound length	M	1000	
18	Net Weight	Kg	Shall be mentioned	
19	Gross weight	Kg	Shall be mentioned	
20	Treated Wooden Drum Standard		AWPA C_1 - 82, C_2 -83, C_{16} - 82, P_5 -83.	

Seal & Signature of the Manufacturer **Seal & Signature of the Tenderer**

8.28 Guaranteed Technical Particulars for 8CX2.5 sq. mm PVC Insulated and PVC Sheathed Copper Cable

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, **otherwise the bid shall be rejected.)**

Sl. No.	Description	Unit	Purchaser's Requirement	Manufacturer's Particulars
1	Name of the Item		8CX2.5 mm^2 PVC Insulated and PVC Sheathed Copper Cable with Armouring	
2	Name of the Manufacturer		Shall be mentioned	
3	Address of the Manufacturer		Shall be mentioned	
4	Standard		Performance Design and Testing shall be in accordance to the BS, IEC, BDS or equivalent International standards.	
5	Cable Size	mm^2	8CX2.5 mm^2	
6	Material		Plain annealed Copper Cable	
7	Numbers & Diameter of Copper wires	mm	7/0.67	
8	Numbers & Diameter of Steel	mm	4x0.8	
9	Nominal size of Steel Tape	mm	0.25	
10	Maximum resistance at 30 deg.	ohm/KM	1.19	
11	Nominal thickness of insulation	mm	0.8 (min.)	
12	Nominal thickness of sheath	mm	1.8 (min)	
13	Colour of sheath		Black	
14	Colour of Core		Red, Yellow, Blue, Black	
15	Approximate outer diameter	mm	24	
16	Approximate weight	Kg/KM	1140	
17	Drum wound length	M	1000	
18	Net Weight	Kg	Shall be mentioned	
19	Gross weight	Kg	Shall be mentioned	
20	Treated Wooden Drum Standard		AWPA C_1 - 82, C_2 -83, C_{16} - 82, P_5 -83.	

Seal & Signature of the Manufacturer **Seal & Signature of the Tenderer**

8.29 Guaranteed Technical Particulars for 16CX2.5 sq. mm PVC Insulated and PVC Sheathed Copper Cable

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, **otherwise the bid shall be rejected.)**

Sl. No.	Description	Unit	Purchaser's Requirement	Manufacturer's Particulars
1	Name of the Item		16CX2.5 mm^2 PVC Insulated and PVC Sheathed Copper Cable with Accessories	
2	Name of the Manufacturer		Shall be mentioned	
3	Address of the Manufacturer		Shall be mentioned	
4	Standard		Performance Design and Testing shall be in accordance to the BS, IEC, BDS or equivalent International standards.	
5	Cable Size	mm^2	16CX2.5 mm^2	
6	Material		Plain annealed Copper Cable	
7	Numbers & Diameter of Copper wires	mm	7/0.67	
8	Numbers & Diameter of Steel	mm	4x0.8	
9	Nominal size of Steel Tape	mm	0.25	
10	Maximum resistance at 30 deg.	ohm/KM	7.69	
11	Nominal thickness of insulation	mm	0.8 (min.)	
12	Nominal thickness of sheath	mm	1.8 (min)	
13	Colour of sheath		Black	
14	Colour of Core		Red, Yellow, Blue, Black	
15	Approximate outer diameter	mm	25	
16	Approximate weight	Kg/KM	1430	
17	Drum wound length	M	1000	
18	Net Weight	Kg	Shall be mentioned	
19	Gross weight	Kg	Shall be mentioned	
20	Treated Wooden Drum Standard		AWPA C_1 - 82, C_2 -83, C_{16} - 82, P_5 -83.	

Seal & Signature of the Manufacturer **Seal & Signature of the Tenderer**

8.30 Guaranteed Technical Particulars for 24CX2.5 sq. mm PVC Insulated and PVC Sheathed Copper Cable

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, **otherwise the bid shall be rejected.)**

Sl. No.	Description	Unit	Purchaser's Requirement	Manufacturer's Particulars
1	Name of the Item		24CX2.5 mm^2 PVC Insulated and PVC Sheathed Copper Cable with Armouring	
2	Name of the Manufacturer		Shall be mentioned	
3	Address of the Manufacturer		Shall be mentioned	
4	Standard		Performance Design and Testing shall be in accordance to the BS, IEC, BDS or equivalent International standards.	
5	Cable Size	mm^2	24CX2.5 mm^2	
6	Material		Plain annealed Copper Cable	
7	Numbers & Diameter of Copper wires	mm	7/0.67	
8	Numbers & Diameter of Steel wires	mm	4x0.8	
9	Nominal size of Steel Tape	mm	0.25	
10	Maximum resistance at 30 deg. C	Ohm/ KM	7.69	
11	Nominal thickness of insulation	mm	0.8 (min.)	
12	Nominal thickness of sheath	mm	1.8 (min)	
13	Colour of sheath		Black	
14	Colour of Core		Red, Yellow, Blue, Black	
15	Approximate outer diameter	mm	28	
16	Approximate weight	Kg/KM	1730	
17	Drum wound length	M	1000	
18	Net Weight	Kg	Shall be mentioned	
19	Gross weight	Kg	Shall be mentioned	
20	Treated Wooden Drum Standard		AWPA C_1 - 82, C_2 -83, C_{16} -82, P_5 - 83.	

Seal & Signature of the Manufacturer **Seal & Signature of the Tenderer**

8.31 GUARANTEED TECHNICAL PARTICULARS OF 110V SUB-STATION BATTERY SET

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, **otherwise the bid shall be rejected.)**

Sl. No.	Description	Unit	EMPLOYER'S Requirement	Manufacturer's guaranteed Particulars
1.	Manufacturer's name & country	-	To be mentioned	
2.	Manufacturer's model no.	-	To be mentioned	
3.	Type	-	Nickel Cadmium Alkaline (enclosed type)	
4.	Operating Voltage	V DC	110	
5.	Continuous Discharge Current at rate of 10 hour & Final Cell Voltage 1.1 Volt	Amp	10	
6.	Short Time Discharge Current at rate of 2 hour & Final Cell Voltage 1.1 Volt	Amp	50	
7.	Electrolyte type	-	To be mentioned	
8.	Capacity at 5-hour rate	AH	100	
9.	Discharge Voltage	Volt	1.3 Per Cell	
10.	Charging Voltage (Normal)	Volt	1.6 Per Cell	
11.	Number of cells	Nos.	92 nos. + 5 nos. Spare	
12.	Voltage per cell	V	1.2	
13.	Charging Voltage (Maximum)	Volt	1.75 Per Cell	
14.	Normal float charge rate	A	To be mentioned	
15.	Maximum boost charge rate	A	To be mentioned	
16.	Amp hour efficiency at: a) 5-hour rate b) 1-hour rate	 % %	 To be mentioned To be mentioned	
17.	Size of cell	mm	To be mentioned	
18.	Weight of cell and electrolyte	kg	To be mentioned	
19.	Standard	-	As per Latest Edition of applicable IEC-60623	

Seal & Signature of the Manufacturer **Seal & Signature of the Tenderer**

8.32 GUARANTEED TECHNICAL PARTICULARS OF SUB-STATION BATTERY CHARGER

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, **otherwise the bid shall be rejected.)**

Sl. No.	Description	Unit	EMPLOYER'S Requirement	Manufacturer's guaranteed Particulars
1.	Manufacturer's name & country	-	To be mentioned	
2.	Manufacturer's model no.	-	To be mentioned	
3.	Rating	-	To be mentioned	
4.	Rated Input voltage range (3-phase)	V AC	415 V ± 10%	
5.	Rated Frequency	Hz	50Hz	
6.	No of Phase	-	03	
7.	Output voltage range a) normal charge b) Float charge c) boost charge	 V DC V DC V DC	 120 V ± 1% 120 V ± 1% 150 V ± 1%	
8.	Voltage drops at output thru Dropper Diodes during Boost Mode	Yes/ No	Yes	
9.	Normal/ boost charge independent units?	Yes/ No	To be mentioned	
10.	Output current	A	50	
11.	Rated Battery Current	A	20	
12.	Efficiency	%	To be mentioned	
13.	Ripple Voltage	%	3%	
14.	Type of AVR	-	Static	
15.	Installation Break Down Voltage	KV	2 KV for 1 Minute	
16.	Type of rectifier	Thyristor/ SMPS	To be mentioned	
17.	MCCB			
	a) Quantity	Nos.	To be mentioned	
	b) Rating	A	To be mentioned	
18.	Standard	-	As per Latest Edition of applicable IEC-60146	
19	Communication Facilities		SCADA Supported	
20	Communication Standard		IEC-61850	

Seal & Signature of the Manufacturer **Seal & Signature of the Tenderer**

8.33 GUARANTEED TECHNICAL PARTICULARS OF LV AC / DC DISTRIBUTION PANEL

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, **otherwise the bid shall be rejected.)**

Sl No	Description	Unit	EMPLOYER's Requirement	Manufacturer's guaranteed Particulars
DC DISTRIBUTION PANEL				
1	Manufacturer's name & country		To be mentioned	
2	Rated normal current of Bus-bar	A	200	
3	No. and size of fuse circuits	Nos./ A	To be mentioned	
4	Thickness of sheet steel (enclosure)	mm	To be mentioned	
5	Dimension	mm x mm x mm	To be mentioned	
6	Weight	Kg	To be mentioned	
7	MCCB			
	a) Manufacturer's Name and Country		To be mentioned	
	b) Manufacturer's model no.		To be mentioned	
	c) Rated voltage		To be mentioned	
	d) Rated current		To be mentioned	
AC DISTRIBUTION PANEL				
1	Manufacturer's name & country		To be mentioned	
2	Rated normal current of Bus-bar	A	400	
3	No. and size of fused circuits	nos/ A	3	
4	Thickness of sheet steel (enclosure)	mm	4	
5	Dimension	mm x mm x mm	To be mentioned	
6	Weight	Kg	To be mentioned	
7	a) Manufacturer's Name and Country		To be mentioned	
	b) Manufacturer's model no.		To be mentioned	
	c) Rated voltage		To be mentioned	
	d) Rated current		To be mentioned	

Seal & signature of Tenderer **Seal & signature of Manufacturer**

8.34 GUARANTEED TECHNICAL PARTICULARS OF STEEL STRUCTURE DESIGN

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, **otherwise the bid shall be rejected.)**

Sl No	Description	Unit	EMPLOYER's Requirement	Manufacturer's guaranteed Particulars
1	Manufacturer's Name and Country	-	To be mentioned	
2	**Maximum ratio of unsupported length of steel compression to their least radius of gyration:**			
	a) Main members	mm	120	
	b) Bracing's	mm	180	
	c) Redundant	mm	180	
3	B.S. 4360 grade 43A steel or other approved standard:			
	a) Elastic limit stress in tension members	Kg/mm^2	To be mentioned	
	b) Ultimate stress in compression members (expressed as function L/R)	Kg/mm^2	$Sc=F/S[\{1+0.00011x\{(L/R)^2/M\}]$	
4	B.S. 4360 grade 50C steel or other approved standard:			
	a) Elastic limit stress in tension members	Kg/mm^2	To be mentioned	
	b) Ultimate stress in compression members (expressed as function L/R)	Kg/mm^2	$Sc=F/S[\{1+0.000166 x\{(L/R)^2/M\}]$	
5	Formula for calculation of ultimate stress in compression.	-	$SC=F/S[1+\{LE/\pi^2E\}x\{(L/R)^2/M\}]$	
	Where,			
	SC = Ultimate stress in compression	Kg/mm^2	To be mentioned	
	F = Yield strength	Kg	To be mentioned	
	S = Section	mm^2	To be mentioned	
	L/R = Length / Radius of gyration	cm	To be mentioned	
	LE = Elastic limit stress	Mg/mm^2	24 or 36	

Sl No	Description	Unit	EMPLOYER's Requirement	Manufacturer's guaranteed Particulars
	E = Elasticity module	Kg/mm^2	22000	
	M = Rigidity Coefficient at each end	-	To be mentioned	
	M=1 with only one bolt at each end of member	-	To be mentioned	
	M=2 with two bolts at each end of a member	-	To be mentioned	
	M=4 if L/R between 110 and 130	-	To be mentioned	
	M=3 if L/R over to 130	-	To be mentioned	
6	Minimum size of member	mm	45 x 45 x --	
7	Weight of each Column	Kg	To be mentioned	
8	Weight of each Girder	Kg	To be mentioned	
9	Total weight	Kg	To be mentioned	

Seal & signature of Tenderer **Seal & signature of Manufacturer**

8.35 GUARANTEED TECHNICAL PARTICULARS FOR ACSR MARTIN

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, **otherwise the bid shall be rejected.)**

Sl. No	Description	Unit	Purchaser's Requirement	Manufacturer's Particulars
1	Name of the Item		ACSR MARTIN	
2	Name of the Manufacturer		Shall be mentioned	
3	Address of the Manufacturer		Shall be mentioned	
4	Standard		Performance Design and Testing shall be in accordance to the BS, IEC, ASTM, BDS or equivalent International standards.	
5	Installation		Overhead	
6	Type		Stranded	
7	Material		Hard drawn Aluminium steel reinforced	
8	Overall diameter	mm	36.17	
9	Nominal cross-sectional area of conductor	mm^2	772.10	
10	Number/diameter of Aluminium Strand	No./mm	54/4.02	
11	Nominal Aluminium cross sectional area	mm^2	685.40	
12	Number/diameter of Steel Strand	No./mm	19/2.41	
13	Nominal Steel cross sectional area	mm^2	86.70	
14	Weight of conductor	Kg/KM	2590	
15	Drum wound length	M	500	
16	Net weight	Kg	Shall be mentioned	
17	Gross weight	Kg	Shall be mentioned	
18	Maximum DC Resistance of Conductor at 20 °C	Ω/KM	0.0425	
19	Minimum breaking Load of Conductor	Kg	min 11400	
20	Maximum working tension of conductor	KN	Shall be mentioned	
21	Current rating at 35ºC rise over 40ºC ambient temperature (75ºC)	Amps.	Shall be mentioned	
22	Practical (final) modulus of elasticity	hbar	7700	
23	Co-efficient of linear expansion	/ºC	shall be mentioned	
24	Aluminum to Steel Ratio		Shall be mentioned	
25	Lay length for Outermost Layer of Aluminium	mm	Shall be mentioned	
26	Lay direction for Outermost Layer of Aluminium		Right hand	
27	Lay ratio for Outermost Layer of Aluminium		10-14	
28	Treated Wooden Drum Standard		AWPA C_1 – 82, C_2 –83, C_{16} –82, P_5 –83.	

Seal and Signature of the manufacturer: **Seal and Signature of the Tenderer:**

8.36 GUARANTEED TECHNICAL PARTICULARS FOR ACSR GROSBEAK

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, **otherwise the bid shall be rejected.)**

Sl. No	Description	Unit	Purchaser's Requirement	Manufacturer's Particulars
1	Name of the Item		ACSR GROSBEAK	
2	Name of the Manufacturer		Shall be mentioned	
3	Address of the Manufacturer		Shall be mentioned	
4	Standard		Performance Design and Testing shall be in accordance to the BS, IEC, ASTM, BDS or equivalent International standards.	
5	Installation		Overhead	
6	Type		Stranded	
7	Material		Hard drawn Aluminum steel reinforced	
8	Overall diameter	mm	25.15	
9	Nominal cross-sectional area of conductor	mm^2	374.70	
10	Number/diameter of Aluminum Strand	No./mm	26/3.97	
11	Nominal Aluminum cross sectional area	mm^2	321.68	
12	Number/diameter of Steel Strand	No./mm	7/3.09	
13	Nominal Steel cross sectional area	mm^2	53.02	
14	Weight of conductor	Kg/KM	1304	
15	Drum wound length	M	500	
16	Net weight	Kg	Shall be mentioned	
17	Gross weight	Kg	Shall be mentioned	
18	Maximum DC Resistance of Conductor at 20 °C	Ω/KM	0.0900	
19	Minimum breaking Load of Conductor	Kg	11400	
20	Maximum working tension of conductor	KN	Shall be mentioned	
21	Current rating at 35ºC rise over 40ºC ambient temperature (75ºC)	Amps.	538 (min)	
22	Practical (final) modulus of elasticity	hbar	7700	
23	Co-efficient of linear expansion	/ºC	18.9×10^{-6}	
24	Aluminum to Steel Ratio		Shall be mentioned	
25	Lay length for Outermost Layer of Aluminum	mm	Shall be mentioned	
26	Lay direction for Outermost Layer of Aluminum		Right hand	
27	Lay ratio for Outermost Layer of Aluminum		10-14	
28	Treated Wooden Drum Standard		AWPA C_1 – 82, C_2 –83, C_{16} –82, P_5 –83.	

Seal and Signature of the manufacturer: **Seal and Signature of the Tenderer:**

8.37 GUARANTEED TECHNICAL PARTICULARS FOR H-TYPE CONNECTOR

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, **otherwise the bid shall be rejected.)**

Sl. No.	Description	Purchaser's Requirement	Manufacturer's Particulars
Compatible for ACSR MARTIN to ACSR MARTIN			
1.	Name & Address of the Manufacturer	Shall be mentioned	
2.	Manufacturer's Code No.	Shall be mentioned	
3.	Applicable Standard	Design, Testing & Performance shall be in accordance to BS, IEC, BDS, ANSI, ASTM or equivalent international standards.	
4.	Installation	Outdoor and shall be installed for the above-mentioned conductor.	
5.	Type	H-Type	
6.	Material	Aluminum	
7.	Minimum Continuous Current rating at 35ºC rise over 40ºC ambient temperature (75ºC)	Shall be mentioned (As per current rating conductor)	
8.	Length	Shall be mentioned	
9.	Weight of 100 nos. in Kg	Shall be mentioned	

Seal and Signature of the manufacturer: **Seal and Signature of the Tenderer:**

8.38 GUARANTEED TECHNICAL PARTICULARS FOR H-TYPE CONNECTOR

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, **otherwise the bid shall be rejected.)**

Sl. No.	Description	Purchaser's Requirement	Manufacturer's Particulars
Compatible for ACSR GROSBEAK to ACSR GROSBEAK			
1.	Name & Address of the Manufacturer	Shall be mentioned	
2.	Manufacturer's Code No.	Shall be mentioned	
3.	Applicable Standard	Design, Testing & Performance shall be in accordance to BS, IEC, BDS, ANSI, ASTM or equivalent international standards.	
4.	Installation	Outdoor and shall be installed for the above-mentioned conductor.	
5.	Type	H-Type	
6.	Material	Aluminum	
7.	Minimum Continuous Current rating at 35ºC rise over 40ºC ambient temperature (75ºC)	Shall be mentioned (As per current rating conductor)	
8.	Length	Shall be mentioned	
9.	Weight of 100 nos. in Kg	Shall be mentioned	

Seal and Signature of the manufacturer: **Seal and Signature of the Tenderer:**

8.39 :GUARANTEED TECHNICAL PARTICULARS FOR GUY/EARTH WIRE.

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, **otherwise the bid shall be rejected.)**

Sl. No.	Description	Unit	Purchaser's Requirement	Manufacturer's Particulars
1	Name of the Item		Guy/Earth Wire	
2	Name &v Address of the Manufacturer		Shall be mentioned	
3	Manufacturer's Code No.		Shall be mentioned	
4	Standard		Performance Design and Testing shall be in accordance to the BS, BDS or equivalent International standards.	
5	Installation		Overhead/Stay	
6	Type		Stranded, Solid and Bare	
7	Material		High Strength Steel	
8	Overall diameter	Mm	9.50	
9	Number/diameter of each strand	No./mm	7/3.15	
10	Nominal cross-sectional area of conductors	mm^2	54.53	
11	Weight of Guy Wire	Kg/KM	430	
12	Ultimate Tensile Strength	KN	62.75	
13	Galvanization		As per ASTM B498-74, Class-A	
14	Modulus of Elasticity	Kg/mm^2	19.7×10^3	
15	Coefficient of linear expansion	/ºC	11.3×10^{-6}	
16	Drum wound length	M	1500	
17	Net weight	Kg	Shall be mentioned	
18	Gross weight	Kg	Shall be mentioned	
19	Lay length	Mm	Shall be mentioned	
20	Lay direction		Right hand	
21	Lay ratio		13-18	
22	Treated Wooden Drum Standard		AWPA C_1 – 82, C_2 –83, C_{16} –82, P_5 –83.	

Seal and Signature of the manufacturer: **Seal and Signature of the Tenderer:**

8.40 GUARANTEED TECHNICAL PARTICULARS FOR PG CLAMP (MARTIN TO MARTIN)

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, **otherwise the bid shall be rejected.)**

Sl. No.	Description	Purchaser's Requirement	Manufacturer's Particulars
Compatible for ACSR MARTIN to ACSR MARTIN			
1.	Name & Address of the Manufacturer	Shall be mentioned	
2.	Manufacturer's Code No.	Shall be mentioned	
3.	Applicable Standard	Design, Testing & Performance shall be in accordance to BS, IEC, BDS, ANSI, ASTM or equivalent international standards.	
4.	Installation	Outdoor and shall be installed for the above-mentioned conductor.	
5.	Type	Bolted Type	
6.	Material	Aluminum Alloy	
7.	Minimum Continuous Current rating at 35ºC rise over 40ºC ambient temperature (75ºC)	Shall be mentioned (As per current rating conductor)	
8.	Dimension	Shall be mentioned	
9.	Weight of 100 nos. in Kg	Shall be mentioned	

Seal and Signature of the manufacturer: **Seal and Signature of the Tenderer:**

8.41 GUARANTEED TECHNICAL PARTICULARS FOR PG CLAMP (GGROSBEAK TO GROSBEAK)

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, **otherwise the bid shall be rejected.)**

Sl. No.	Description	Purchaser's Requirement	Manufacturer's Particulars
Compatible for ACSR GROSBEAK to ACSR GROSBEAK			
1.	Name & Address of the Manufacturer	Shall be mentioned	
2.	Manufacturer's Code No.	Shall be mentioned	
3.	Applicable Standard	Design, Testing & Performance shall be in accordance to BS, IEC, BDS, ANSI, ASTM or equivalent international standards.	
4.	Installation	Outdoor and shall be installed for the above-mentioned conductor.	
5.	Type	Bolted Type	
6.	Material	Aluminum Alloy	
7.	Minimum Continuous Current rating at 35ºC rise over 40ºC ambient temperature (75ºC)	Shall be mentioned (As per current rating conductor)	
8.	Dimension	Shall be mentioned	
9.	Weight of 100 nos. in Kg	Shall be mentioned	

Seal and Signature of the manufacturer: **Seal and Signature of the Tenderer:**

8.42 GUARANTEED TECHNICAL PARTICULARS AND GUARANTEES OF 33 KV BUS BAR & JUMPER

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, **otherwise the bid shall be rejected.)**

Sl. No.	Description	Unit	WZPDCL's Requirement	Manufacturer's guaranteed Particulars
1	Manufacturer's Name and country	-	To be mentioned	
2	Material (conductor)			
	a) Bus bars	-	ACSR MARTIN	
	b) Jumper/ connections	-	MATRTIN/ HAWK/ GROSBEAK	
3	Overall diameter	mm	To be mentioned	
4	Nominal cross section	mm^2	To be mentioned	
5	Cross section and make –up	-	To be mentioned	
6	Maximum rated current	A	1250	
7	Maximum working tension of main connections	Kg/m^2	To be mentioned	
8	[redacted]	Ohms	To be mentioned	
9	Tensile breaking stress of material	N/ mm^2	To be mentioned	
10	Maximum permissible span length	m	To be mentioned	
11	Maximum sag under own weight of maximum span	mm	To be mentioned	

Seal & Signature of the Manufacturer **Seal & Signature of the Tenderer**

8.43 GUARANTEED TECHNICAL PARTICULARS AND GUARANTEES OF SHIELD WIRE, EARTHING GRID AND EARTHING ELECTRODE

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, otherwise the bid shall be rejected.)

Sl. No.	Description	Unit	WZPDCL's Requirement	Manufacturer's guaranteed Particulars
A.	SHIELD WIRES			
1	Manufacturer's name & country	-	To be mentioned	
2	Material	-	High Strength Steel	
3	Grade of Steel	Kg	60000	
4	Nos. of Strand	Nos.	7	
5	Diameter of each strand	mm	3.05	
6	Overall diameter	mm	9.525	
7	Nominal cross -section	mm^2	35	
8	Weight per km length	Kg	407	
9	Maximum rated current (3 seconds)	A	To be mentioned	
10	Maximum working tension of main connection	Kg/m^2	To be mentioned	
11	Resistance of conductors per 1000 meters at 20° C	ohms	To be mentioned	
12	Rated Ultimate Tensile Strength	Kg/mm^2	4900	
13	Maximum permissible span length	m	To be mentioned	
14	Maximum sag under own weight of maximum span	mm	To be mentioned	
15	Co-efficient of liner expansion	cm/ ^{0}C.	To be mentioned	
16	Class of Zinc Coating	-	Class-A	
17	Galvanization	-	As per BS-729 OR ASTM A-153	
B.	EARTHING GRID			
1	Manufacturer's name & country	-	To be mentioned	
2	Material	-	Copper	
3	Overall diameter	mm	To be mentioned	
4	Nominal cross -section			
	a) Interconnecting the earth electrodes	mm^2	To be mentioned	
	b) Connecting equipment to mesh	mm^2	To be mentioned	
6	Area of each earthing grid	m x m	To be mentioned	
7	Depth of bedding of conductor	mm	To be mentioned	
8	Maximum earth fault current for 3 sec.	KA	25	
9	Resistance of conductors per 1000 meters at 20°C	Ohms	To be mentioned	
C.	EARTHING ELECTRODES			
1	Manufacturer's name & country	-	To be mentioned	
2	Material	-	Copper	
3	Dimensions: a) Dia b) Length	 mm m	 16 4	
4	Number of electrodes per group	-	As per schedule	
5	Number of earthing points per substation	-	To be mentioned	
6	Calculated resistance of combined earth grid and points	ohm	Less than one (0.5)	

Seal & Signature of the Manufacturer **Seal & Signature of the Tenderer**

8.44 MANUFACTURER'S GUARANTEED TECHNICAL DATA SCHEDULE FOR 415V, 3-PHASE, 300 AMPS MCCB & ENCLOSURE

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, **otherwise the bid shall be rejected.)**

Sl. No.	Description	WZPDCL's Requirement	Manufacturer's guaranteed Data
A.	**Three phase 300A LV MCCB**		
01.	Manufacturer's name & address	To be mentioned	
02.	Manufacturer's model no.	To be mentioned	
03.	Operating voltage	415 V AC	
04.	Max. system voltage	457 V AC	
05.	Rated continuous current	300 Amps.	
06.	Number of poles	3 (three)	
07.	Rated insulation voltage i.e. maximum system voltage (Ui)	≥ 800 Volts AC	
08.	Rated Impulse withstands voltage i.e. Uimp	≥ 8.0 kV	
09.	Frame size	300 Amps.	
10.	Rated service Short circuit Breaking capacity i.e. Ics	36 KA	
11.	Thermal element setting	from ≤40% to ≥100% of rated continuous current.	
12.	Magnetic element setting	from ≤400% to ≥1000% of rated continuous current	
13.	Operating mechanism	As per IEC Standard	
14.	Construction	As per IEC Standard	
15.	Nominal dimension (Height x Width x Depth)	mm x mm x mm	
16.	Indication for ON-TRIP-OFF position	To be provided	
17.	Original Printed catalogue	To be furnished	
18.	Dimensional drawing	To be furnished	
19.	Weight, Kg	To be furnished	
20.	IEC Standards for Design, manufacture, testing and performance.	latest editions of IEC 60947-1 and IEC 60947-2 or equivalent international standards.	
B.	**MCCB Panel/ Enclosure**		
01.	Manufacturer's Name & Address	To be mentioned	
02.	Manufacturer's Model no.	To be mentioned	
03.	Construction	As per IEC Standard	
04.	Overall dimension (Height x Width x Depth)	500 mm x 300 mm x 200mm	

Sl. No.	Description	WZPDCL's Requirement	Manufacturer's guaranteed Data
05.	Thickness (minimum)	1.63 mm	
06.	Material of the box	Galvanized steel sheet of min 1.63 mm thick.	
07.	Necessary fixing channels with adjustable hole including nuts, bolts etc.	Shall be provided	
08.	Standard of galvanization	Latest revision of ASTM A90/ BS EN ISO 1461:2009 standard.	
09.	Dimensional drawing	To be furnished	

Seal & Signature of the Manufacturer **Seal & Signature of the Tenderer**

8.45 GUARANTEED TECHNICAL PARTICULARS AND GUARANTEES OF LED FLOOD LIGHT

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, **otherwise the bid shall be rejected.)**

Sl. No.	Description	Unit	WZPDCL's Requirement	Manufacturer's guaranteed Particulars
1	Manufacturer's Name & country of origin	-	To be mentioned	
2	Manufacturer's model No.	-	To be mentioned	
3	Input Voltage	V	220	
4	Operating Voltage	V	180-240	
5	Rated Wattage	W	50	
6	Efficacy	lu/W	100	
7	Driver Efficiency		Min 90%	
8	Life Span	Hrs	50000	
	Operating temperature		-5 to 50degree C	
9	color temperature	K	5000-6000	
10	Housing	-	in two pieces (upper and lower housings) Die cast aluminum housing	
11	Electrical and gear compartment		Integral Inverter Electronic	
12	Protection Degree		IP65	
13	painting		RAL 7035	
14	Frequency	Hz	50	
15	Front Glass		F - Flat glass	
16	Net Wight	Kg	To be mentioned	

Seal & Signature of the Manufacturer **Seal & Signature of the Tenderer**

8.46 GUARANTEED TECHNICAL PARTICULARS AND GUARANTEES OF LED SIGN BOARD (ELECTRONIC)

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, otherwise the bid shall be rejected.)

Sl No	Description	WZPDCL's requirement	Tenderers Guaranteed particulars
1	Pixel pitch	P4/ P6	
2	LED configuration	SMD	
3	LED density	Minimum 8500 LED/m^2	
4	Brightness	6,500 nits (calibrated)	
5	Color Processing	16 bit/color	
6	Colors	281 trillion	
7	Hor. viewing angle	-70°/+70°	
8	Vert. viewing angle	-35°/+10°	
9	Power consumption (typical)	Max 300 W/m^2	
10	Heat dissipation (typical)	784 BTU/hr/m^2	
11	Operational temperature	-20°/+50°C	
12	Ruggedness	IP65 (front)	
13	Dimensions (HxWxD)	7 x 5 feet	
14	Module surface	Minimum 1 m^2	
15	Weight / Tile	To be mentioned	
16	Features: Audio, Video, Elkbone frame, Ethernet, HDMI, USB, VGA with all necessary configuration software	Yes	
17	Certifications	CE, ETL, FCC Class A, CEBEC, RohS	

Seal & Signature of the Manufacturer **Seal & Signature of the Tenderer**

8.47 TECHNICAL REQUIREMENT & GUARANTEE SCHEDULE FOR SUBSTATION AUTOMATION SYSTEM

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, otherwise the bid shall be rejected.)

Sl. No	DESCRIPTION	WZPDCL REQUIREMENT	Manufacturer's guaranteed Particulars
1.	Name of the Manufacturer/Developer		
	Country of Origin	EU/USA/CANADA/Japan	
2.	**General Requirement:**		
	Standards to be complied with Substation Automation system		
	Communication protocol at all levels	IEC 61850.Fully complying with the standard.	
	Temperature range (min/max) Computer	0° to 50° C	
	Relative humidity	20 to 90 % non-condensing	
	Base of Station HMI	Active X	
	System performance and inter-operability test among ABB, Siemens, Alstom, Schneider, GE and SELIEDs done in the system verification center.	Yes	
	Control IEDs and protection IEDs are from same manufacturer	Yes	
	Electronic device		
	Manufacturer's name & address	Shall be mentioned	
	Serial communication interface included?	YES	
	Protection & Control IED's connected same bus?	Yes (IEC61850)	
	Self-monitoring	To be provided	
	Display of measured values	To be provided	
	Remote parameterization	To be provided	
	Disturbance record upload & analysis	To be provided	
	Availability Calculation shall be furnished for each equipment & as well as for the entire system	To be provided with Bid.	
3	**Detailed Requirements:**		
	Number of years of proven field experience of Offered system. (Note: Proof of experience should be furnished. The components used in the offered system and those with field experience should be the same)	5Yrs.	
	Model of the Substation Automation System	Shall be mentioned	
	Name and Address of the manufacturer	Shall be mentioned	
	Name of the Manufacturer/Developer		
	Country of Origin	EU/USA/CANADA/Japan	
	The Automation Panel shall be from the origin of the manufacturer of the system	Yes	
	Engineering and Assembling of the substation automation system shall be from the origin of the system.	Yes	
	Design life of Substation Automation System	≥ 20 Yrs	
	Manufacturer's quality assurance system	ISO 9001/ 9002 or equivalent	

Sl. No	DESCRIPTION	WZPDCL REQUIREMENT	Manufacturer's guaranteed Particulars
	Dimensions of cubicle		
	Width	mm	
	Depth	mm	
	Height	mm	
	Floor load	N/sq. m max. 600	
4	**Station Level Equipment:**		
	Station Computer	Industrial PC	
	MTBF (Mean time between Failures)	Hrs	
	MTTR (Mean time to repair)	Hrs	
	Dual Station Computers Provided in redundant hot standby configuration	YES	
	Hot standby takeover time	Seconds	
	offered software	5 Yrs	
	Operating System	Windows	
	All standard picture as per Tspec included in HMI	To be provided	
	Process Status Display Command Procedures	To be provided	
	Event processing as per Tspec	To be provided	
	Alarm processing as per Tspec	To be provided	
	Reports as per Tspec	To be provided	
	Trend Display as per Tspec	To be provided	
	User Authority levels as per spec	To be provided	
	System supervision & monitoring as per Tspec	To be provided	
	Automatic sequence control as per Tspec	To be provided	
	High quality SCD file complete with ICD files & station topology	To be provided	
5	**Gateway to Central Control Room (2 Nos)**	To be provided	
	Name of manufacturer & Country of origin	To be provided	
	Model no.		
	Number of years of proven field experience of offered unit	5Yrs	
	Insulation tests	IEC60255-5	
	Fast disturbance tests	IEC 61000-4-4, Calss4	
	Industrial environment	EN50081-2, Class A	
	Industrial grade hardware with no moving parts (PC-based gateway is not accepted)	To be provided	
	Design life of offered equipment	20Yrs	
	Redundant communication channel	To be provided	
	Redundant CPU	To be provided	
	Redundant DC/DC Supply	To be provided	
	MTBF (Mean time between Failures)	Hrs	
	MTTR (Mean time to repair)	Hrs	
	Manufacturer's Catalogue	To be provided	
6	**Station Bus**:		

Sl. No	DESCRIPTION	WZPDCL REQUIREMENT	Manufacturer's guaranteed Particulars
	Physical Medium	Armoured Glass fiber optic	
7	**Inter bay Bus**		
	Physical Medium	Armoured Glass fiber optic	
8	**Printer Server**		
	MTBF	Hrs	
9	**Event Printer**		
	MTBF	Hrs	
10	**Hard Copy Colour Printer**		
	MTBF	Hrs	
11	**Master Clock – GPS (Global Positioning System) Receiver:**		
	Name of the manufacturer & country of origin	Shall be mentioned	
	Manufacturer' s address	Shall be mentioned	
	Model	Shall be mentioned	
	MTBF	Hrs	
12	**Bay Control Unit / IED – HV; Separate Bay controller unit shall be provided for each bay/feeder, which will be the part of GIS panel.**		
	Manufacturer's name & address	Shall be mentioned	
	Type or Model	Shall be mentioned	
	Country of Manufacture	Shall be mentioned	
	Number of years of proven field experience of offered unit	5 Yrs.	
	Separate Bay-controller unit provided for each bay & feeder	Yes	
	Type of Bay-controller offered HV/MV	HV	
	Select Before Operate with Open Execute & Close Execute	Yes	
	Single bit dependence	No	
	Interlocking, bay & station wide Synchro check function	Yes	
	Maximum Voltage difference	Specify range	
	Maximum Frequency difference	Specify range	
	Maximum Phase difference	Specify range	
	Double command blocking	Yes	
	Independent settable parameter groups	Yes	
	Local Display Unit	4	
	Sequence of event recorder	To be provided	
	Events	256	
	Time resolution	1ms	
	Disturbance recorder function	YES	
	Comprehensive self-supervision	YES	
	Battery free backup of events and disturbance records	YES	
	Insulation tests	IEC60255-5	

Sl. No	DESCRIPTION	WZPDCL REQUIREMENT	Manufacturer's guaranteed Particulars
	Fast disturbance tests	IEC61000-4-4, Class 4	
	MTBF	Hrs.	
	MTTR	Hrs.	
	Temperature range: IED's		
	Operation	-10 to +50	
	Transport and storage	-10 to +50	
	Relative humidity:		
	Operating max./min	93%	
	Transport and Storage	93%	
13	**Backup Control Mimic – HV**		
	Control functionality:		
	Control of breaker as well as all isolators/earthing	To be provided	
	Switch (Control functionality should not be affected if bay-controller fails) Key-Locked	To be provided	
	Interlock override function	To be provided	
	Separate backup control mimic provided for each bay & feeder	To be provided	
14	**Bay Control Unit/ IED – MV; Separate Bay controller unit shall be provided for each bay/feeder, which will be the part of GIS panel.**		
	Manufacturer's name & address	Shall be mentioned	
	Type or Model	Shall be mentioned	
	Country of Manufacture	Shall be mentioned	
	Number of years of proven field experience of offered unit	5 Yrs.	
	Separate Bay-controller unit provided for each bay & feeder	Yes	
	Control functionality implementation in software:	To be provided	
	Select Before Operate with Open Execute & Close Execute	Yes	
	Interlocking, bay & station wide Synchro check function	Yes	
	Maximum Voltage difference	Specify range	
	Maximum Frequency difference	Specify range	
	Maximum Phase difference	Specify range	
	Local Display Unit	To be provided	
	Sequence of event recorder	To be provided	
	Events	Specify	
	Time resolution	1ms	
	Disturbance recorder function	To be provided	
	Comprehensive self-supervision	To be provided	
	Supervision Insulation tests	IEC60255-5	
	Fast disturbance tests	IEC61000-4-4, Class 4	

Sl. No	DESCRIPTION		WZPDCL REQUIREMENT	Manufacturer's guaranteed Particulars
	MTBF		Hrs.	
	MTTR		Hrs.	
	Temperature range: IED's			
	Operation		-10 to +50	
	Transport and storage		-10 to +50	
	Relative humidity:			
	Operating max./min		93%	
	Transport and Storage		93%	
15	**Backup Control Mimic – MV**			
	Control functionality:			
	Control of breaker as well as all isolators /earthing switches Separate backup control mimic provided for each bay & feeder		To be provided	
16	**Ethernet Switch**			
	Name of manufacturer &. address		Shall be mentioned	
	Model number		Shall be mentioned	
	Type		Industrial Grade, rackable 19"-24 ports (min.)	
	Redundant Power supply		To be provided	
17.	**Operator Work Station (OWS)**			
	Brand		Any International reputed brand.	
	Model		To be mentioned	
	Type		Industrial PC	
	Country of Manufacture		USA/ UK/ EU /Japan/ Canada	
	Processor	GHz	Intel core i7 10th generation or latest	
	Clock Speed	GHz	3.0 GHz (min), 8 MB Cache Memory (min)	
	Bus Speed	MHz	Min. 1600 MHz or higher	
	RAM	GB	8 GB, Expandable to 16 GB (mini.)	
	HDD	GB	2 x 1 TB SSD (RAID with NVMe)	
	Mouse		Same Brand USB Scroll Optical Mouse	
	Keyboard		Same brand USB Keyboard	
	Monitor	inch	Same brand LED 24", 1920x1080, Full HD Monitor	
	OS Support		Windows 10 Professional or latest	
	OS		License windows with recovery kit	
	Software		Licensed Anti-Virus	

Sl. No	DESCRIPTION		WZPDCL REQUIREMENT	Manufacturer's guaranteed Particulars
			Software	
18	**Engineer Work Station (EWS)**			
	Brand		Any International reputed brand.	
	Model		To be mentioned	
	Type		Industrial PC	
	Country of Origin		USA/ UK/ EU/ Japan/ Canada	
	Processor	GHz	Intel Core i5 Processor, 10th generation or latest	
	Clock Speed	GHz	3.0 GHz (min), 8 MB L3 Cache Memory (min)	
	Bus Speed	MHz	Min. 1600 MHz or higher	
	RAM	GB	(2x4 GB) 1 DIMM DDR4	
	HDD	GB	Min. 512 GB SSD NVMe	
	Mouse		Same Brand Wireless Scroll Optical Mouse	
	Keyboard		Integrated standard Keyboard	
	Monitor	inch	15.6", Full HD, True Life Display	
	Battery		6 cell lithium-ion battery	
	Battery Backup		6 hours or higher with A/ C Adapter	
	OS Support		Windows 10 professional or latest	
	OS		License windows with recovery kit	
	Software		Licensed Anti-Virus Software	
19.	**Laser Color Printer**			
	Brand		Any International reputed brand.	
	Model		To be mentioned	
	Country of origin		USA/ UK/ EU/ Japan/ Canada	
	Toner type		Toner and associated drum unit in single case, No starter toner.	
	Resolution	dpi	1200 x 1200 dpi (Minimum)	
	Printing Speed	ppm	62-Page-per Minute (Letter), 35 PPM (A4) (min.)	
	First Page Print Out	second	As fast as 8 seconds	
	Memory	MB	256 MB (Minimum) Expandable to 1 GB	
	Trays		100 sheet multi-purpose	

Sl. No	DESCRIPTION		WZPDCL REQUIREMENT	Manufacturer's guaranteed Particulars
			input tray, 2 x 500 sheet input tray 50-sheet face up output tray, 250-sheet face down output tray	
	Media Sizes		Letter, Legal, A4, A5, B5 and custom sizes	
	Media Types		Paper (Plain, Preprinted, Letterhead, Bond, Color, Recycled, Rough), Transparencies, Labels	
20	**Event Printer**			
	Brand		Any International reputed brand.	
	Model		To be mentioned	
	Country of origin		USA/ UK/ EU/ Japan/ Canada	
	Print Method	PIN	9 Pin Serial Impact Dot Matrix.	
	Print Speed	LPS	Min. 6.0 LPS (30 Columns: 16 CPI).	
	Data Buffer	KB	4KB.	
	Inked Ribbon		ERC-38(Black/Red).	
	Interface		USB Interface, Bi-directional parallel.	
21	**System Performance:**			
	Exchange of display (First reaction)		<2S	
	Presentation of a binary change in the Process display		<1S	
	Presentation of an analogue change in the process display		<1S	
	From order to process output		<1S	
	From order to updated of display		<1S	
22	**UPS**			
	Brand		Any International reputed brand.	
	Model		To be mentioned	
	Country of Manufacturer		USA/ UK/ EU/ Japan/ Canada	
	Capacity		VA	
	Backup		2 hours	
	Battery capacity		To be mentioned	
23	Protocol Converter / IO module, if required			
	Brand		To be mentioned	
	Model		To be mentioned	
	Country of Manufacturer		USA/ UK/ EU/ Japan/ Canada	

Seal & Signature of the Manufacturer **Seal & Signature of the Tenderer**

8.48 GUARANTEED TECHNICAL PARTICULARS FOR DESKTOP COMPUTER

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, **otherwise the bid shall be rejected**)

Sl. No.	Description	WZPDCL's Requirement	Manufacturer's guaranteed Particulars
1	Brand	To be mentioned (Any International reputed brand operating in the recognized continental markets for decades.)	
2	Model	To be mentioned	
3	Country of origin	North America / EU / Japan	
4	Country of Manufacturer	To be mentioned	
5	Processor Speed (Clock speed)	3.6 GHz (minimum)	
6	Processor	10th Generation Intel Core i5 Processor, 8MB Cache or above	
7	Storage	1TB SATA HDD 7200 rpm	
8	**Performance**		
	RAM	8GB (8GBx1) DDR4 upgradable up to 64GB DDR4-2400 SDRAM	
	DIMM	4	
	Chipset	Intel original Q272 chipset	
	Graphics Card	Integrated Intel HD Graphics 630 or above	
9	**Screen**		
	Screen features	LED Backlight Color Monitor	
	Screen size	24 inches	
10	**Connectivity**		
	Audio	High-Definition Integrated Audio	
	Bays	1 internal 3.5" 2 internal 2.5", 1 external 5.25"	
	I/O Ports	8 External USB: 4 x 3.0 (2 front/2 rear) and 4 x 2.0 (2 front/2 rear); 1 RJ-45;1 Display Port 1.2; 1 UAJ, 1 Line-out; 1 VGA, 2 low-profile PCIe x16 (one wired as a x4); 2 low-profile PCIe x1; 1 M.2 2230 for optional wireless	
11	NIC	10/100/1000 base T (built in /Integrated)	
12	**Media**		
	Optical drive	Super Multi DVD writer	
13	**Features**		
	Keyboard	USB Entry Business Keyboard (English)	
	Mouse	USB Optical Mouse	
14	Power Supply	220-240V, 50Hz	
15	**General**		
	Operating system	Windows 10 Pro (Licensed)	
	Warranty	International warranty	
	Software	a) Windows 10 Pro (Licensed)	
		b) MS office 2013 Professional (Licensed)	
	Brochure and CDs	All brochure, instructions, manual and driver CDs to be supplied with the product	
	Connection Cables	All necessary power and data connection cables to be supplied along with the product, power cables (3 pin flat)	

Seal & Signature of the Manufacturer **Seal & Signature of the Tenderer**

8.49 GUARANTEED TECHNICAL PARTICULARS FOR UPS

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, **otherwise the bid shall be rejected**)

Sl. No.	Description	WZPDCL's Requirement	Manufacturer's guaranteed Particulars
1	Brand & Model	To be mentioned (Any International Reputed Brand & Model)	
2	Capacity	1000 VA	
3	Technology	Line Interactive	
4	Transfer Time	<2 ms	
5	Input Voltage	140~300 VAC	
6	Input Frequency	50/60 Hz± 5%	
7	Output Voltage	220 VAC ± 8%	
8	Output Frequency	50/60 Hz± 5%	
9	Output Wave form	AC Mode: Simulated Sine wave	
10	Backup time	At full load 30 minutes (one computer with monitor)	
11	Battery Type	Sealed Maintenance free Lead Acid	
12	Battery Recharging	8-10 Hours	
13	Noise (EMI/RFI) filter	Built in	
14	Protection	Spike, Surge, Blackout, Brownouts, Overload, Short circuit, Under & Over Voltage, Battery Low & Battery Over charge as per international Safety Standard	
15	UPS Warranty	03 (Three) Years Replacement warranty	
16	Battery Warranty	01 (one) Year warranty from the date of commissioning.	

Seal & Signature of the Manufacturer **Seal & Signature of the Tenderer**

8.50 GUARANTEED TECHNICAL PARTICULARS FOR NETWORK LASER DUPLEX PRINTER

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, **otherwise the bid shall be rejected**)

	Description	Unit	WZPDCL's Requirement	Manufacturer's guaranteed Particulars
1	Brand		To be mentioned (Any International reputed brand operating in the recognized continental markets for decades.)	
2	Model		To be mentioned	
3	Country of Origin		North America / EU / Japan	
4	Country of Manufacturer		To be mentioned	
5	Toner type		Toner and associated drum unit in single case, No starter toner.	
6	Fuser Unit		Instant on fuser technology with ceramic heating elements.	
7	Resolution	dpi	1200 × 1200 dpi (Minimum)	
8	Processor	MHz	Min. 800 MHz	
9	Printing Speed	ppm	32-Page-per Minute (Letter), 35 PPM (A4) (min.)	
10	First Page Print Out	second	As fast as 8 seconds	
11	Memory	MB	256 MB (Minimum) Expandable to 1 GB	
12	Memory Slots		2 DIMM Slots Minimum	
13	Interface		Jet direct Fast Ethernet embedded print server, two open EIO slots, High Speed USB 2.0 Port & Parallel Port (min.)	
14	Languages		PCL 6, PCL 5e, POST Script 3 emulation	
15	Duty Cycle	page	2, 75,000 Pages per Month	
16	Trays		100 sheet multi-purpose input tray, 2 x 500 sheet input tray 50-sheet face up output tray, 250-sheet face down output tray	
17	Media Sizes		Letter, Legal, A4, A5, B5 and custom sizes	
18	Media Types		Paper (Plain, Preprinted, Letterhead, Bond, Color, Recycled, Rough), Transparencies, Labels	
19	Power Requirements		220-240 V / 50Hz	
20	Client Operating System Supported		Windows XP/7/8/10 Linux etc., server	
21	Network Operating System Supported		Via Jet direct print server: Me, NT 4.0, 2000, XP, XP 64-bit, Server 2003, Red Hat Linux 6 and later.	
22	Network Protocols Supported		Via Jet direct print server: TCP/IP, HTTP	
23	Warranty Period		Full 03(Three) years replacement and instant service warranty. Replacement time maximum 07 (Seven) days.	

Seal & Signature of the Manufacturer **Seal & Signature of the Tenderer**

8.51 GUARANTEED TECHNICAL PARTICULARS FOR AIR CONDITIONER

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, **otherwise the bid shall be rejected**)

SI. No.	Item Description	WZPDCL's Requirement	Manufacturer's guaranteed Particulars
In Door Unit Specification: Floor Ceiling Unit 4 Ton			
01	Brand	International reputed Brand like General, Panasonic, Toshiba, Hitachi, Samsung & LG.	
02	Model	To be Mentioned	
03	Country of Origin	To be Mentioned	
04	Cooling Capacity (Min)	14 kW	
		48,000 Btu/h	
05	Heating Capacity (Min)	15 kW	
		48,000 Btu/h	
06	Air Flow	Min 1600 m^3/h	
		Min 940 CFM	
07	Sound Pressure Level	<45 dB	
08	Dimension	To be Mentioned	
09	Net weight	To be Mentioned	
10	To be Submitted with Tender Document	Original Brochure & Catalogue supporting the model offered by the Tenderer	
11	Free Servicing	02 (Two) year from the day of completion of installation testing and commissioning of VRF system.	
12	Warranty	02 (Two) Year from the day of installation, testing and commissioning of VRF system inclusive of Parts	

Seal & Signature of the Manufacturer **Seal & Signature of the Tenderer**

8.52 GUARANTEED TECHNICAL PARTICULARS OF DIGITAL HIGH VOLTAGE 5 KV INSULATION RESISTANCE TESTER

(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, otherwise the bid shall be rejected.)

Sl. No.	Parameters	WZPDCL's Requirement	Bidder's Particulars
1.	Name of Manufacturer & Address	To be Mentioned	
2.	Model	To be Mentioned	
3.	Country of Origin	EU/ USA/ UK/ Japan / Canada	
4.	Test Voltage (DC V)	With fixed ranges of 500V, 1000V, 2.5 KV and 5 KV	
5.	Insulation Resistance Measuring Ranges (Auto-Range)	0 to 1 TΩ	
6.	Accuracy	±5% of reading	
7.	Capacitance measuring range	10nF to 25 µF with accuracy of ±10%	
8.	Current measuring range	±0.01mA to 3mA with accuracy of ±5%	
9.	Timer Range	0 to 99 minutes	
10.	Testing parameters	IR, PI, DAR,	
11.	Guarding	2% error guarding 100Mohm load	
12.	IP Rating	IP65	
13.	Storage	On board storage of measurement with time stamping up to 100 results or more	
14.	Dimensions	Should be portable	
15.	Weight (Battery Included)	Approx. 10Kg	
16.	Power Source	In Built Rechargeable Battery (Li ion) with 4 Hrs continuous testing at 5KV with 100 MΩ load and shall be operational on main and battery individually and simultaneously. BATTERY SHALL MEET IEC 62133	
17.	Accessories	Test leads 15 meters each (good insulation) + large clips, software, screened USB Cable.	

Seal & Signature of the Manufacturer **Seal & Signature of the Tenderer**

8.53 GUARANTEED TECHNICAL PARTICULARS OF EARTH & SOIL RESISTANCE TESTER

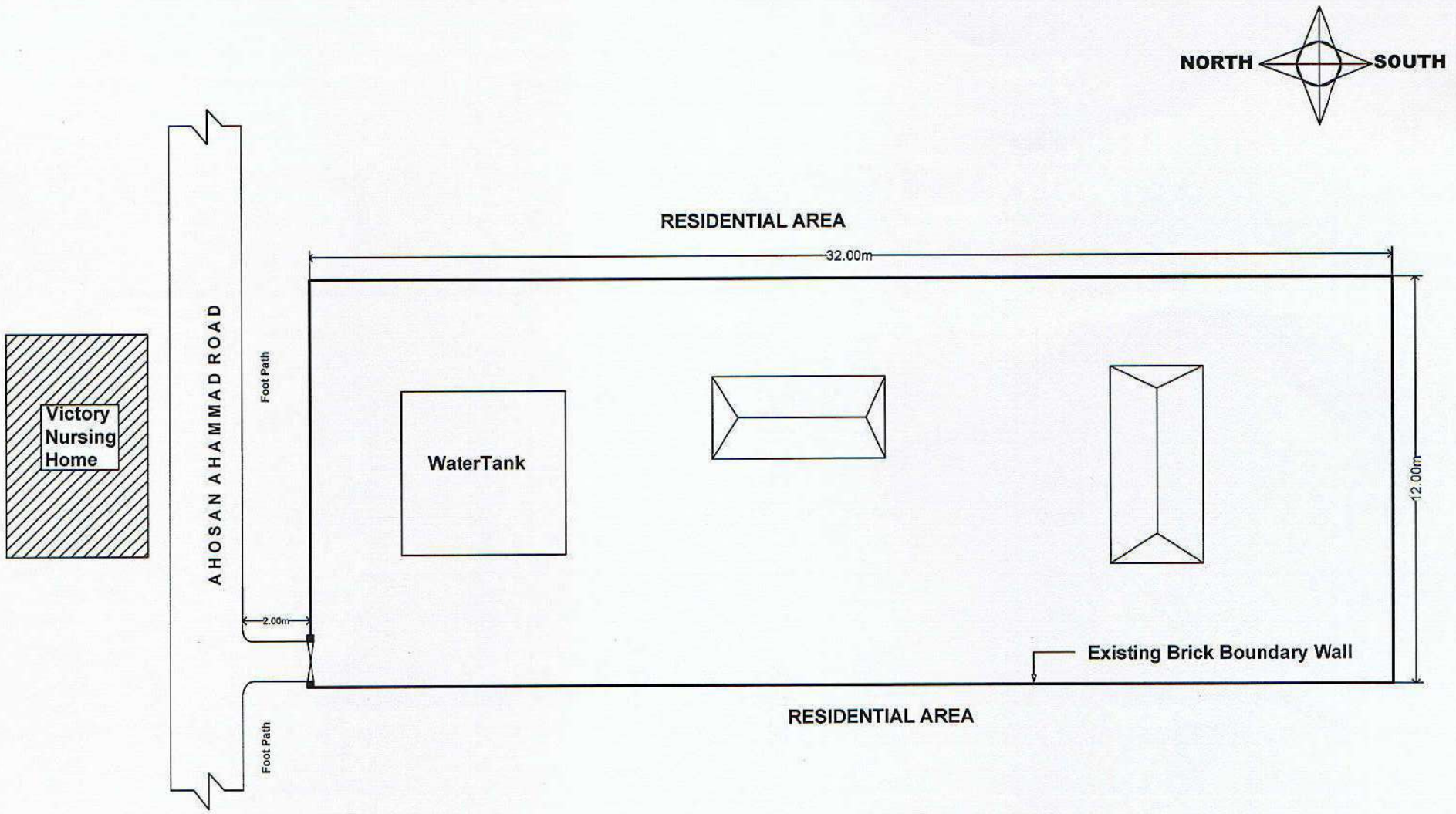
(To be filled up by the Manufacturer in Manufacturer Letterhead Pad, otherwise the bid shall be rejected.)

Sl. No.	Description	WZPDCL's Requirement	Bidder's Particulars
1.	Name of Manufacturer & Address	To be Mentioned	
2.	Model	To be Mentioned	
3.	Country of Origin	EU/ USA/ UK/ Japan / Canada	
4.	Earth resistance range and accuracy	010 to [redacted] resolution and accuracy of % ±2 digits	
5.	Comply with standards	BS 7430, IEC 61010, IEC 61326	
6.	Test frequency	105 to 160Hz reversing d.c. (50Hz operation default to 128Hz) set in steps of 0.5Hz	
7.	Test current	50mA max (selectable high and low levels)	
8.	Maximum output voltage	50V r.m.s.	
9.	Maximum interference	40V peak-to-peak (50Hz sinusoidal nature)	
10	Display	Alphanumeric LC.D. giving test information and a large (20mm) 3Yz-digit reading	
11.	Environmental protection	IP54	
12.	Flash test	3 KVa.c.	
13	Fault conditions	To withstand 240Va.c. between any two terminals	
14.	Power supply	(1) Rechargeable battery, (2) 5hours life continuous use (3) Charging supply required: 200 to 260V 50Hz (4) Charging time: 6hrs max (from completely exhausted), charging current automatically controlled to stop overcharging	
15.	Weight	Approximately 5kg (for ease of field use)	

Seal & Signature of the Manufacturer **Seal & Signature of the Bidder**

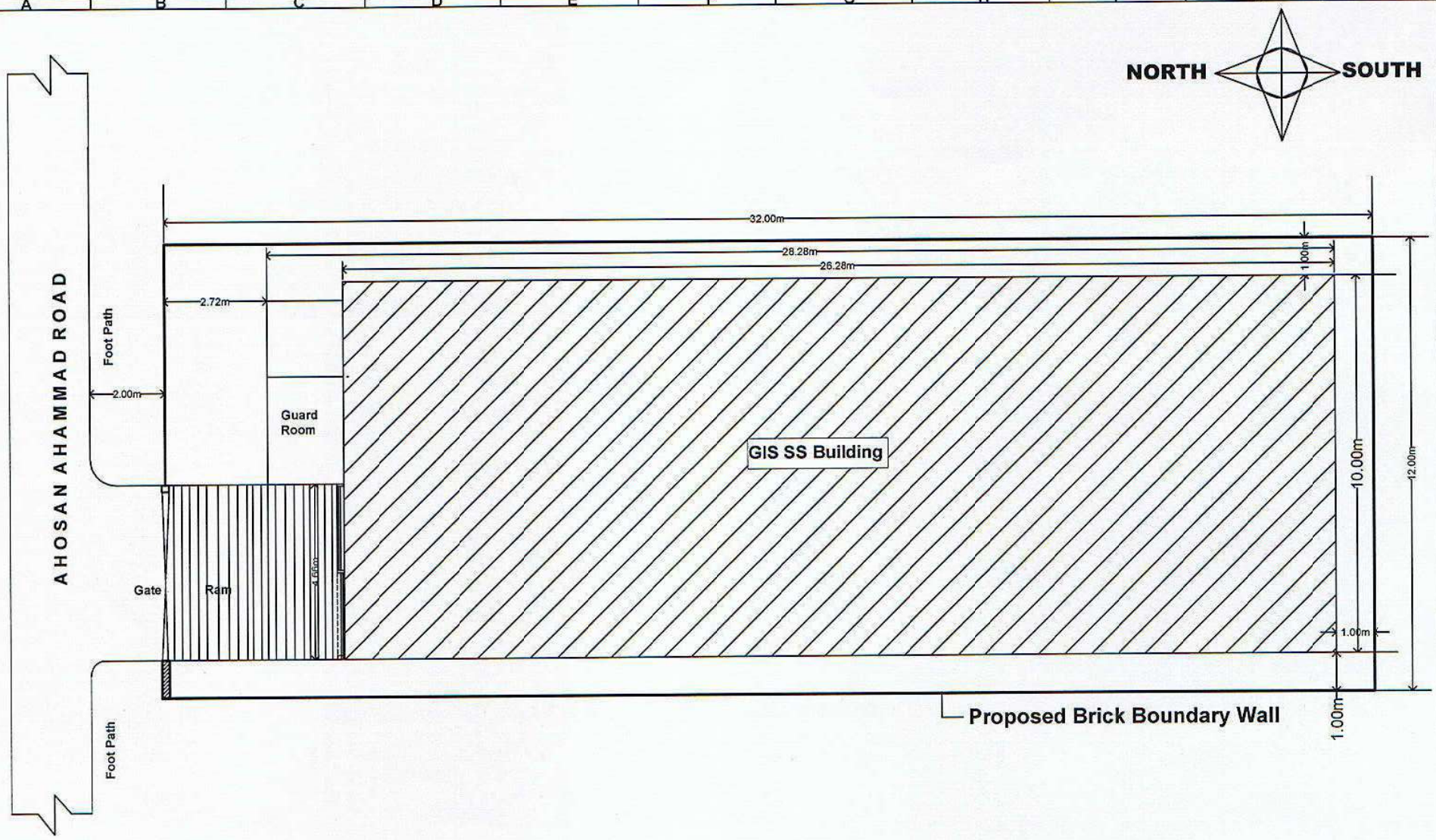
Annex-6.4.1:

Drawings for Khulna (AARD.) 33/11kV, 2x10/13.33 MVA GIS Sub-station (New) under GD-3

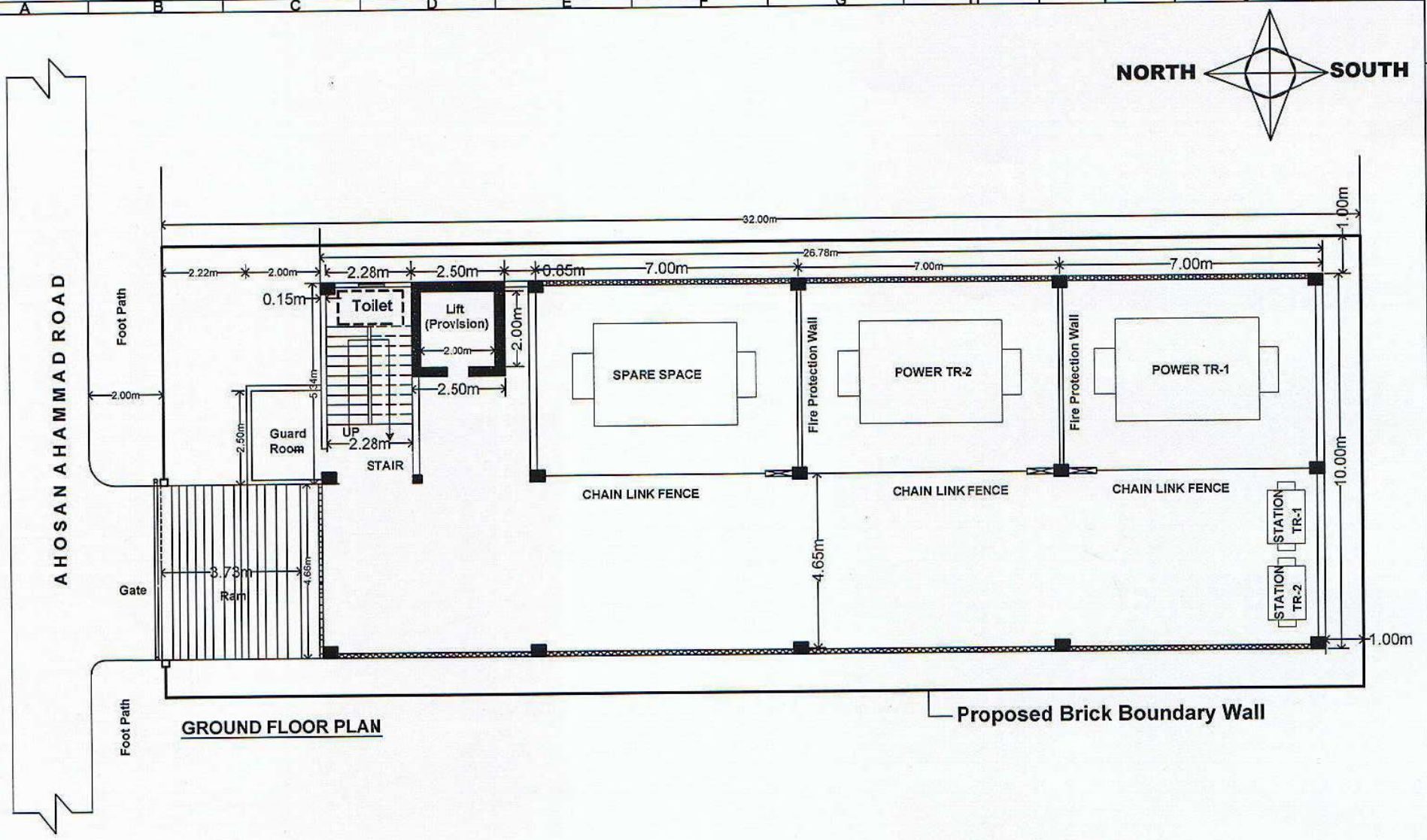


Revision		Consultant	Engineers Associates Ltd.
WEST ZONE POWER DISTRIBUTION COMPANY LIMITED STRENGTHENING POWER DISTRIBUTION SYSTEM PROJECT		Drawn By	Md. Abdul Baten
		Checked By	Engr. Rama Nath Roy

Sub-station	KHULNA (AARD) 33/11kV, 2X10/13.33 MVA GIS NEW SS	
TITLE		Drawing No.
LOCATION PLAN OF 33/11 kV NEW KHULNA GIS SUB-STATION		Kh-01

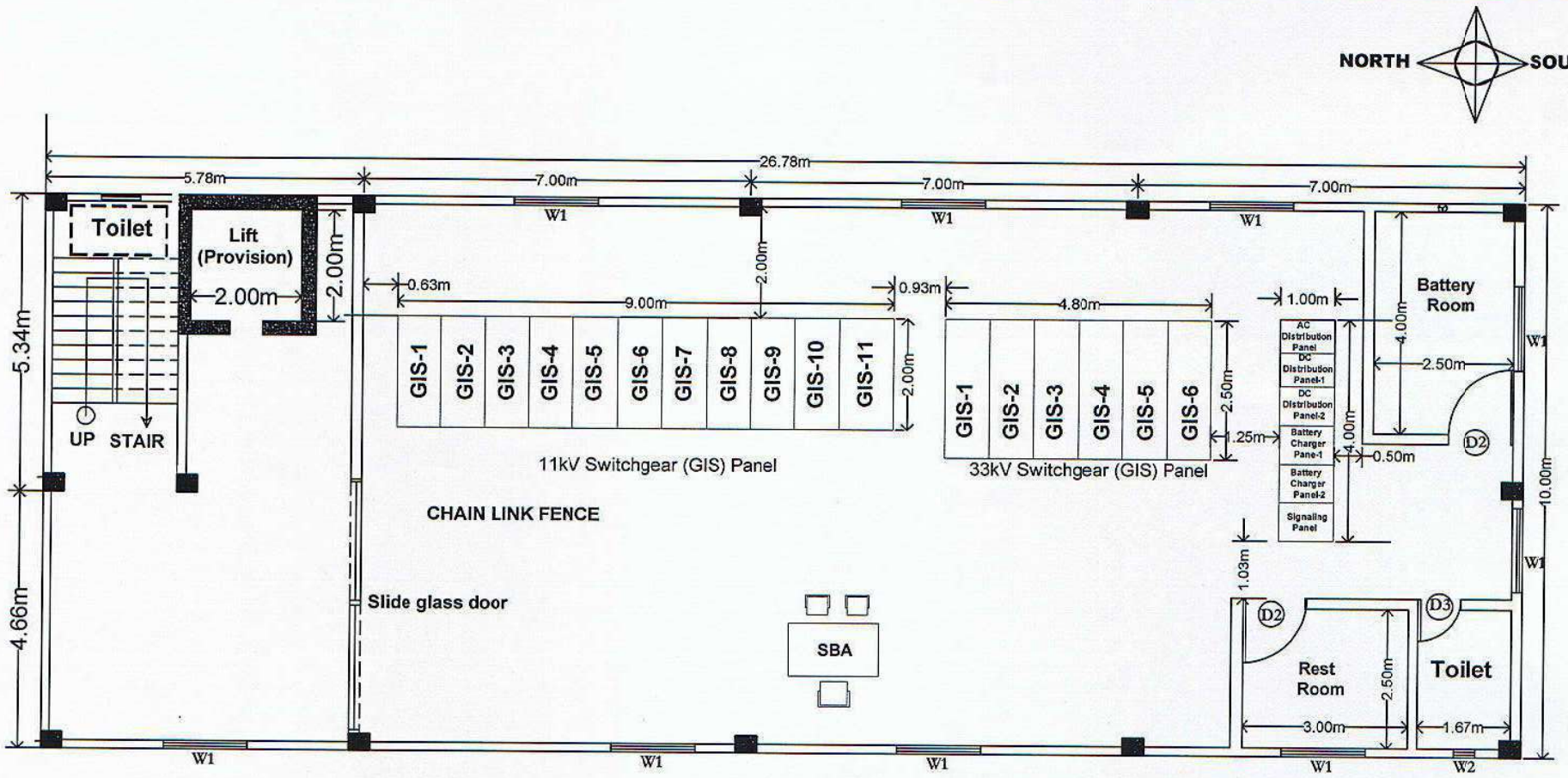


Revision		Consultant	Engineers Associates Ltd.	Sub-station	KHULNA (AARD) 33/11kV, 2X10/13.33 MVA GIS NEW SS
WEST ZONE POWER DISTRIBUTION COMPANY LIMITED STRENGTHENING POWER DISTRIBUTION SYSTEM PROJECT		Drawn By	Md. Abdul Baten	TITLE	Drawing No.
		Checked By	Engr. Rama Nath Roy	PROPOSED LAY OUT PLAN OF 33/11 kV NEW KHULNA GIS SUB-STATION	Kh-02



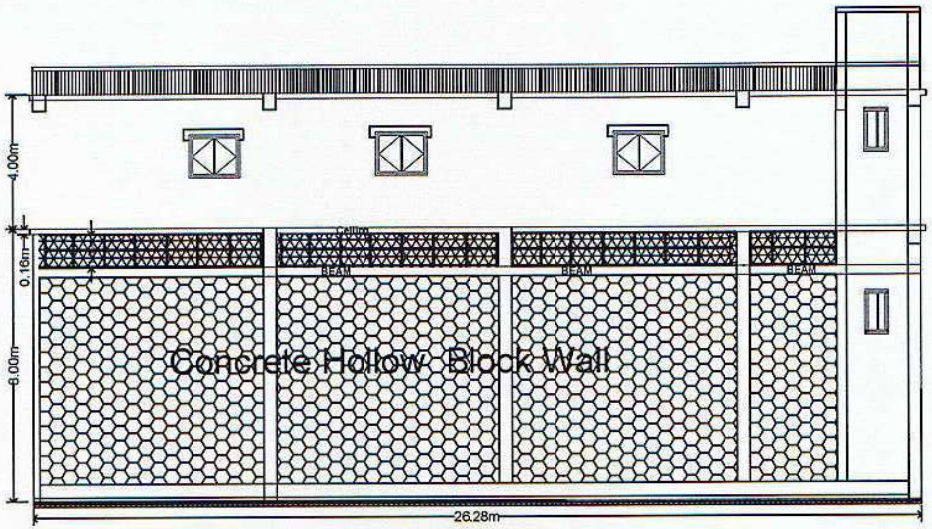
GROUND FLOOR PLAN

Revision		Consultant	Engineers Associates Ltd.	Sub-station	KHULNA (AARD) 33/11kV, 2X10/13.33 MVA GIS NEW SS
WEST ZONE POWER DISTRIBUTION COMPANY LIMITED STRENGTHENING POWER DISTRIBUTION SYSTEM PROJECT		Drawn By	Md. Abdul Baten	TITLE	Drawing No.
		Checked By	Engr. Rama Nath Roy	PROPOSED GROUND FLOOR PLAN OF 33/11 kV NEW KHULNA GIS SUB-STATION	Kh-03

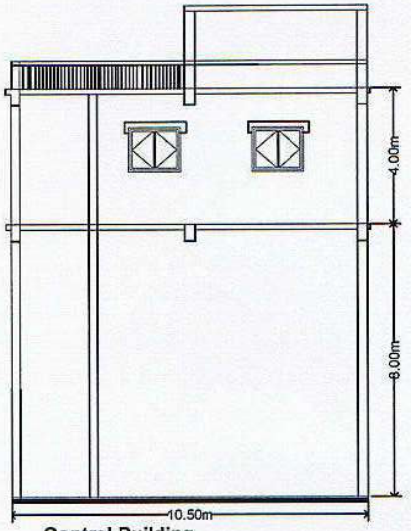


1ST FLOOR PLAN
(Control Building Plan)

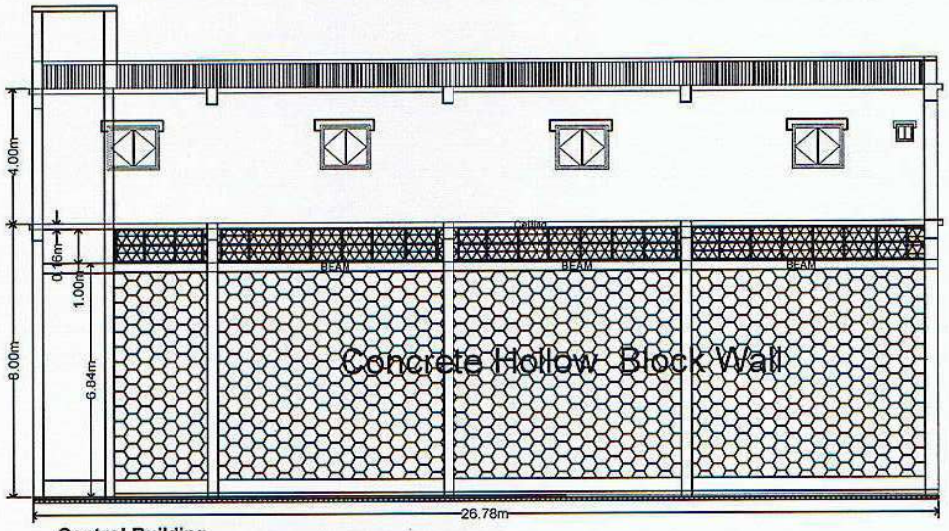
Revision		Consultant	Engineers Associates Ltd.	Sub-station	KHULNA (AARD) 33/11kV, 2X10/13.33 MVA GIS New SS
WEST ZONE POWER DISTRIBUTION COMPANY LIMITED STRENGTHENING POWER DISTRIBUTION SYSTEM PROJECT		Drawn By	Md. Abdul Baten	TITLE	Drawing No.
		Checked By	Engr. Rama Nath Roy	PROPOSED 1ST FLOOR PLAN OF 33/11 kV NEW KHULNA GIS SUB-STATION	Kh-04



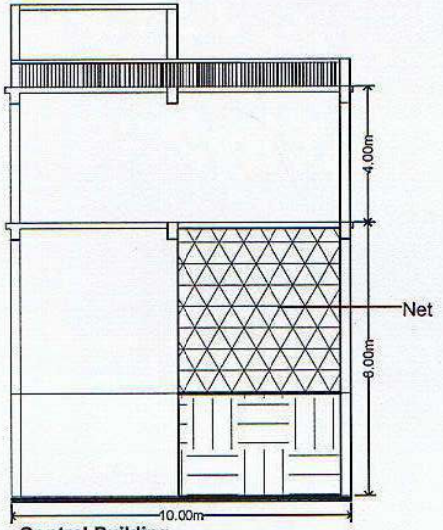
Control Building
Left Elevation (West)



Control Building
Back Elevation (South)

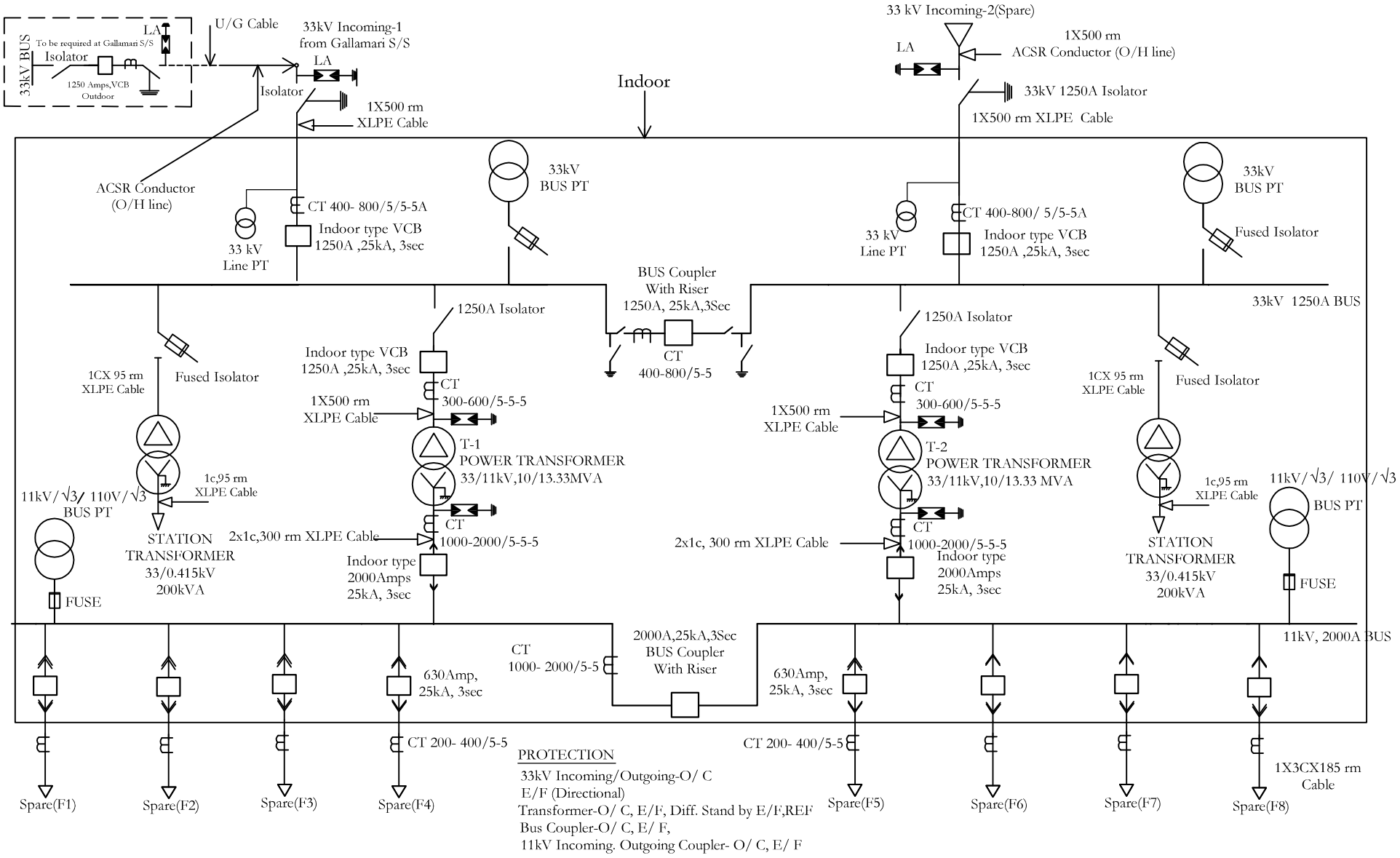


Control Building
Right Elevation (East)



Control Building
Front Elevation (North)

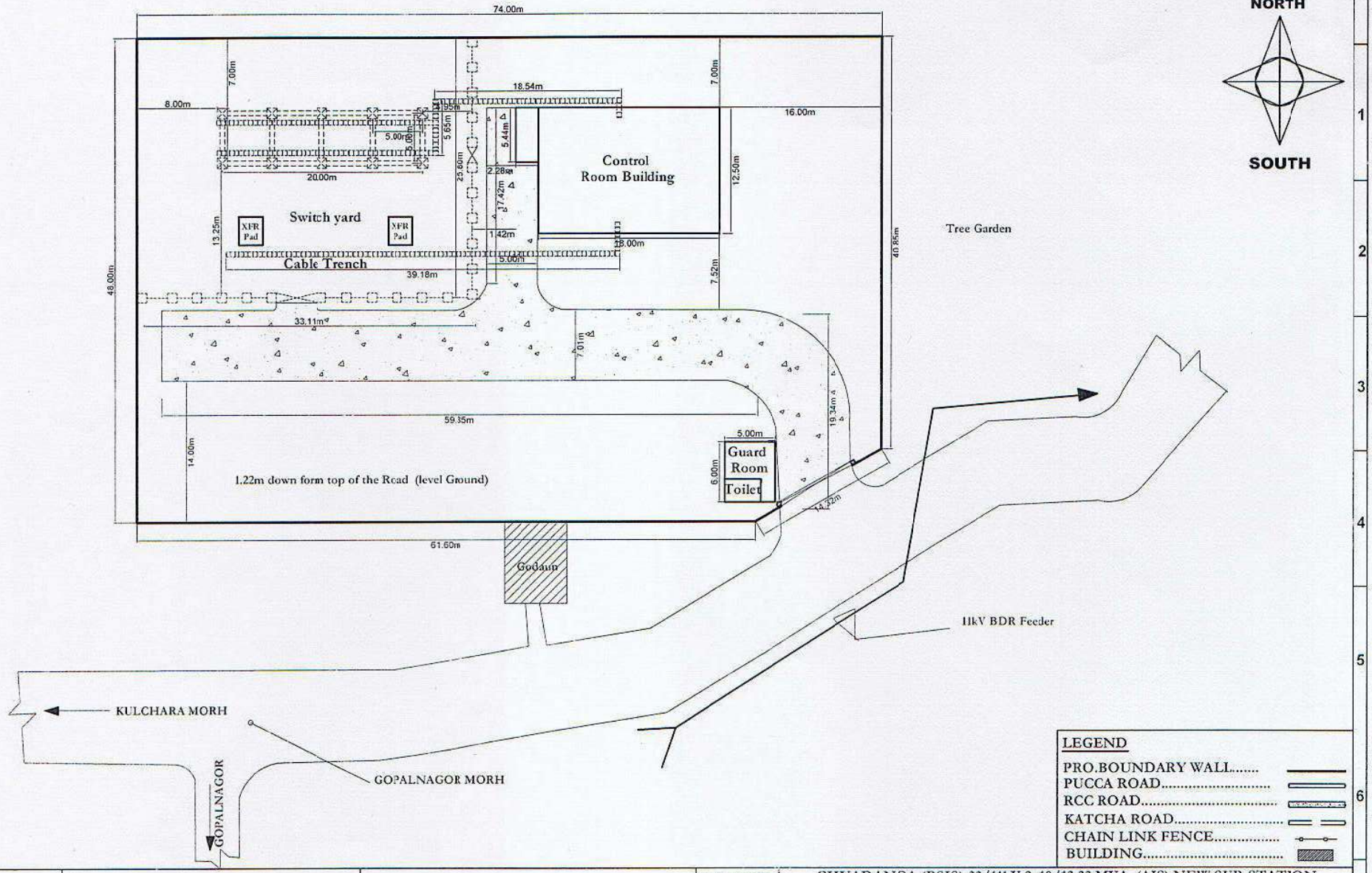
Revision		Consultant	Engineers Associates Ltd.	Sub-station	KHULNA (AARD) 33/11KV, 2X10/13.33MVA GIS NEW SUB-STATION
WEST ZONE POWER DISTRIBUTION COMPANY LIMITED				Title	Drawing No.
EXPANSION AND UP-GRADATION OF POWER DISTRIBUTION SYSTEM PROJECT		Drawn By	Md. Abdul Baten	ELEVATION OF KHULNA (AARD) 33/11KV, 2X10/13.33MVA GIS NEW SUB-STATION (FRONT,RIGHT,LEFT & BACK)	KH-05
		Checked By	Engr. Rama Nath Roy		



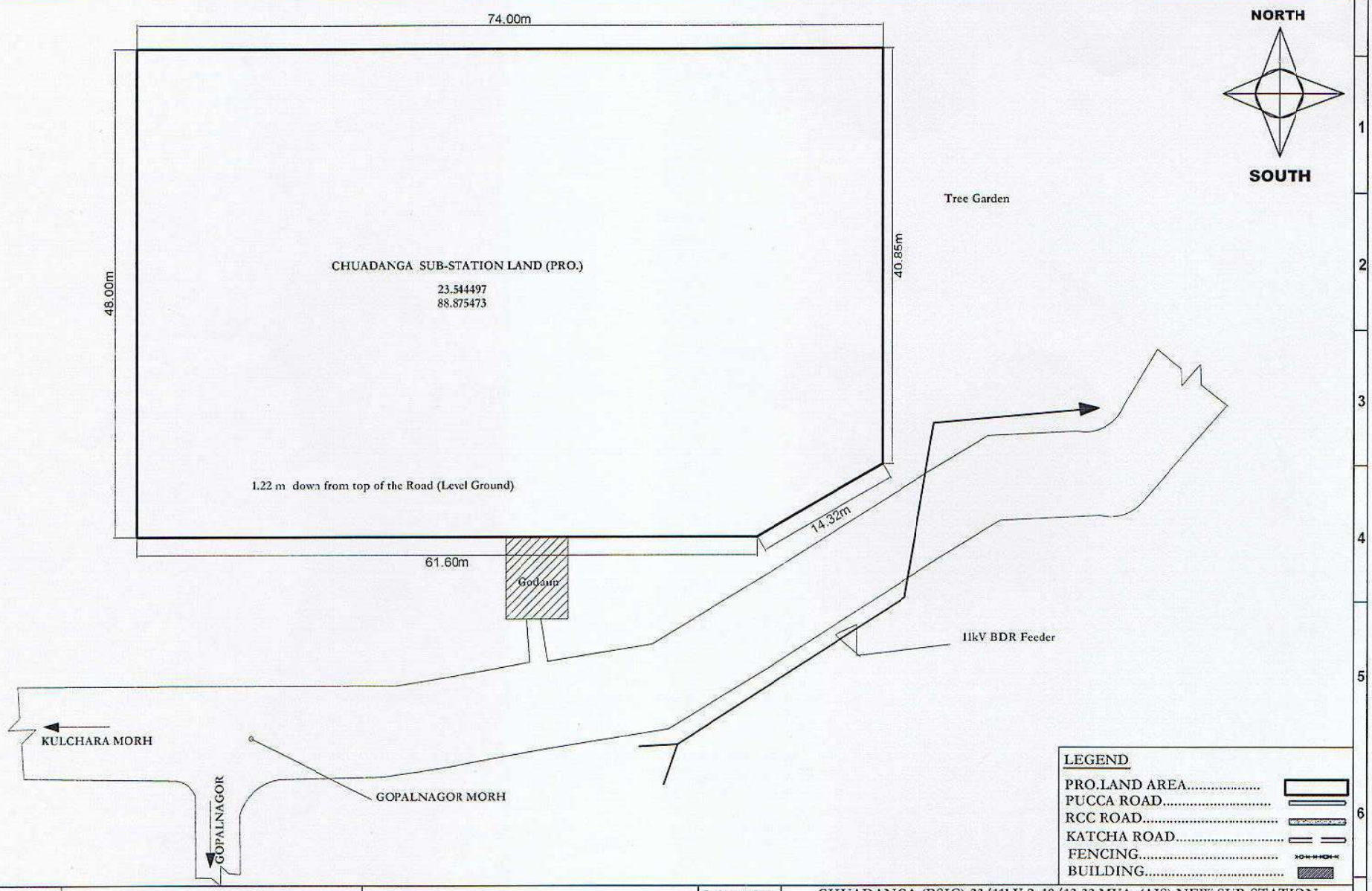
Revision		Consultant	Engineers Associates Ltd.	Sub-station	KHULNA(AARD.) 33/11kV, 2X10/13.33 MVA GIS NEW SUB-STATION
WEST ZONE POWER DISTRIBUTION COMPANY LIMITED STRENGTHENING POWER DISTRIBUTION SYSTEM PROJECT		Prepared By	Engr. Noor Mohammad	TITLE	Drawing No.
		Checked By	Engr. Rama Nath Roy	SINGLE LINE DIAGRAM OF 33/ 11KV KHULNA GIS SUB-STATION	Kh-06

Annex-6.4.2:

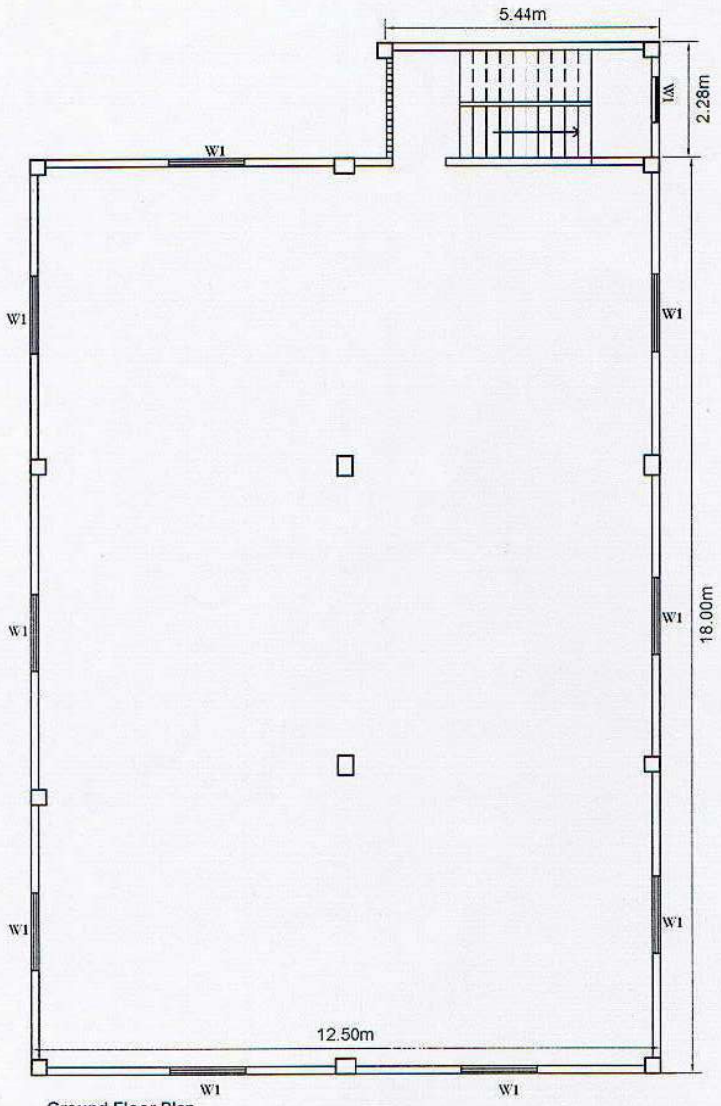
Drawings for Chuadanga 33/11kV, 2x10/13.33 MVA AIS New Sub-station under GD-3



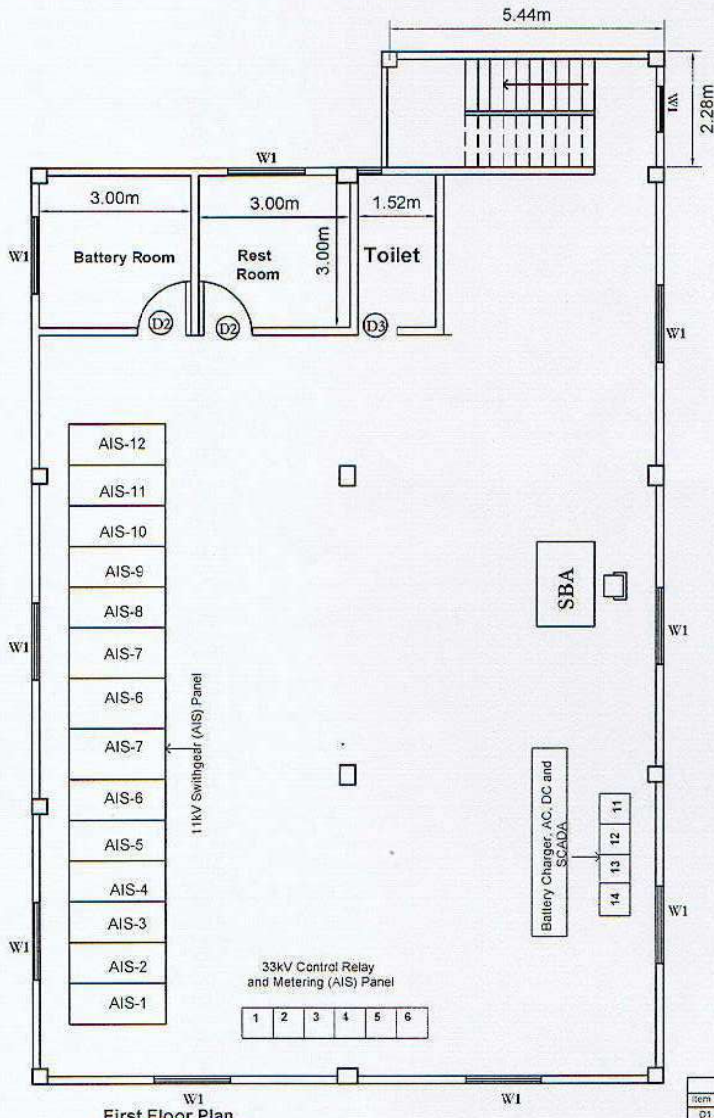
Revision		Sub-station	CHUADANGA (BSIS) 33/11kV 2x10/13.33 MVA (AIS) NEW SUB-STATION
WEST ZONE POWER DISTRIBUTION COMPANY LIMITED	Consultant	Engineers Associates Ltd.	TITLE / Drawing No.
EXPANSION AND UP-GRADATION OF POWER DISTRIBUTION SYSTEM PROJECT	Prepared by	Md. Abdul Baten	POROPSED LAYOUT PLAN OF 33/11 kV CHUADANGA (BSIC) SUB-STATION / CHU-02
	Checked by	Engr. Rama Nath Roy	



Revision		Sub-station	CHUADANGA (BSIC) 33/11kV 2x10/13.33 MVA (AIS) NEW SUB-STATION
WEST ZONE POWER DISTRIBUTION COMPANY LIMITED	Consultant: Engineers Associates Ltd.	TITLE	Drawing No.
EXPANSION AND UP-GRADATION OF POWER DISTRIBUTION SYSTEM PROJECT	Prepared by: Md. Abdul Baten	POROPSED SITE LOCATION PLAN OF 33/11 kV CHUADANG (BSIC) SUB-STATION	CHU-01
	Checked by: Engr. Rama Nath Roy		



Ground Floor Plan
(Control Building Plan)

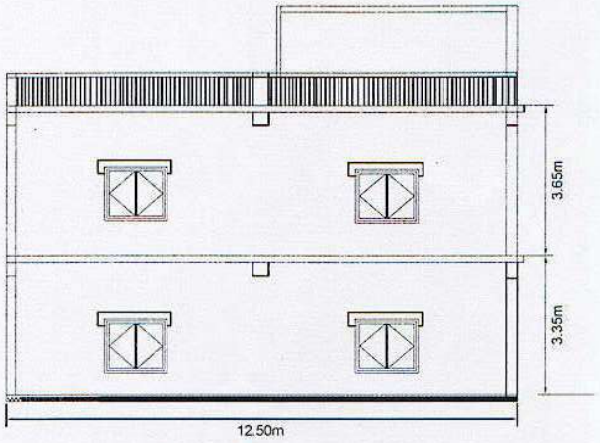


First Floor Plan
(Control Building Plan)

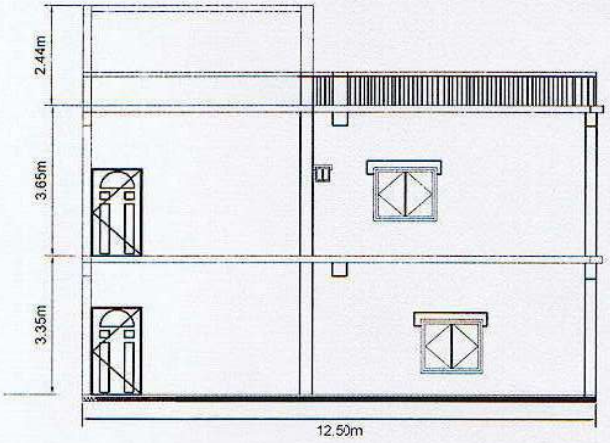
Note : All dimensions are given in meter

Measurement of Door & Windows			
Item	Description	Width	Height
D1	Wooden Door	1.22 or (4')	2.13 or (7')
D2	Wooden Door	1.02 or (3'4")	2.13 or (7')
D3	Wooden or PVC Plastic Door	0.76 or (2'6")	2.13 or (7')
W1	Steel Framed Double Panel Thai Glass Window	1.52 or 5')	1.37or (4'6")
W2	Steel Framed Double Panel Thai Glass Window	0.61 or (2')	0.61or (2')

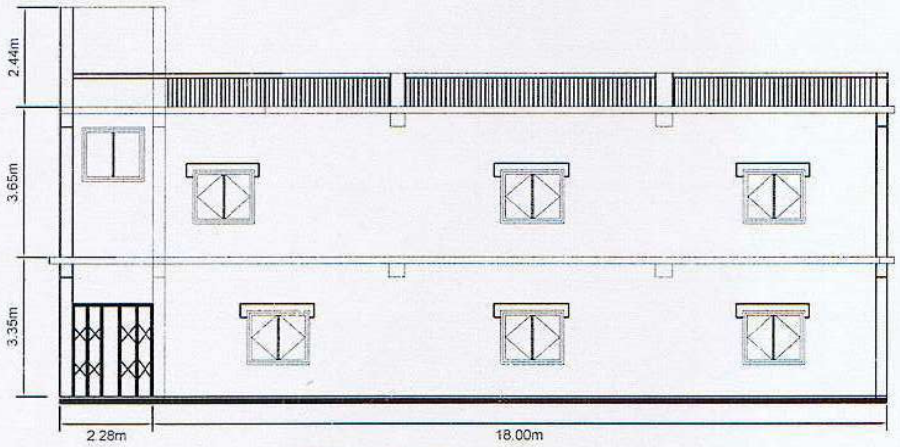
Revision		Consultant	Engineers Associates Ltd.	Sub-station	CHUADANGA (BSIC) 33/11kV 2x10/13.33 MVA (AIS) NEW SUB-STATION
WEST ZONE POWER DISTRIBUTION COMPANY LIMITED				Title	Drawing No.
EXPANSION AND UP-GRADATION OF POWER DISTRIBUTION SYSTEM PROJECT		Drawn By	Md. Abdul Baten	PROPOSED CONTROL BUILDING (GR.FLOOR & FIRST FLOOR)	CHU.-03
		Checked By	Engr. Rama Nath Roy		



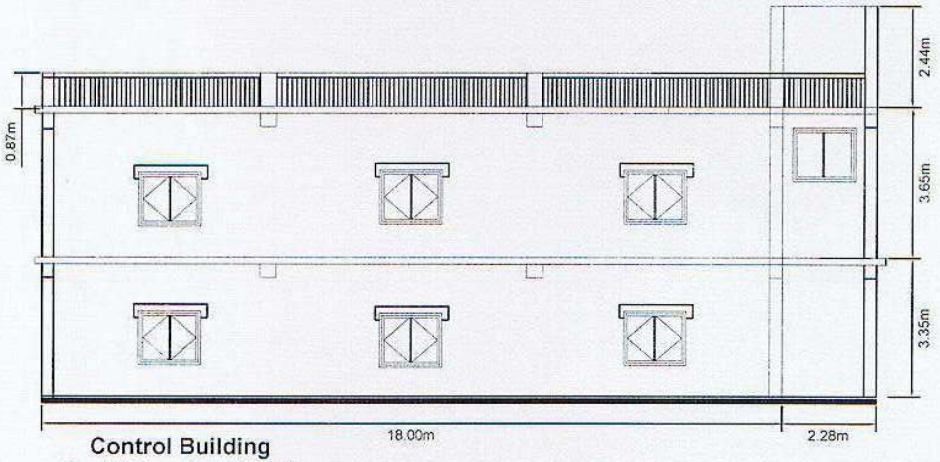
Control Building
Right Elevation (East)



Control Building
Left Elevation (West)



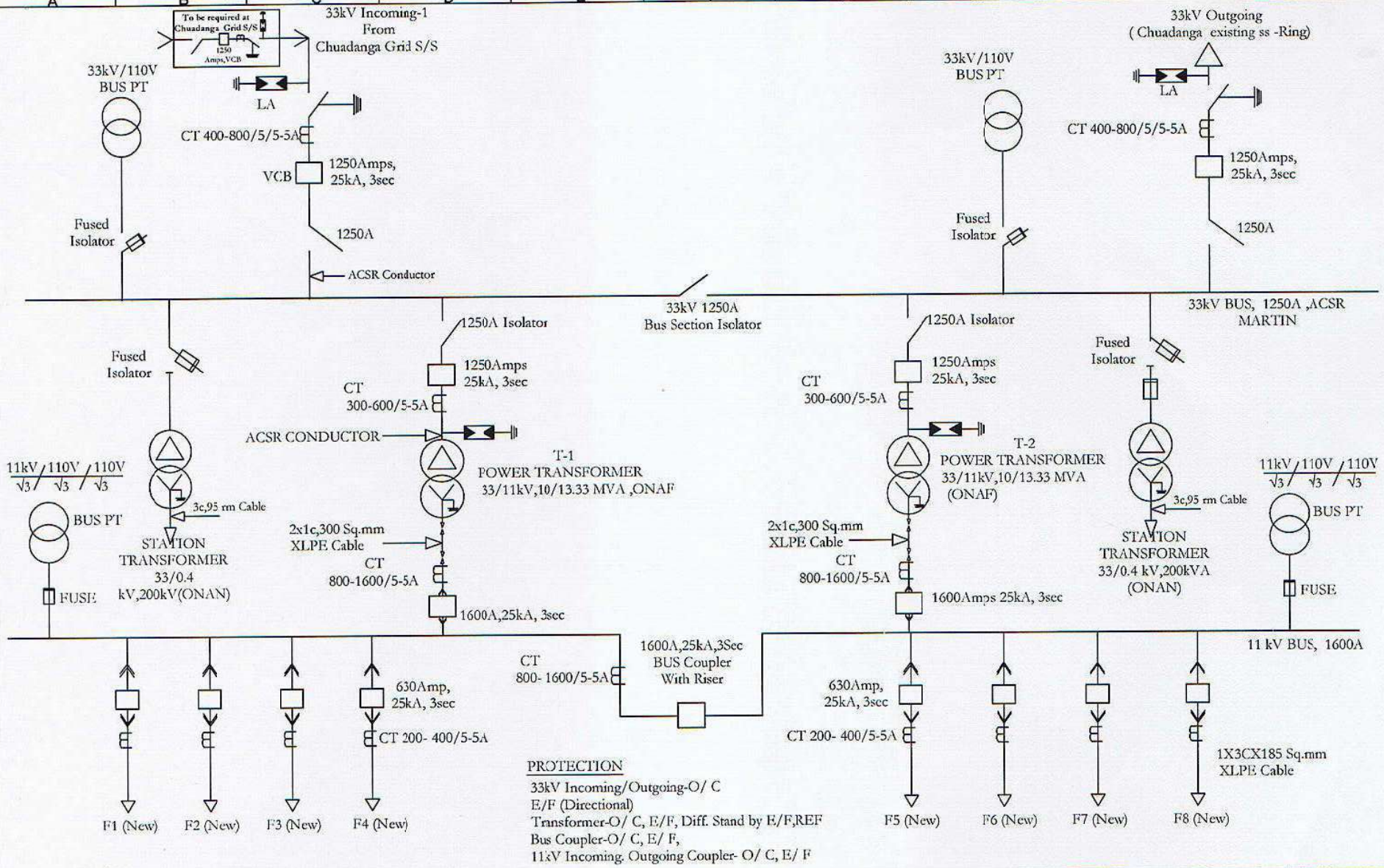
Control Building
Front Elevation (West)



Control Building
Back Elevation (East)

Note : All dimensions are given in meter

Revision		Consultant	Engineers Associates Ltd.	Sub-station: CHUADANGA (BSIC) 33/11kV 2x10/13.33 MVA (AIS) NEW SUB-STATION
WEST ZONE POWER DISTRIBUTION COMPANY LIMITED				Title / Drawing No.
EXPANSION AND UP-GRADATION OF POWER DISTRIBUTION SYSTEM PROJECT		Drawn By	Md. Abdul Baten	ELEVATION OF CONTROL BUILDING (FRONT,RIGHT,LEFT & BACK) — CHU-04
		Checked By	Engr. Rama Nath Roy	



Revision		Consultant	Engineers Associates Ltd.	Sub-station	CHUADANGA(BSIC) 33/11 kV, 2X10/13.33 MVA AIS SUB-STATION (NEW)
WEST ZONE POWER DISTRIBUTION COMPANY LIMITED		Drawn By	Engr.Noor Mohammad	TITLE	SINGLE LINE DIAGRAM OF 33/11KV CHUADANGA(BSIC) , AIS (REGULAR) SUB-STATION
EXPANSION AND UP-GRADATION OF POWER DISTRIBUTION SYSTEM PROJECT		Checked By	Engr. Rama Nath Roy	Drawing No.	CHU-05